(Version: 15 April 2002)

Corrigenda for Transport Phenomena
(2d Edition, 2nd Printing)

(In designating line locations, "a" means "from above" and "b" means "from below")

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Some teachers and students might find the following reference of interest: “Who Was Who in Transport Phenomena,” by R. B. Bird, *Chemical Engineering Education*, Fall 2001, pp. 256-265.

Page	Location	Reads	Should Read
4	Table 0.2-1	Change the second "22" to "23"	
20	Fig 1.2-2(*a*)	In the first and second drawings from above,	

		should appear to be an arbitrary angle, rather than 90 degrees	
21	Fig 1.2-3	Velocity profile needs to be redrawn so that it does not appear that there is slip at the wall	
22	Eq 1.3-2	x_α should be defined as the mole fraction of species α	
23	Eq 1.3-3	$(2.80)^{1/2}$	$(28.0)^{1/2}$
24	3 lines above Eq 1.4-5	assuming	summing
28	Ex 1.4-2, table	$\sum_{\beta=1}^{3} x_\alpha \Phi_{\alpha\beta}$	$\sum_{\beta=1}^{3} x_\beta \Phi_{\alpha\beta}$
33	After Eq 1.6-3	In the expression for ψ, a left parenthesis should be inserted immediately after the left bracket.	
37	Prob 1A.1, ans	10^{-4}	10^{-5}
38	Prob 1A.6	$\Delta\tilde{U}_{\mathrm{vap}}$	$\Delta\hat{U}_{\mathrm{vap}}$
38	Prob 1A.6	Table 1.1-1	Table 1.1-2
38	Prob 1B.2	1B.2)	1B.2
38	After Eq 1B.3-1	…the Mooney Equation.	…Eq. 1.6-2.
39	Eq 1C.3-1	$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}$	$\int_{-\infty}^{\infty}\int_{-\infty}^{\infty}\int_{0}^{\infty}$
42	Item (a)	In connection with the no-slip condition, there should be a reference to S. Richardson,	

		J. Fluid Mech., **59**, 707-719 (1973). There it is shown that the no-slip condition leads to the same velocity profile (over most of the cross-section) as the complete-slip condition, but with a sinusoidal wall (describing roughness).	
49	Fig 2.3-1	Drawing should make it clear that Δr is the thickness of the lightly shaded region	
49	Fig 2.3-1	The quantity R should be shown as the inner radius of the cylindrical wall	
49	Fig 2.3-1	The arrow representing the combined flux of momentum in at r should terminate at r; similarly, the arrow representing the combined flux of momentum out at $r + \Delta r$ should have its tail at $r + \Delta r$	
56	Fig. 2.5-1	τ_{zz} should be replaced by τ_{xz} in two places.	
56	Fig. 2.5-2	In the equation below the lower plate insert a minus sign just after the equals sign	
59	Eq 2.6-5	Should be a box around this equation	
62	Prob 2A.4	1 micron = 10^{-6}	1 micron = 10^{-6} m
65	Prob 2B.7 (line 1)	diameter	radius
67	Eq 2B.10-3	8μ	$8\mu L$
79	Fig. 3.2-1	indicating the flux	indicating the directions of the fluxes
94	2 lines before Eq 3.6-42	$\frac{1}{2}\rho\Omega^2 rp$	$\frac{1}{2}\rho\Omega^2 r^2$

