

# Corrections needed for Environmental Transport Processes

## Print-On-Demand Version (2/6/2009)

### CHAPTER 1

- p. 6 Eq. 1-6, the definitions of  $x$  and  $y$  are switched.  
 In the first line change “air” to “water”, second line, change “water” to “air”  
 Eq. 1-6, replace “species C” with “species  $i$ ” in each of the three lines. [Note that  $i$  is italicized]  
 Eq. 1-9 are mass fractions. Replace word “mole” with “mass” in each of the three lines.
- p. 9 Table 1.4, First row, right column. Term in denominator should have a /, so change  $\phi_B M_B$  to read  $\phi_B / M_B$   
 Table 1.4, mass fraction definition, the mole fractions should be multiplied by  $M$ , so remove all “/”, to read:

$$\phi_C = \frac{y_C M_C}{y_B M_B + y_C M_C + \dots + y_N M_N}$$

- Example 1.1, 2nd line change "Show that relatively" to "Show that a relatively"  
 Example 1.1, eq. 1-23, change “0.228” to “0.0228”
- p. 10 In Table 1.5 the notation for liter should be a capital L not lower case l.  
 Change [g l<sup>-1</sup>] in the units on the two most right-hand columns to [g L<sup>-1</sup>]  
 Line below eq. 1-24, change “concentration or air” to “concentration of air”
- p. 15 Equation 1-47, subscripts are incorrect. Change  $Q_{2b}$  to  $Q_{in,2}$  and  $Q_{2c}$  to  $Q_{out}$
- p. 18 The term on the right hand side of eq. 1-60, change the  $c_i$  term to 1, so  
 Change from  $\frac{c_r}{V_0 - Q t}$  to  $\frac{1}{V_0 - Q t}$
- First line below eq. 1-62, change subscript from “f” to “0” and from “o” to “0”, so it reads: “(V<sub>0</sub>-V<sub>f</sub>)/V<sub>0</sub>”.
- p. 19 In Fig P-1.3, the lower horizontal line, the arrow should point to the left, not the right.

### CHAPTER 2

- p. 26 3<sup>rd</sup> paragraph, first line, change “qualitatively to” to “to qualitatively”.
- p. 30 Item 2 (of the 5 tabulated items), change “are unity” to “are constant”.
- p. 31 Eq. 2-16, change the first letter u to be the greek letter mu, change “u<sub>i</sub><sup>00</sup>” to “μ<sub>i</sub><sup>00</sup>”  
 Line above eq. 2-20, change from “Eq. 2-19 as” to “Eq. 2-18 as”.
- p. 32 Eq 2-26, change “-94.23” to “-94.26”  
 eq. 2-27, change “-98.32” to “-98.35”
- p. 34 Second line of example 2.2, change “at an acetate” to “an acetate”.
- p. 44 Eq. 2-91, omit first 10<sup>-4</sup>, so that  $n_{Bw} = 10^{-4} c_{Bw} V_w =$  becomes  $n_{Bw} = c_{Bw} V_w =$   
 Eq. 2-89, change subscripts C to M, so it reads  $\rho_{Mw} = \frac{c_w M_M}{\gamma_{Mw} P_M^0}$
- Line below 2-89, change subscripts on  $\gamma$  and  $\rho$  from  $C$  to  $M$ , so they read “ $\gamma_{Mw}$ ” and “ $\rho_{Mw}$ ”.
- Eq. 2-90, change  $\rho$  subscript from  $C$  to  $M$ , so it read “ $\rho_{Mw}$ ”  
 Eq. 2-90, change “mg m<sup>-1</sup>” to “mg g<sup>-1</sup>”  
 Two lines after Eq. 2-90, change subscript from  $C$  to  $M$ , so change “ $p_C$ ” to “ $p_M$ ”  
 Three lines after Eq. 2-90, change subscript from  $C$  to  $M$ , so change “ $\rho_{Cw}$ ” to “ $\rho_{Mw}$ ” and “ $p_C$ ” to “ $p_M$ ”
- p. 45 Eq. 2-94, change 0.0145 to 0.0415
- p. 46 Eq. 2-104, The subscripts should be C not A. Change  $x_{Ao} \gamma_{Ao}$  to  $x_{Co} \gamma_{Co}$
- p. 53 Problem 2.3, line 4, omit words “units missing”.  
 Problem 2.3, line 6, change subscript on  $M$  from  $a$  to  $D$ , so change “ $M_a$ ” to “ $M_D$ ”.  
 Problem 2.3, line 10 change “5 mg humics/L” to “5 mg humics/L-soil”.
- p. 55 Problem 2.9, line 6, exponent is positive. Change 10<sup>-5</sup> to be 10<sup>5</sup>  
 Problem 2.10, grammatical error, change end of last sentence from “of  $C$  are in solution” to “of  $C$  is in solution.”
- P. 56 Problem 2.15, line 7, change  $x$  in subscript of  $H$  to  $c$ , or “ $H_{Tpx}$ ” to “ $H_{Tpc}$ ”.