105	Prob 3A.6 ans	**C**	C
109	Eq. 3B.10-1	Just before the term on the left side, insert a minus sign	
117	Eq 4.1-14	$\dfrac{\int_0^{\eta}\exp\left(-\bar{\eta}^2\right)d\bar{\eta}}{\int_0^{\eta}\exp\left(-\bar{\eta}^2\right)d\bar{\eta}}$	$\dfrac{\int_0^{\eta}\exp\left(-\bar{\eta}^2\right)d\bar{\eta}}{\int_0^{\infty}\exp\left(-\bar{\eta}^2\right)d\bar{\eta}}$
117	Ex 4.1-2 (I.C.)	for all y	for $0 \le y \le b$
118	After Eq 4.1-29	These equations has	These equations have
125	Eq 4.2-19	$=\int_0^{2\pi}$	$=\mu\int_0^{2\pi}$
129	3 lines after Eq 4.3-19	$\Psi=\frac{3}{2}$	$\Psi=-\frac{3}{2}$
145	Prob 4B.7a	Add at the end of part (a): "Is this flow irrotational?"	
149	Eq. 4C.3-5	$\nabla^2 p$	$\nabla^2 \mathcal{P}$
150	Prob 4C.4 ans	$\mathcal{P}_2/\mathcal{P}_1$	R_2/R_1
151	Prob 4D.4 title	**flows.**[10]	**flows.**
151	Prob 4D.4(*a*)	...solution.	...solution.[10]
151	Prob 4D.5 (problem title)	functions for steady	functions for
151	Prob 4D.5(a)	compressible flow.	steady flow.
151	Prob 4D.5(b)	Replace by:	

		"Show that the expression $\mathbf{A}/\rho = \mathbf{d}_3 \psi / h_3$ reproduces the velocity components for the four incompressible flows of Table 4.2-1. Here h_3 is the scale factor for the third coordinate (see §A.7). (Read the general vector **v** of Eq. A.7-18 here as **A**.)	
151	Prob 4D.5(c)	corresponding to Eq. 4.3-2	of $[(\nabla \psi_1) \times (\nabla \psi_2)]$
154	Eqs 5.1-4 & 5	$v_{z,\max}$	$\bar{v}_{z,\max}$
155	Eq 5.1-6	0.198	0.0198
157	2 lines above Eq 5.2-3	5.5-2	5.2-2
167	Eq 5.5-7	$\bar{\tau}_{rz}^{(t)}$	$\bar{\tau}_{rz}$
175	Line 5a	$r < b$ $r > b$	$r < bR$ $r > bR$
175	Eq 5C.2-3	$\dfrac{(r - aR)v_*^>}{\nu}$	$\dfrac{(R - r)v_*^>}{\nu}$
175	Eq 5C.2-4	$(1 - a^2)\sqrt{1 - b^2}$	$\left\{ \dfrac{(b^2 - a^2)^{3/2}}{\sqrt{a}} + (1 - b^2)^{3/2} \right\}$
180	Eq 6.2-6	bold-face script P	light-face script P
184	5 lines after Eq 6.2-23	$32.17\ \mathrm{lb}_m / \mathrm{ft}\ \mathrm{lb}_f \mathrm{s}^2$	$32.17\ (\mathrm{lb}_m \mathrm{ft}/\mathrm{s}^2) / \mathrm{lb}_f$
185	Eq 6.3-5	$\mathcal{P}$	$\breve{\mathcal{P}}$

186	1 line below Eq 6.3-13	defintition	definition
186	5 lines above Eq 6.3-14	6.1-2	6.2-2
193	Prob 6A.1, ans	10^2	10^3
193	Prob 6A.3, ans	gal/hr	gal/min
193	Prob 6A.4	liquid in centipoises.	liquid.
194	Prob 6A.9, ans	679	480
195	Eq 6B.4-3	$\mathfrak{T}$	T_z
201	Eq 7.2-5	$\dfrac{5.5}{\pi(0.025)^2}$	$\dfrac{5.5}{\pi(0.025)^2(1000)}$
207	Example 7.5-1 (line 2b)	The water...	Water at 68˚F...
208	Eq 7.5-18	$\hat{W}_m = w\hat{W}_m$	$W_m = w\hat{W}_m$
213	Eq 7.6-28	234 1041	−234 −1041
224	Prob 7A.1, ans	1.64 1.13×10^4	0.157 1.08×10^3
229	Prob 7B.12 title	Criterion for Vapor-Free Flow in a Pipeline	Criterion for vapor-free flow in a piping system
271	Table 9.1-5	63 92	0.63 0.92