### CHAPTER 3

- p. 61 Eq. 3.7, include power of 1/3 in  $V$  term, so it reads  $V_{C,c}^{1/3}$
- p. 62 Two lines above eq. 3-10, change “With a gas” to “When a gas”.
- p. 63 Table 3.1 title, first line, subscript is  $cg$  not  $cw$  so change  $D_{cw}$  to  $D_{cg}$   
Three lines above Eq. 3.1, change the + to a times sign, so change “ $(\epsilon_M/k_B + \epsilon_d/k_B)^{1/2}$ ” to “ $(\epsilon_M/k_B \times \epsilon_d/k_B)^{1/2}$ ”
- p. 64 Eq. 3-16, subscript “ $Ag$ ” should be “ $Ma$ ”, so change “ $D_{Ag}$ ” to “ $D_{Ma}$ ”
- p. 66 First line, change “equation” to “equation, or”  
First line below eq. 3-27, change subscript on  $D$  from  $w$  to letter  $l$ , so it reads  $D_{cl}$ . Similarly change the subscript on  $\mu$  from  $w$  to letter  $l$ , so it reads  $\mu_l$   
4<sup>th</sup> line after eq. 3-27, insert a dash between  $g$  and  $mol$  so change  $g\ mol^{-1}$  to  $g\ mol^{-1}$   
6<sup>th</sup> line from bottom of page above Table 3.3. Change “Molar volumes at normal boiling” to “Molal volumes at normal boiling”  
Table 3.3 in table heading, the subscript of  $\Phi_B$  the  $B$  should be the letter  $l$ , so change  $\Phi_B$  to  $\Phi_l$   
Table 3.3 in column heading, for  $\Phi$  the subscript 4 should be the letter  $l$ , so change  $\Phi_4$  to  $\Phi_l$
- p. 67 Table 3.4, two column headings: delete “e” from end of “mole” so that it reads “mol”  
Table 3.4, two column headings: insert a dash between  $g$  and  $mol$  so change  $g\ mol^{-1}$  to  $g\ mol^{-1}$   
Table 3.4, two column headings: delete the dash between  $cm^3$  and  $g\ mol^{-1}$  so it reads  $cm^3\ g\ mol^{-1}$
- p. 69 Eq. 3-36, change subscripts on  $D$  from  $A$  to  $C$ , so in two places replace  $D_{Aw}$  with  $D_{cw}$   
Example 3.2, line 8 change “H (6×3.7)” to “H (12×3.7)”
- p. 70 First line below eq. 3-39, change subscript from  $A$  to  $G$  or  $V_{A,b}$  to  $V_{G,b}$   
Eq. 3-40, the answer needs a factor of  $10^{-8}$ , so it reads  $920 \times 10^{-8}\ cm^2\ s^{-1}$ .
- p. 76 Eq. 3-54, change subscripts on  $D$  in two places from “ $Dw$ ” to “ $Cw$ ”.
- p. 82 3<sup>rd</sup> line below eq. 3-67, change  $A$  to  $C$ , or change “ $y_{A,i}$  and  $y_{A,t}$ ” to “ $y_{C,i}$  and  $y_{C,t}$ ”  
3<sup>rd</sup> line below eq. 3-67, change  $A$  to  $C$ , or change “ $A$  in the gas” to “ $C$  in the gas”.
- p. 85 2<sup>nd</sup> line below eq. 3-78, equation numbers are wrong, so change “3-54 - 3-56” to “3-74 - 3-76”.
- p. 87 Table 3.9, error in lower versus upper case of letter in column heading, so in third column heading change  $mg\ DOC\ l^{-1}$  to  $mg\ DOC\ L^{-1}$ .
- p. 92 Line above eq 3-89, change “ $L/D_c$ ” to “ $L/u$ ”.
- p. 96 Graphics printing error in legend to upper figure in Figure 3.11. The first line should read “Colorado River, Nev.”, but this is illegible.
- p. 100 5<sup>th</sup> line after eq. 3-98, the apostrophe is missing, so change “ $c_{r,0}s$ ” to “ $c_{r,0}'s$ ”
- p. 103 The first two entries in the third column are not correct. Change -0.57 to -0.051 and change -1.05 to -0.105  
Third line after eq. 3-100, change 6.8 to 6.9.
- p. 105 Line 3, the formula for grease is given as  $(C_{51}H_{99})_6$  but it should read  $C_{51}H_{99}O_6$ .  
Problem 3.8, line 6, change “(a) What would concen-” to “(a) What concen-”
- P. 108 Problem 3.15, line 1, change “, and perchloroethylene (PCE)” to “or perchloroethylene (PCE),”

## CHAPTER 4

- p. 112 Figure 4.1, the bottom axis labeled “ $Z$ ” should be “ $X$ ”, and the vertical axis labelled “ $X$ ” should be “ $Z$ ”
- p. 113 first line below eq. 4-4, change “Surface forces are composed of 9 components” to “Surface forces can be composed of nine components.”  
Second line below eq. 4-4, change “of one of surfaces” to “of one of the surfaces”.  
The subscripts on  $\omega$  in equation 4-5 contain errors. The equation should be:  
**Surface Forces In** =  $(\omega_{xx}|_x + \omega_{yy}|_x + \omega_{zz}|_x)(\Delta y\ \Delta z) + (\omega_{yx}|_y + \omega_{yy}|_y + \omega_{yz}|_y)(\Delta x\Delta z) + (\omega_{xz}|_z + \omega_{zy}|_z + \omega_{zz}|_z)(\Delta x\Delta y)$
- p. 114 5<sup>th</sup> line below 4.3 heading, change “heat transport is considered” to “heat transport is not considered”.  
Line below eq. 4-8, change “derivitive” to “derivative”.
- p. 115 Second line after eq. 4-13, change “The internal forces acting on the control volume for” to “The forces acting on the control volume surface for”  
Eq. 4-14 is incorrect, and needs to be written as:  
 $(p|_x - p|_{x+\Delta x})(\Delta y\Delta z) + (p|_y - p|_{y+\Delta y})(\Delta x\Delta z) + (p|_z - p|_{z+\Delta z})(\Delta x\Delta y)$
- Eq. 4-16, change  $\Delta \mathbf{p}$  to  $\nabla \mathbf{p}$
- p. 121 Eq. 4-47, all the letter “ $C$ ”s should be capitalized, i.e. “ $c_{cw}$ ” should be “ $C_{Cw}$ ”, etc. (total of 5 places).
- p. 122 Eq. 4-52 and eq. 4-53, and all text in between equations, make all the letters  $u$  a bold  $\mathbf{u}$  (but do not bold

subscripts). There should be 10 total changes.

First line below eq. 4-53, subscript should be  $C$  not  $A$ , so change  $\mathbf{J}_{w>>A}$  to  $\mathbf{J}_{w>>C}$

Eq 4-57, change the  $\Delta$  symbol to a  $\nabla$  symbol.

- p. 124 Eq. 4-64, change “ $A$ ” to “ $C$ ” in the subscripts (change a total of 3 times in the equation).

The signs equation 4-65 are wrong, and  $=0$  is missing. Change the equation as indicated below

$$\frac{\partial c_{Cj}}{\partial t} + \mathbf{u}_j \cdot \nabla c_{Cj} - D_{Cj} \nabla^2 c_{Cj} - R_{Cj} = 0$$

## CHAPTER 5

- p. 132 In Eq. 5-4, change the partials to  $d$ , so it reads: 
$$\frac{d}{dz} (u_{ax} c_{Ca}) = \frac{d}{dz} \left( D_{Ca} \frac{dc_{Ca}}{dz} \right)$$

- p. 133 In eq. 5-5, the  $\nabla$  term should not be there, so change the equation to read:  $b_1 = -D_{Ca} \frac{dc_{Ca}}{dz} + u_{ax} c_{Ca}$

Eq. 5-9, change  $C$  to lower case  $c$  in the derivative term, so change “ $dC$ ” to “ $dc$ ”.

- p. 134. First line below eq. 5-12, change “ $0.1 \text{ cm}^2$ ” to “ $0.01 \text{ cm}^2$ ”.

Eq. 15 has 2 errors. First, parentheses are missing, so change  $10 \text{ cm}^2$  to read  $(10 \text{ cm})^2$  noting that the 2 is on the outside of the parentheses. Second, change 8.2 to 8.

- P. 135 Eq. 5-21, Change the letters “ $N$ ” to “ $J$ ” (two changes in this equation)

The two lines above eq. 5-23, eq. 5-23 itself, and the line below eq. 5-23, need to be completely replaced with the following:

“Under steady conditions,  $dJ_{Ca,z}/dz=0$ , or  $J_{Ca,z}$  is a constant. Using Eq. 5-10 for the flux, with  $c_{Ca}=y_C c_a$ , we can write

$$\frac{dJ_{Ca,z}}{dz} = \frac{d}{dz} \left[ \frac{D_{Ca} c_a}{(1-y_C)} \frac{dy_C}{dz} \right] = 0 \quad (5-23)$$

Integrating twice, we obtain the general solution”

- p. 136. First Line below eq. 5-30 and second line below (2 changes), change “Eq. 5-29” to “Eq. 5-30”

Eq. 5-31, the subscript on  $c$  should be  $a$  not the number 1, so change “ $c_1$ ” in the denominator to “ $c_a$ ” Also, change  $A$  in subscript of  $y$  to  $C$ , so change “ $y_{A,z}$ ” to “ $y_{C,z}$ ”.

- p. 137 First line, change “systems” to “system”.