273	Line 14a	and the proceed	and then proceed
274	Line 5a	is it customary to use	it is customary to use
278	Line 6a	from Eq. 1.4-18	from Eq. 1.4-14
278	Eq 9.3-20	Add on to the last line of the equation: $= 0.0257\ \ \mathrm{W/m \cdot K}$	
278	1 line after Eq 9.3-20	6.35 ... K	$0.02657\ \ \mathrm{W/m \cdot K}$
278	Ex 9.3-1 (last line)	9.1-1	9.1-2
278	Line 10b	Eqs. 9.3-17 and 18	Eq. 9.3-17
278	Line 9b	Example 1.5-2	Example 1.4-2
280	Ex 9.4-1	given in Table 9.1-2 is 0.103	as interpolated from Table 9.1-3 is 0.101
282	Eq 9.6-4	$\kappa_{\mathrm{eff},zz}$	$\kappa_{\mathrm{eff},xx}$
287	Prob 9A.1(b)	9.1-1	9.1-2
288	Prob 9A.11(a)	Add at the end of part (a) The latter g_i values closely approximate the fitted ones[6] for the present sample. The right-hand member of Eq. 9A.11-1 is to be multiplied by 1.25 for completely dry sand.[6]	
288	Prob 9A.11,Ans	*Answers* in $\mathrm{cal/cm \cdot s \cdot K}$ for wet and dry sand respectively: **(a)** Eq. 9A.11-1 gives $k_{\mathrm{eff}} = 6.3 \times 10^{-3}$ and 0.38×10^{-3} with	

		$g_1 = g_2 = g_3 = \frac{1}{3}$, vs. 6.2×10^{-3} and 0.54×10^{-3} with $g_1 = g_2 = \frac{1}{8}$ and $g_3 = \frac{3}{4}$. **(b)** Eq. 9.6-1 gives $k_{\text{eff}} = 5.1\times10^{-3}$ and 0.30×10^{-3}.	
288	Prob 9A.11(b)	The particle...0.712	(Delete that sentence)
289	Eq 9C.1-4	$y=\frac{\tilde{V}}{RT}\left[T\left(\frac{\partial p}{\partial T}\right)_{\tilde{V}}-1\right]$	$y=\frac{\tilde{V}}{R}\left(\frac{\partial p}{\partial T}\right)_{\tilde{V}}-1$
289	Eq 9C.1-5	$y=Z\frac{1+(\partial\ln Z/\partial\ln T_r)_{p_r}}{1-(\partial\ln Z/\partial\ln p_r)_{T_r}}$	$y=Z\frac{1+(\partial\ln Z/\partial\ln T_r)_{p_r}}{1-(\partial\ln Z/\partial\ln p_r)_{T_r}}-1$
298	Eqs 10.3-20 and 10.3-21	In both equations, add $+T_0$ the right side of the equation	
298	Fig 10.4-1	The quantity b should be the thickness of the gap between the two cylinders	
300	Eq 10.4-10	Delete the last term in this equation, (x/b)	
301	Eq 10.5-4	$-\mu v_z\frac{dv_z}{dz}$	$+\rho\hat{H}^{\circ}v_z-2\mu v_z\frac{dv_z}{dz}$
301	Line 2b	first and fourth	first, fourth, and fifth
302	Eq 10.5-15	z	Z
302	Eq 10.5-16	$0<z<L$	$0<Z<1$
303	Eq 10.5-17	$z>L$	$Z>1$
303	Fig 10.5-2	$\Theta_{\text{I}}, \Theta_{\text{II}}, \Theta_{\text{III}}$	$\Theta^{\text{I}}, \Theta^{\text{II}}, \Theta^{\text{III}}$