- p. 138 Line 4, add a superscript / to the  $z$  term, so it reads  $z = z_1'$

Eq. 5-40, the second  $dt$  should be  $dz$ , so on the right hand side of the equation change  $z' dt$  to  $z' dz$

Eq. 5-41, the numerator on the right hand side contains an error, the second  $z$  term should contain a subscript zero. So change the term  $(z'^2 - z'^2)$  to  $(z'^2 - z_0'^2)$

- p. 141 Eq. 5-53, change  $\frac{d^2x}{dy^2}$  to  $\frac{d^2y}{dx^2}$

- p. 142 Eq. 5-63, change the “ $Cw,eqw$ ” subscript to “ $Cw,eq$ ”.

Eq. 5-64, change  $\frac{dC_{Cw}}{dz}$  to  $\frac{d^2c_{Cw}}{dz^2}$

- p. 146 6<sup>th</sup> line down from top of page, change “down the along” to “down along”

- p. 147 Eq. 5-83 has an extra term  $dy$  that should not be there, so after the integral change  $u_{w,z} dx dy$  to  $u_{w,z} dx$

- p. 148 Eq. 5-87, the denominator on the last term should be  $x$ , not  $z$ , so change  $\frac{\partial^2 c_{Cw}}{\partial z^2}$  to be  $\frac{\partial^2 c_{Cw}}{\partial x^2}$

Second line below eq. 5-87, change the  $z$  and  $x$  letters, so it reads “of the  $x$  direction and one as a function of  $z$ ”.

- p. 149 Eq. 5-92, on the right hand side,  $z$  should be  $x$ , so change  $dz^2$  to  $dx^2$ .

- p. 150 line above eq. 5-99 should refer to eq. 5-98 not 5-84.

- p. 153 Eq. 5-112, at the end of the equation change the  $dy$  to be  $dz$

- p. 156 Eq. 5-126, change the subscript from  $A$  to  $C$ , so that  $c_{Aw}$  becomes  $c_{Cw}$

- p. 158 2<sup>nd</sup> line after eq. 5-136, change “production” to “product”

- Eq. 5-141, second line, first right-most term, there is an extra “r”, so change “ $r \frac{\partial c}{\partial r} r$ ” to “ $r \frac{\partial c}{\partial r}$ ”
- p. 159 First line, an “r” is missing. Change first line term from “ $2\pi\Delta r\Delta z$ ” to “ $2\pi r\Delta r\Delta z$ ”
- Eq. 5-142, second line, (i) change “ $D$ ” to “ $\frac{D}{r}$ ”; (ii) the second term in the numerator has an extra “r”, so change “ $r \frac{\partial c}{\partial r} r$ ” to “ $r \frac{\partial c}{\partial r}$ ”; and (iii) the  $k$  is missing the subscript 1, so change “ $kc$ ” to “ $k_1c$ ”.
- Eq. 5-144, the signs for the second and third term need to be switched, producing
- $$\frac{d^2c}{dr^2} + \frac{1}{r} \frac{dc}{dr} - \frac{k_1}{D} c = 0$$
- 2<sup>nd</sup> line after eq. 5-147, change reference from “Eq. 5-135” to “Eq. 5-145”.
- p. 160 Eq. 5-149, the two  $k$  terms are missing the subscript number 1, so change them from “ $k$ ” to “ $k_1$ ”.
- Problem 5.1, line 2, change 8.2 to 8.
- p. 163 Problem 5.10, line 3. Change a period in the chemical equation to an arrow, so that  $H^+ + OCl^- \cdot HOCl$  becomes  $H^+ + OCl^- \rightarrow HOCl$

## CHAPTER 6

- p. 165 In both Eqs. 6-1 and 6-2, the letter  $J$  should not be bold.
- p. 166 First line of section 6.2, change “In section 5.3” to “In section 5.2”.
- Fourth line of section 6.2, change “two liquid phases” to “two phases”.
- p. 168 Eq. 6-9, change  $A$  in subscript to  $C$ , or “ $D_{Aw}$ ” to “ $D_{Cw}$ ”.
- p. 170 In line 4 and line 7, change “1/3” to “2/3”.
- Last 2 lines of text on the page, change “that the predictions of the stagnant film theory do not” to “that stagnant film theory does not”
- p. 171 Line 5, change “chemical flux is predicted” to “chemical flux predicted”
- Line 8, powers of  $D$  are wrong. Change from “ $D_{Cw}^{1/2}$  and not  $D_{Cw}^{1/2}$ ” to “ $D_{Cw}^{2/3}$  and not  $D_{Cw}^1$ ”
- p. 175 Line above eq. 6-30, change “Eq. 6-28” to “Eq. 6-29”.
- Line above eq. 6-31, change “Eq. 6-29” to “Eq. 6-30”.
- 1<sup>st</sup> line after Eq. 6-31, change “Eq. 6-21” to “Eq. 6-20”.
- p. 176 Eq. 6-35, change from italicized font to normal font, bold letter  $k$ , so change “ $k_w$ ” to “ $\mathbf{k}_w$ ”
- p. 178 Eq. 6-48, the = sign should be a minus sign, so change the first term ( $y_{C,\infty} = y_{C,i}$ ) to ( $y_{C,\infty} - y_{C,i}$ )
- p. 179 Eq. 6-50, change subscript on  $H$  from “ $cx$ ” to “ $Cyx$ ”, so change “ $H_{cx}$ ” to “ $H_{Cyx}$ ”
- p. 182 Eq. 6-62, the exponent should be 1/3 not 2/3, so the term reads  $Pe^{1/3}$ .
- p. 183 First line below eq. 6-70, / is missing. Change  $Sc = v_w D_{Cw}$  to  $Sc = v_w / D_{Cw}$
- Eq. 6-72, the denominator should contain the letter “nu” not “mu” so the term  $(gL^3/\mu_w^2)^{1/6}$  should be  $(gL^3/\nu_w^2)^{1/6}$
- p. 184 6 lines below Eq. 6-73, change “organic solutes in water a” to “organic solutes in water in a”.
- Eq. 6-74, the term in parentheses on the left should be raised to the 1/3 power; and the  $Sc$  term should be to the -0.5 power (not 0.5) power.
- Third line below eq. 6-74, subscript on  $D$  is  $C$  not  $A$ , so replace  $v_w/D_{Aw}$  with  $v_w/D_{Cw}$
- Third line below Eq. 6-75,  $a$  is missing a subscript  $w$ , so change “ $J_w^2 a$ ” to “ $J_w^2 a_w$ ”.
- First line after equation 6-76, symbol is “ $a$ ” not Greek letter alpha so replace  $J_a a_a \mu_a$  with  $J_a a_a \mu_a$
- Third line from bottom of page (end of paragraph below eq. 6-76). Add the sentence “The constant 5.23 applies only to packing larger than 15 mm, and should be 2.00 for smaller media.”
- p. 188 Third line from bottom of equation, change “Equation 6-94” to “Equation 6-96”.
- Second line from bottom, delete “is” (the last word of the line).
- p. 189 In first line, change “factor in Eq. 6-90” to “factor in Eq. 6-96”.

## CHAPTER 7

- p. 193 Second paragraph, first line, change “energy inputs” to “energy input”.
- p. 195 Eq. 7-2, a symbol  $\prime$  is missing. The equation should read:  $\langle u_x \rangle = (\overline{u_x^2})^{1/2}$
- p. 197 4<sup>th</sup> line after eq 7-6, change “Komogorov” to “Kolmogorov”
- Third line after eq. 7-7, changes “Eqs. 7-14 and 7-15” to “Eqs. 7-6 and 7-7”

- 4 lines below Eq. 7-7, change “likely to be range” to “likely to be a range”.
- p. 199 Eq. 7-12, change the minus sign to a plus sign.
- p. 200 First paragraph above eq. 7-17, insert word turbulent to read “Mass transport in turbulent sheared fluids”
- p. 201 Line below 7-22, change “expected for” to “as expected for”.
- p. 203 Example 7.1, first line, insert word radius to read “ for a 100- $\mu\text{m}$  (radius) particle”
- p. 204 Line above Figure 7.5, change “Eq. 7-14” to “Eq. 7-15”.
- p. 205 2<sup>nd</sup> line after eq. 7-31, change from “Eq. 7-4” to “Eq. 7-6”.  
Eq. 7-36, change “ $b_D$ ” to “ $b_{d,p}$ ” in numerator, and “2<sup>3</sup>” to “2” in denominator.
- p. 206 First line, change from “Eq. 7-14” to “Eq. 7-32”.  
Eq. 7-37, delete term “ $\rho_w$ ” from the numerator.  
Two lines below eq. 7-37,  $r$  should not be in bold text, so it should read “ $\mathbf{F} \times r \sin \theta$ ”.  
Line above Eq. 7-39, change “Eq. 7-31” to “Eq. 7-32”.  
Example 7.2, line 4, change “7.6:3.3” to “7.6:2.3”
- p. 207 First line, change “Eq. 7-36” to “Eq. 7-37”.  
Eq. 7-41, delete term “(1.0 g cm<sup>-3</sup>)” from numerator, and put a power 3 on the rps term so it reads “ $(\frac{100}{60} \text{ rps})^3$ ”
- p. 209 Second line, change “7-48” to “7-51”  
Eq. 7-52, the term “(1 min/60 s)” is missing, so change to:  

$$\left( \frac{(1 \text{ L/min}) (10 \text{ cm}) (981 \text{ cm/s}^2) (1 \text{ min}/60 \text{ s})}{(1.5 \text{ L}) (0.01 \text{ cm}^2/\text{s})} \right)^{1/2}$$
- p. 214 Line 6 of example, change reference from “using Eq. 7-36” to “using Eq. 7-37”.  
Line above equation 7-65, change “500 ml” to “500 mL”.
- p. 215 Line 7 of section 7.5, change “order efficiently to” to “order to efficiently”.
- p. 217 Line 6, omit word “this”, so change “Based on this the above” to “Based on the above”  
Line below eq. 7-69, change “from Eq. 7-17” to “from Eq. 7-7”.
- p. 219 Change Example number from 7.4 to 7.5
- p. 222 Eq. 7-77, subscript on  $v$  is incorrect. Change it from  $b$  to  $w$ , or  $v_b^2$  to  $v_w^2$   
First line after eq. 7-81, change reference to eq. 7-80 not 7-71, so it should read “Substituting the rise velocity into Eq. 7-80”
- p. 223 Eq. 7-90. The subscript on  $Q$  should be the letter “a” not “O”, so change “ $Q_O$ ” to “ $Q_a$ ”; and there should not be a number 2 in the denominator, which should just read “ $v_{rb}$ ”.  
First line after Eq. 7-91, change reference to eq. 7-91 not 7-81, so it should read “we approximate eq. 7-91 as just”
- p. 224 Additional clarification is needed here.  
In the first line, add to “obtain” to read “obtain for a single bubble”  
In the next text line, change “For larger bubbles” to “For larger, single bubbles,”  
Eq. 7-93 is incorrect. Change it to read:  

$$u_b [\text{cm s}^{-1}] = (2 g R_b)^{1/2} = 44.3 R_b^{1/2}$$
  
Eq. 7-93, change the “ $u$ ” to “ $U$ ”  
Eq. 7-94. Change the number in the denominator from 1.1 to 1.41.  
Two lines above equation 7-96, change the word “diameter” to “radius”.
- p. 225 Lines 3 and 4 change subscript on  $K$  (two places) from  $aw$  to  $wa$ , or “ $K_{aw}$ ” to “ $K_{wa}$ ”.  
Line above Fig. 7-12, change “Eq. 7-88” to “Eq. 7-98”.
- p. 226 3<sup>rd</sup> line after eq. 7-100, minus sign is missing, so change “ $(K_{wa} a_v)$ ” to “ $-(K_{wa} a_v)$ ”
- p. 228 Problem 7.3, Line 5, subscript on  $H$  should be  $O_{px}$ , so change “ $H_{Opc}$ ” to “ $H_{Opx}$ ”.

## CHAPTER 8

- p. 232 Eq. 8-3, change subscript on  $K$  is  $MM$  but should be  $mm$ , so change “ $K_{MM}$ ” to “ $K_{mm}$ ”.
- p. 233 Eq. 8-9, the letter  $f$  in the equation should have a subscript  $a$ , so change “ $f$ ” to “ $f_a$ ”
- p. 238 Eq. 8-19, the = sign is missing before  $Sh_G$ . The last two terms should be  $= \frac{Sh_G}{Sh=1} = Sh_G$
- p. 239 Line 8, change “BSA is soluble” to “BSA is a soluble”.
- p. 241 Third line below “Transport by Diffusion” section, change reference from “Fig. 7.13” to “Fig. 7.11”.

p. 242 Eq. 8-23 should read:  $R_C V = R_C 4\pi r^2 \Delta r \theta$

The line after eq. 8-23, the term should not contain a  $\Delta r$ , and should read "dividing by  $4\pi\theta$ ".

Eq. 8-24, the equation is missing a term " $r^2$ " on the left side, and should therefore read:

$$D_C \left( \frac{dc}{dr} \right) r^2 \Big|_{r+\Delta r} - D_C \left( \frac{dc}{dr} \right) r^2 \Big|_r - R_C r^2 \Delta r = 0$$

p. 243 Eq. 8-30, there is a plus sign and a term R is missing, so the equation should read

$$c(r) = c_s + \frac{k_O X}{6 D_O} (r^2 - R^2)$$

Eq. 8-31, the first term is inverted, and the subscript on the first  $c$  should be  $s$ , and so the equation should

read 
$$R = \left[ \frac{6 D_O}{k_O X} (c_s - c_0) \right]^{1/2}$$

p. 245 Eq. 8-47 the subscript on  $u$  should be  $ag$  not  $f$ , so change " $u_f$ " to " $u_{ag}$ ".

Second line from bottom, again change " $u_f$ " to " $u_{ag}$ ".

p. 247 Line above Eq. 8-58, change "Cozeny-Karmen" to "Kozeny-Carmen".

Eq. 8-59, a superscript 2 is missing. Change  $R_{cyl}$  to  $R_{cyl}^2$

p. 251 Eq. 8-67, power of 2 missing in denominator. Change it from  $(1-\theta)$  to  $(1-\theta)^2$

p. 254 3<sup>rd</sup> Paragraph, 4 lines down, change "made using assuming" to "made using".