307	Eq 10.6-29	The third term in the denominator should be $\frac{\ln(r_2/r_1)}{k_{12}}+\frac{\ln(r_3/r_2)}{k_{23}}$ [That is, a plus sign needs to be inserted.]	
310	Eq 10.7-17	102	120
312	Eq 10.8-10	In the second line of this equation, $+\rho\hat{H}^{\circ}v_z$ needs to be added to the right side	
317	After Eq 10.9-5	Move the right parenthesis from just after "10.B-11" to just after "viscosity"	
318	Eq 10.9-12	$\frac{B^2}{12\mu}$	$\frac{B^2}{2\mu}$
319	Eq 10.9-17	$\frac{1}{2}$	$\frac{1}{12}$
323	Eq 10B.5-1	$T_b - T_0$	$(T_b - T_0)$
325	Prob 10B.8 ans	T_1	T_κ
326	Prob 10B.11	Use...§10.9	Use the $\breve{y}$, $\breve{v}_z$, and Gr defined in §10.9 (but with $\overline{\mu}$ in lieu of μ)
326	Eq 10B.11-2	Insert: $b_T = \frac{1}{2}\overline{\beta}\Delta T$, before $b_\mu = \cdots$	
326	Eq 10B.11-4	Gr	$\frac{1}{2}$Gr
326	1 line after Eq 10B.11-4	second...b_μ.	third and higher powers of ΔT
326	2 lines after Eq 10B.11-4	$P = \frac{2}{15}\mathrm{Gr}b_\mu$	$P = \frac{1}{30}\mathrm{Gr}b_T + \frac{1}{15}\mathrm{Gr}b_\mu$

326	Eq 10B.11-5	Replace the entire equation by $v_z = \frac{1}{12}\mathrm{Gr}\left(\breve{y}^3 - \breve{y}\right) + \frac{1}{60}\mathrm{Gr}b_T\left(\breve{y}^2 - 1\right) - \frac{1}{80}\mathrm{Gr}b_\mu\left(\breve{y}^2 - 1\right)\left(5\breve{y}^2 - 1\right)$	
326	Prob 10B.13	Eq. 10.5-1	Eq. 10.5-7
327	Prob 10B.14 ans	$T_1 - T_0$	$T_0 - T_1$
328	Prob 10B.16 Answer	**(b)**	**(c)**
328	Prob 10B.16 Answer (a)	$\frac{\cosh\sqrt{4h/D}\,z}{\cosh\sqrt{4h/D}\,L}$	$\frac{\cosh\sqrt{4h/kD}\,z}{\cosh\sqrt{4h/kD}\,L}$
334	2 lines above Eq 11.1-1	conservation energy	conservation of energy
345	Fig 11.4-1	Extend the vertical line indicating the right end of the double arrow for *R* until it becomes tangent with the inner surface of the outer sphere	
345	Eq 11.4-23	$\left[\frac{d}{dr}\left(\frac{1}{r^2}\frac{d}{dr}\left(r^2 v_r\right)\right)\right]$	$\left(\frac{1}{r^2}\frac{d^2}{dr^2}\left(r^2 v_r\right)\right)$
345	Eq 11.4-24	w_r	w_r^2
349	Line 2a	11.4-44 to 4	11.4-44 to 49
363	2nd line of (c) Prob 11.B-2	Omit… $r = R$.	Multiply Eq. 11B.2-1 by rdr and integrate from $r = 0$ to $r = R$.
363	Eq 11B.2-3	$\langle T \rangle$	T_b

363	Eq 11B.2-5	The bracket on the right side of the equation should read: $\left[\left(\frac{r}{R}\right)^2-\frac{1}{2}\left(\frac{r}{R}\right)^4-\frac{1}{4}\right]$	
363	After Eq 11B.2-5	Replace the sentences by: after determining the integration constant by an energy balance over the tube from $z = 0$ to $z = z$. Keep in mind that Eqs. 11.2-2 and 5 are valid solutions only for large z. The complete solutions for small z are discussed in Problem 11D.2.	
367	Line 12a	freezing of the solid	freezing of the liquid
367	Prob 11B.12(b)	Just before the period, insert the following: ; here A is a constant	
369	Prob 11B.15(c)	three dimensionless	dimensionless
370	Prob 11C.2, ans	$(x^2-B^2)y$	$(B^2-x^2)y$
377	Eq 12.1-25	$\exp\left[(n+\frac{1}{2})^2\pi^2\tau\right]$	$\exp\left[-(n+\frac{1}{2})^2\pi^2\tau\right]$
383	Line 6a	with time	with ζ
384	Eq 12.2-15	$\psi=\frac{q_s}{q_0}$	$\psi=\frac{q_y}{q_0}$
384	Line 4b	$\chi\to\infty,\ \psi\to 1$	$\chi\to\infty,\ \psi\to 0$
386	2nd paragraph	Moreover...equation	Moreover, both the velocity components (in Cartesian coordi-