2<sup>nd</sup> line after Eq. 8-76, change "Eq. 8-65" to "Eq. 8-76"

Last line of page, change "Eq. 8-64 and Eq. 8-66" to "Eq. 8-75 and Eq. 8-77"

p. 256 Eq. 8-84, omit the subscript from  $f$ , so change " $f_T$ " to " $f$ ".

p. 257 Line 4, change subscript on  $b$  from 1 to 2, so change " $b_1$ " to " $b_2$ "

Eq. 8-88, change " $b_2$ " to " $b_1$ "

First line after Eq. 8-88, change " $b_1$ " to " $b_2$ "

Eq. 8-89, change " $b_2$ " to " $b_1$ "

First line after Eq. 8-89, change change " $b_2$ " to " $b_1$ "

Eq. 8-90, change " $b_2$ " to " $b_1$ "

Eq. 8-92, change in numerator " $dC$ " to " $dc$ "

p. 259 Eq. 8-102, the subscript on  $\eta$  should be "a" not "d", so changeto  $\eta_a$

## CHAPTER 9

p. 264 Second paragraph, Line 3, change "tricking" to "trickling".

p. 265 Eq. 9-3, subscripts are incorrect. The concentration difference should be written as  $(c_{Cw,\infty} - c_{Cb,0})$

p. 266 Eq. 9-12, subscripts are incorrect. The concentration difference should be written as  $(c_{Cw,\infty} - c_{Cb,0})$

p. 267 Eq. 9-17, first  $Sc$  term should be raised to " $-1/3$ " not " $1/3$ " power, so change " $Sc^{1/3}$ " to " $Sc^{-1/3}$ ".

p. 270 Eq. 9-24, the denominator on the last term should be  $x$ , not  $z$ , so change  $\frac{\partial^2 c_{Cw}}{\partial z^2}$  to be  $\frac{\partial^2 c_{Cw}}{\partial x^2}$

p. 271 Eq. 9-31. After the  $+ R_b A \Delta x$  term add  $= 0$ , so it becomes  $+ R_b A \Delta x = 0$

p. 272 Line 1. Change  $A \delta x$  to  $A \delta x$

Eq. 9-32, Add - sign to change  $R_b$  to  $-R_b$

Eq. 9-33, Add - sign to change  $R_b$  to  $-R_b$

Eq. 9-35, omit  $C$  from subscript on  $R$  term, so change " $R_{Cb}$ " to " $R_b$ ".

Line above eq. 9-36, change subscript from  $S$  to  $c$ , or  $Y_{X/S}$  to  $Y_{X/c}$

Line below eq. 9-36, change subscript  $w$  to  $b$ , or  $c_{Cb} \gg K_m$  to  $c_{Cw} \gg K_m$

p. 273 Line above eq. 9-40, change reference from Eq. 9-30 to Eq. 9-33

p. 275 Eq. 9-53, several subscripts are incorrect.

The subscript on the diffusion coefficient should be  $Cw$ , or  $D_{Cw}$ .

The concentration difference should be written as  $(c_{Cw,\infty} - c_{Cb,0})$

p. 276 Eq. 9-61, Replace the 1 with a  $B_0$ . Change from  $x_b^* = 1$  to  $x_b^* = B_0$

p. 277 Line after eq. 9-66, change subscript from "b" to zero, so change " $c_{Cw,b}$ " to " $c_{Cw,0}$ "

- Line above eq. 9-70, change reference from Eq. 9-21 to Eq. 9-66.  
 First line after eq. 9-70, change “an incompletely penetrated” to “a completely penetrated”.
- p. 279 Second line from bottom of page, change = sign to  $\leq$  so that  $R_{\text{lim}}=1$  becomes  $R_{\text{lim}}\leq 1$ .
- p. 280 Eq. 9-85, remove the negative sign.  
 Eqs. 9-89, 9-90, 9-91, change subscript on  $Y$  from  $X/S$  to  $X/c$ , so change “ $Y_{XS}$ ” to “ $Y_{Xc}$ ”.
- p. 281 Eq. 9-92, replace the - sign with a + sign in the denominator  
 Below eq. 9-92, change  $s_{\infty}^*$  to  $s_{b0}^*$  everywhere in that paragraph (total of 4 times).  
 Line 4 below eq. 9-92, change Eq. 9-95 to Eq. 9-85  
 Eq. 9-93, change subscript on  $Y$  from  $X/S$  to  $X/c$ , so change “ $Y_{XS}$ ” to “ $Y_{Xc}$ ”.  
 Eq. 9-95 change  $z^*$  to  $x^*$   
 Eq. 9-96 change  $z^*$  to  $x^*$  and  $dz^*$  to  $dx^*$   
 last line of the page, change  $dz^{*2}$  to  $dx^{*2}$
- p. 282 Line 1, change 9-85 to 9-92  
 Change the sentence below equation 9-98, to be  
 “This equation can be solved by separation of variables (Williamson and McCarty, 1976; Suidan, 1986) to obtain”  
 Three lines after Eq. 9-99, change subscript from  $s$  to  $b_0$ , so change “ $s_s^*$ ” to “ $s_{b0}^*$ ”  
 Six lines above eq. 9-101, the two  $\delta_b$  terms are missing the \*. Change them both to be  $\delta_b^*$   
 Seven lines above eq. 9-101, change the reference from “Suidan (1987)” to “Suidan *et al.* (1987)”.
- p. 286 Eq. 9-121, add subscript “end” to  $b$  term, so the last term reads:  $b_{\text{end}} X \delta_b(t)$   
 Eq. 9-122, the second term is incorrect. The whole equation should be:  

$$\frac{d\delta_b^*}{dt^*} = \frac{\mu_{\text{max}} Y_{X/c}}{b_{\text{end}}} J^* - \delta_b^*$$
- p. 292 Eq. 9-139, the denominator of the last term, replace  $K_s$  with  $K_m$
- p. 294 5 lines after equation 9-142, insert  $t+$  so change “S at time  $\Delta t$ ” to be “S at time  $t+\Delta t$ ”
- p. 325 Eq. 9-212, the exponent of 3 should be  $1/3$  not  $1/2$ , so change “ $3^{1/2}$ ” to “ $3^{1/3}$ ”.
- p. 328 Problem 9.3, part c, add to end of sentence “assuming an influent sBOD of 100 mg/L”
- p. 329 In the first line a slash is missing. Change  $\Phi = \delta_b(k_1 D_{Cb})^{1/2}$  to  $\Phi = \delta_b(k_1 / D_{Cb})^{1/2}$
- p. 330 Problem 9.11, part b change “glucose” to “glucose”.
- p. 331 Problem 9.14, Line 2, change “Eq. 9-77” to “Eq. 9-76”.
- P. 332 There is a missing reference. Include: “Suidan, M.T., B.E. Rittmann, and U.K. Traegner. 1987. *Wat. Res.*, **21**(4):491-498.”

## CHAPTER 10

- p. 338 Eq. 10-11, the subscript for  $x^2$  is incorrect, so that the first term should be changed on the right hand side of the equation to read  $= D \frac{\partial^2 \bar{c}}{\partial x^2} + \frac{\partial^2 \bar{c}}{\partial y^2} + \dots$
- p. 339 Eq. 10-14, the subscript for  $y^2$  is incorrect, so that the second term should be changed on the right hand side of the equation, and, the negative signs on the right hand side should be removed, so that the right hand side reads:  

$$= D \frac{\partial^2 \bar{c}}{\partial x^2} + D \frac{\partial^2 \bar{c}}{\partial y^2} + \frac{\partial}{\partial x} \left( e_x \frac{\partial \bar{c}}{\partial x} \right) + \frac{\partial}{\partial y} \left( e_y \frac{\partial \bar{c}}{\partial y} \right)$$
- Eq. 10-15, a plus sign is missing between terms on the right hand side; it should read:  

$$= (D + e_x) \frac{\partial^2 \bar{c}}{\partial x^2} + (D + e_y) \frac{\partial^2 \bar{c}}{\partial y^2}$$
- p. 342 The line following eq. 10-26, change “z” to “x” to read:  
 “For one-dimensional transport in the x direction...”
- p. 343 Eq. 10-33, denominator should be  $\partial x$  not  $\partial$ .  
 2 lines above eq. 10-34, refer to equation 10-30 and not 10-7, to read:  
 “The solution of Eq. 10.30 with these three...”
- p. 344 Line above eq. 10-39, refer to equation 10-35 and not 10-12, to read:

- “The solution of Eq. 10.35 is”
- p. 346 Eq. 10.43, the  $s^2$  term in the demoninator should be a  $2^2$   
Eq. 10.47, replace right hand side term  $c_0$  with  $M$
- p. 347 Line above eq. 10-51, change reference from Eq. 10-27 to Eq. 10-50.
- p. 348 line above example 10.2. Change or to as, so change “with time or the plume” to “with time as the plume”  
Example 10.2, line 3, missing text at the end of line. Change “above the lake surface.” to “above the lake surface, so that  $E_x=0.04 \text{ m}^2 \text{ s}^{-1}$ .”
- p. 350 Figure 10.7 part (B) needs to be redrawn to show a velocity term to the left on the top (see page).
- p. 352 Third line below eq. 10-71, insert comma to change “chemical so that” to “chemical, so that”.  
Change the text in the third line from “relative to diffusion across the channel” to “because cross-sectional diffusion evens out the cross-sectional concentration gradients”.
- p. 354 2<sup>nd</sup> line after eq. 10-79, replace “A” with “a chemical”
- p. 356 Eq. 10-83, replace the second equals sign with a minus sign, so that the equation reads  
$$u_x(y) = 2\bar{u} - u_{sh}f(r^*)$$
  
Line after eq. 10-85, change “Substituting Eq. 10-85” to “Substituting Eq. 10-84”
- p. 358 Line below eq. 10-94, change “=0.40” to “=0.4085”.  
Eq. 10-95, change “0.593” to “5.93”
- p. 366 Figure 10.17, label on the x-axis, change to capitalize Pe and change d in denominator, so that the axis label reads: Peclet number, Pe ( $Pe=ud/D$ )
- p. 367 Table 10.1. Replace  $K_L$  with  $E_L$  in the Table caption and in the column heading.

## CHAPTER 11

- p. 378 Second paragraph, line 10, change “ $4Et$ ” to “ $32Et$ ”.
- p. 380 Equations 11-9, 11-10, 11-11, 11-12. In all of these equations, the power on c is incorrect.  
Change  $\partial c^2$  to  $\partial^2 c$  where it appears in these equations.  
Eq. 11-12, change term  $u_x c$  to  $u_x \frac{\partial c}{\partial x}$
- p. 381 Last line of page, use a lower case subscript to change  $\bar{E}_v$  to  $\bar{E}_v$
- p. 386 Eq. 11-23,  $w$  in the denominator should be squared, so change “ $w$ ” to “ $w^2$ ”.
- p. 387 Line above Eq. 11-31, change reference from Eq. 11-16 to Eq. 11-17  
Last paragraph, second line, omit +h in equation. Change:  $\{1+\ln[(z+h)/h]\}$  to  $[1+\ln(z/h)]$
- p. 388 Second to last line of paragraph 1, subscript is missing. Change LCM to  $L_{CM}$   
Three lines above eq. 11-32, change “in the steam” to “in the stream”.  
Line above eq. 11-32, change reference from eq. 10-46 to 10-69.
- p. 390 Eq. 11-37 change  $c_0$  to  $\frac{c_0}{2}$   
Eq. 11-38, change  $\frac{dc^2}{dx^2}$  to  $\frac{d^2c}{dx^2}$   
Eq. 11-39, BC 2, change  $\frac{dc}{dz}$  to  $\frac{dc}{dx}$
- p. 393 Fifth line after Eq. 11-43, change reference from Eq. 11-36 to Eq. 11-43  
Second line after Eq. 11-44, change reference from Eq. 11-36 to Eq. 11-42.
- p. 395 Last line of first paragraph, change reference from Eq. 11-38 to Eq. 11-47.
- p. 400 Eq. 11-56, change first term from  $\int_{m_0}^0 dm_c$  to  $\int_{m_0}^0 \frac{dm_c}{A(m_c)}$
- p. 402 Eq. 11-62 and Eq. 11-63, the subscript is wrong on t. Replace subscript  $C,p$  with  $C,d$   
Eq. 11-62, change the denominator of the m term from “C” to “C,d”, so change  $m_C^{2/3}$  to  $m_{C,d}^{2/3}$
- p. 403 Paragraph after Eq. 11-66, change (two times) the reference of Eq. 11-59 to Eq. 11-66.
- P. 404 Subscript  $v$  is used incorrectly in many places instead of  $w$  (for wave):  
Eq. 11-68, change  $m_{c,v}$  to  $m_{c,w}$  and  $h_v$  to  $h_w$   
First line below eq. 11-68, change  $m_{c,v}$  to  $m_{c,w}$

- Second line below eq. 11-68, change  $h_v$  to  $h_w$   
 Eq. 11-69, change  $t_{c,v}$  to  $t_{c,w}$  and  $h_v$  to  $h_w$   
 Eq. 11-70, change  $m_{c,v}$  to  $m_{c,w}$   
 Eq. 11-71, change  $c_{c,v}$  to  $c_{c,w}$   
 Eq. 11-72, change in two places  $h_v$  to  $h_w$   
 The paragraph between Eq. 11-71 and Eq. 11-72, change references  
     From Eq. 11-51 to Eq. 11-58 (two times)  
     From Eq. 11-64 to Eq. 11-71
- p. 406 Line 3, change “weight from 4 to 35 or more” to “weight from molecules containing 4 carbons to those containing 35 carbons.”  
 Paragraph 3, line 8, change “boiling” to “boiling”  
 Four lines above eq. 11-74, change “air-water” to “air-oil”  
 Three lines above eq. 11-74, change “air-water” to “air-oil”
- p. 408 Eq. 11-84, the 0.5 is misplaced in the equation and should proceed the first x term. Change the equation to read
- $$t_{1/2} = - \frac{\ln [0.5 x_{c_{o,0}}/x_{c_{o,0}}]}{b_e} = \frac{\ln 2}{b_e}$$
- p. 409 Change reference from Eq. 11-73 to Eq. 11-83.  
 Eq. 11-85, change the coefficient to from 0.32 to 0.92  
 Two lines below eq. 11-85, change “half-life of 1 h” to “half-life of 3 h”
- p. 410 Line 5 of problem 11.5, replace “over a distance of” with “ over the next”.

## CHAPTER 12

- p. 414 2<sup>nd</sup> line after eq. 12-5, remove minus sign, so change “[L<sup>-2</sup>]” to “[L<sup>2</sup>]”.  
 Third line below eq. 12-5, remove minus sign from 10 power, so change “10<sup>-8</sup>” to “10<sup>8</sup>”.  
 In eq. 12-6, change  $\Delta h$  to be  $\Delta l$ , and include 2 negative signs so the equation reads:
- $$\kappa = - \frac{Q\mu}{A} \frac{\Delta l}{\Delta p} = \frac{(1 \text{ cm}^3 \text{ s}^{-1})(1 \text{ cp})}{(1 \text{ cm}^2)} \frac{1}{(-1 \text{ atm cm}^{-1})} \equiv 1 \text{ darcy}$$
- p. 415 Section 12.3, line 2. Change “In that section” to “In this section”, and then in the next line, change the words “derived” and “presented” to “derive” and “present”.
- p. 417 Eq. 12-18 change  $c(\xi, t)$  to  $c(\xi)$  in the numerator of the first term.  
 Example 12.1, line 7, the exponent should be -4 not -6: change  $6 \times 10^{-6}$  to  $6 \times 10^{-4}$
- p. 418 In eq. 12-25, replace the = sign following (1500 m) with a - sign.
- p. 419 Line above Eq. 12-31, change reference from Eq. 12-24 to Eq. 12-26
- p. 420 First line after eq. 12-35, change “L’Hospital’s” to “L’Hopital’s”.
- p. 422 Line above Eq. 12-50, change reference from Eq. 12-34 to Eq. 12-44.
- p. 424 line above eq. 12-57, change end of sentence from “one column, or” to “one column pore volume, or”
- p. 427 Caption to Figure 12.6, line 4, change “phyenyl” to “phenyl”. Also, there seems to be a font size change between lines 3 and 4 beginning with “chloro-S-tri-“
- p. 430 Lines 9 and 10 from top of page, change “for cases where adsorption and intra-aggregate diffusion are” to “for cases where adsorption is”  
 Lines 5 and 6 below Eq. 12-70, change “with (Eq. 12-14) and without (Eq. 12-31) reaction” to “without (Eq. 12-14) and with (Eq. 12-31) reaction”
- p. 436 Eq. 12-82, a term is missing from the end of the second equation. Change from  $= \rho_r g L_{mv,v}$  to:
- $$= \frac{2\sigma_{mv}}{R_h} + \rho_r g L_{mv,v}$$
- p. 437 Eq. 12-84, minus sign is missing. Change  $2 \sigma_{mv}$  to  $-2 \sigma_{mv}$   
 Eq. 12-86, power on  $R_h$  of 2 is missing. Change  $R_h$  to  $R_h^2$   
 Eq. 12-87,  $R_h$  should be in the numerator, not denominator. Change from  $= \frac{2}{R_h Bo}$  to  $= \frac{2 R_h}{Bo}$
- p. 447 Second line above Eq. 12-111, a  $\theta_w$  is missing. Change  $N_n = V_n/(\pi d_n^3/6)$  to  $N_n = V_n/(\theta_w \pi d_n^3/6)$ .

- p. 457 Third line above Eq. 12-132, the first 20°C should be 40°C, so change first term in that line to  $c_{pw,eq}(40^\circ\text{C})=240 \text{ mg L}^{-1}$ .
- p. 459 4<sup>th</sup> line from bottom of page, get rid of + sign, so that term reads  $Sh_a^+ = k_{na} d_g^2 / D_{Na}$
- p. 460 Table 12.8, the “Conditions” column, third line from the bottom, the subscript should be  $n$  not  $w$  on the  $\theta$  term, so change the column entry from “ $0.04 \leq \theta_w \leq 0.10$ ” to “ $0.04 \leq \theta_n \leq 0.10$ ”.
- p. 461 Problem 12.2, Line 3 on page. Order of  $dL$  is wrong. Change  $(A_p \theta L d)$  to  $(A_p \theta d L)$   
On next line, change  $(A \theta dt)$  to  $(A dt)$
- p. 462 Problem 12.6, last line. Add new sentence:  
“Assume  $\sigma_{aw}=20 \text{ g s}^{-2}$ ,  $\sigma_{mw}=50 \text{ g s}^{-2}$ , and  $\rho_n=0.73 \text{ g cm}^{-3}$ .”  
Problem 12.7, line 5, change the subscript TW to Ta so that it reads:  $\sigma_{Ta}=29$
- p. 463 Problem 12.9, part b, the end of the first sentence is missing. Add text following “ $(D_{pw,s}/a_s^2=8.8 \times 10^{-8} \text{ s}^{-1})$ ” so that it becomes “ $(D_{pw,s}/a_s^2=8.8 \times 10^{-8} \text{ s}^{-1}$  and  $D_{Tw,s}/a_s^2=0.17 \times 10^{-8} \text{ s}^{-1}$  where  $a_s$ =soil grain radius)”. Also in the next sentence, change “(see Problem 3.13)” to “(see Problem 3.15)”.

### CHAPTER 13

- p. 474 Replace the two sentences above eq. 13-13, which are: “The volume of the generator particle is larger than that of the primary particle by  $v_g=v_p/\zeta_g$ . Defining the generator length as  $l_g$ , the generator volume can be written as” with “Defining the volume of a *single, hypothetical* “fractal generator” particle as  $v_g=v_p/\zeta_g$ , and with a length  $l_g$ , the generator volume can be written as”  
Eq. 13-13, the subscript in the first term should be “g” not “g,e”: change “ $v_{g,e}$ ” with “ $v_g$ ”.  
Eq. 13-16, change N to N\*  
Eq. 13-16 and 13-17,  $l$  subscript should be  $p$  not  $g$ : change  $l_g$  to  $l_p$
- p. 475 Eq. 13-18,  $l$  subscript should be  $p$  not  $g$ : change  $l_g$  to  $l_p$   
First sentence of section “Aggregate Mass”, line 2, change  $dp$  to  $lp$  so equation reads  $m_p = \rho_p \zeta_p l_p^3$

Eq. 13-19:  $b$  subscript should be a  $D$ : change  $b_p$  to  $b_D$

Eq. 13-19:  $l$  subscript should be  $p$  not  $g$ : change  $l_g$  to  $l_p$

Three lines above eq. 13-20, change  $v_{ag,e} = (\pi/6) l_{ag}^3$  to  $v_{ag,e} = \xi_{ag} l_{ag}^3 = (\pi/6) l_{ag}^3$

Eq. 13-20, change from  $\rho_{ag} = \frac{\pi}{6} \rho_p \xi_p l_p^3 l_g^{-D} b_D l_{ag}^{D-3}$  to  $\rho_{ag} = \frac{6}{\pi} \rho_p \xi_p b_D \left( \frac{l_{ag}}{l_p} \right)^{D-3}$

- p. 476 Eq. 13-21, change from  $\theta_{ag} = 1 - \frac{\pi}{6} \xi_p l_p^3 l_g^{-D} b_D l_{ag}^{D-3}$  to  $\theta_{ag} = 1 - \frac{6}{\pi} \xi_p b_D \left( \frac{l_{ag}}{l_p} \right)^{D-3}$

- p. 477 Table 13.2, Several equations in last column need to be changed:

$N^*$  equation,  $l$  subscript should be  $p$  not  $g$ : change  $l_g$  to  $l_p$

$v_{ag}$  equation,  $l$  subscript should be  $p$  not  $g$ : change  $l_g$  to  $l_p$

$v_{ag,e}$  equation. Remove dot over  $v_{ag,e}$

$m_{ag}$  equation,  $l$  subscript should be  $p$  not  $g$ : change  $l_g$  to  $l_p$

Change  $\rho_{ag}$  equation to:  $\rho_{ag} = \frac{6}{\pi} \rho_p \xi_p b_D \left( \frac{l_{ag}}{l_p} \right)^{D-3}$

Change  $\theta_{ag}$  equation to:  $\theta_{ag} = 1 - \frac{6}{\pi} \xi_p b_D \left( \frac{l_{ag}}{l_p} \right)^{D-3}$

Change  $U_s$  equation to:  $U_s = \left[ \frac{2g \xi_p b_D (\rho_p - \rho_w)}{b_{dl} \rho_w \xi_2 v^{b_d}} l_p^{1+D_2-D} l_{ag}^{D-D_2+b_d} \right]^{1/(2-b_d)}$

- p. 480 Two lines above eq. 13-34, change  $A_{ag} = \xi_2 l_p^{D_2}$  to  $A_{ag} = \xi_2 l_p^{2-D_2} l_p^{D_2}$

Eq. 13-34, change to:  $U_s = \left[ \frac{2g \xi_p b_D (\rho_p - \rho_w)}{b_{dl} \rho_w \xi_2 v^{b_d}} l_p^{1+D_2-D} l_{ag}^{D-D_2+b_d} \right]^{1/(2-b_d)}$

Eq. 13-35, include parentheses in power, and change  $D_3$  to  $D$ , so the equation is:  $U_{set} \sim l^{D-D_2+b_d/(2-b_d)}$

- p. 481 Table 13.4, subscript on  $b$  term should be a lower case  $d$  (not  $D$ ) in first column  
 Change fourth row to be  $U_{set} \sim l^{D-D_2+b_d/(2-b_d)}$   
 Change fifth row to be  $U_{set} \sim l^{D-D_2+b_d/(2-b_d)}$
- p. 500 Problem 13.2, in the two equations below replace  $\pm$  symbols with  $=$  signs.

#### CHAPTER 14

- p. 509 Eq. 14-8, change in first term " $\Delta^2\Psi$ " to " $d^2\Psi$ "
- p. 510 Eqs. 14-9 and 14-10, change in first term " $\Delta^2\Psi$ " to " $d^2\Psi$ "  
 Eq. 14-9, subscript " $i$ " is missing from last  $N$  term, so change " $N_\infty$ " to " $N_{i\infty}$ "
- p. 511 Line 3, spelling error, change "Hemholtz" to "Helmholtz".  
 Line 4, spelling error, change "outer Helmholtz layer" to "outer Helmholtz layer".
- p. 512 Example 14.1, Line 2, change from 20°C to 25°C.  
 Example 14.1, Eq. 14-21, change the power in the last term from  $\frac{1}{2}$  power to  $-\frac{1}{2}$  power.
- p. 516 Eq. 14-134, change the  $+$  sign to a  $-$  sign in front of the last term, so it is " $-AR/12s$ "
- p. 520 Second paragraph, line 3, change "Collisions by Brownian motion" to "Collisions by differential sedimentation"
- p. 522 Eqs. 14-44, 14-47 and 14-48, change the letter  $v$  ("vee") in the denominator to  $\nu$  (greek letter "nu").  
 Eq. 14-47, after the letter  $g$  on the r.h.s. of the equation, omit the greek letter  $\pi$  from the first term, so the equation now will read

$$\beta_{ds} = \left( \frac{g \Delta \rho}{18 \nu \rho} |d_i^2 - d_j^2| \right) \left( \frac{\pi}{4} (d_i + d_j)^2 \right)$$

- p. 524 Table 14.1, line for laminar fluid shear, terms should be raised to power of 3 not 2. Change to:

$$\beta_{sh} = \frac{G}{6} (d_i + d_j)^3 \quad \text{and} \quad \beta_{sh} = \frac{G}{\pi} (\nu_i + \nu_j)^3$$

- p. 527 3<sup>rd</sup> line after eq. 14-61, change reference from Eq. 14-58 to Eq. 14-59.  
 Line above eq. 14-62, change reference from Eq. 14-58 to Eq. 14-57.  
 Eq. 14-62,  $-$  sign is missing. Change  $2/3$  to  $-2/3$  in the equation.
- p. 528 Eq. 14-63,  $-$  sign is missing. Change  $b_{sh}$  to  $-b_{sh}$  in the equation.
- p. 529 2<sup>nd</sup> line below eq. 14-68, omit " $t$ " so term " $b_{Cp} Cp t$ " becomes " $b_{Cp} Cp$ "

#### CHAPTER 15

- p. 571 Eq. 15-27, subscript is missing from  $N$  on second term: change  $\frac{\partial N}{\partial Z}$  to  $\frac{\partial N_z}{\partial Z}$   
 Eq. 15-28, following last term ending with  $N$  there should be an " $= 0$ " so we have "...  $N = 0$ "
- p. 580 2<sup>nd</sup> line below eq. 15-60, replace "Eq. 14-49" with "Eq. 15-49".

- p. 581 Table 15.2. "Collector Efficiency" column, in the third line down, replace " $\gamma^{2/3}$ " with " $b_H^{1/3}$ " so the equation reads:

$$\eta = 4.04 b_H^{1/3} Pe^{-2/3} + \frac{3}{2} R^{*2} + S^*$$

- p. 597 An  $=$  sign is missing from the equation. Change  $L_{1-\log} \frac{\ln 10}{\lambda}$  to  $L_{1-\log} = \frac{\ln 10}{\lambda}$
- P. 610 Problem 15.2, line 8, change " $10^{-20} \text{ g/cm}^2\text{-s}^3$ " to " $10^{-13} \text{ g/cm}^2\text{-s}^2$ "

#### APPENDICES

- p. 614 Symbol  $a_n$ , line 3, the units should be changed from  $L^3 L^{-2}$  to  $L^2 L^{-3}$
- p. 627 Table A3.3, all values in right hand column for  $v_a$  are off by a factor of 100. Therefore, the double zero's need to be omitted from each column value. Therefore, change 0.00132 to 0.132, 0.00136 to 0.136, and so forth.
- p. 630 Table A3.6, the units of the far column for the Henry's law constant are incorrect.  
 Change: from  $\text{atm mol m}^{-3}$  to  $\text{atm mol}^{-1} \text{m}^3$
- p. 631 Table A3.7, the diffusivity of naphthalene should be changed from "0.513" to "0.0513"

- p. 632 Table A3.9, last column, the subscript should be "C" not "A", so change " $D_{A3}$ " to " $D_{C3}$ ".
- p. 644 Eq. A4-53, at the end a minus sign is missing, so change " $n \neq 1$ " to " $n \neq -1$ "
- Eq. A4-54, at the end a minus sign is missing, so change " $n = 1$ " to " $n = -1$ "