			nates!) of §4.3 and the temperature profiles of this section satisfy the Laplace equation.
396	Prob 12A.5 Ans	0.111	0.111 cm^2/s
396	Prob 12B.1 Ans	7.9 0.19	8.2 0.20
420	Eq 13.6-24	α_2	a_2
423	Fn 1	1882-1857	1882-1957
425	Eq 14.1-9	k^{01}	k_{01}
434	Eq 14.3-14	L/D	z/D
435	Before and after Eq 14.3-16	Re_b	Re
451	Prob 14B.2	oil temperature	oil bulk temperature
451	Prob 14B.5	dT	dT_b
455	§15.1, line 7a	To these we add:	To these we add (also at the entry and exit planes):
477	Eq 15B.1-2	Q	Q_c
480	2nd line of table	1242	1245
483	Prob 15C.1(d)	Eq. 15C.1-3	Eq. 15C.1-4
507	Eq 16.6-6	$q^{(r)}$	$q_z^{(r)}$

509	Prob 16B.3	The second part (a) should be relabeled (b)	
509	Prob 16B.3	Replace opening paragraph by: A Schedule 40 two-inch horizontal Steel pipe (inside diameter 2.067 in., wall thickness 0.154 in.; $k = 26\ \text{Btu/hr}\cdot\text{ft}\cdot\text{F}$) carrying steam is insulated with 2 in. of 85% magnesia ($k = 0.35\ \text{Btu/hr}\cdot\text{ft}\cdot\text{F}$) and tightly wrapped with a layer of clean aluminum foil ($e = 0.05$). The pipe is surrounded by air at 1 atm and 80 F, and its inner surface is at 250 F.	
523	Ex 17.2-1, table	T(K)	T_c(K)
527	After Eq 17.3-17	…over a wide of…	…over a wide range of
529	Line 3b (in text)	…process here…	…process there…
530	Ex 17.4-1, soln	0.705	0.705 cp
531	Eq 17.4-9	1.40	140
536	Eq 17.8-4	x_A	x_α
538	Fn 5	Insert after (1999): ; **40**, 1791 (2001)	
540	Prob 17A.7 Title	self-diffusion at high density	self-diffusion
542	Eq 17C.2-3	∇x_A	$\nabla \omega_A$
544	Fn 1	3nd edition	3rd edition

553	Eq 18.3-14	Add large space between the equation and the parenthetical expression	
553	Last line	$\mathrm{Da}^{\mathrm{II}} \to 0$	$\mathrm{Da}^{\mathrm{II}} \to \infty$
559	Eq 18.5-5	$\approx \mathcal{D}_{AB} \dfrac{\partial c_A}{\partial x}$	$\approx -\mathcal{D}_{AB} \dfrac{\partial c_A}{\partial x}$
570	Prob 18A.6	---	The density of liquid ether may be taken to be 0.712 $\mathrm{g/cm^3}$ at the experimental conditions
572	Prob 18B.7	Fig. 18.2-3	Fig. 18.2-4
574	Prob 18B.10(a)	$c\mathcal{D}_{23} = 4.68 \times 10^{-6}$	$c\mathcal{D}_{23} = 4.68 \times 10^{-6}$ g-moles/cm·s
574	Prob 18B.10(b) (iv) below table	N_{2z}, B, C, and D N_{1z}, N_{1z}, N_{2z}	LN_{2z}, LB, LC, and LD LN_{1z}, LN_{1z}, LN_{2z}
574	Prob 18B.10 next-to-last sentence	is close enough	converges
575	Prob 18B.11 ans	x_{B0}	$x_{B\infty}$
584	Line 4b	$\rho D\omega_\alpha/Dt$	$\rho D\omega_A/Dt$
589	Fn d of Table	19D.1	19D.2
593	Fig 19.4-1	z (in 2 places)	y (in 2 places)
594	Line 6a	$T = T_\infty$	$T = T_\delta$

607	Fig 19B.4	The z axis should extend *downward* from the oxygen-SiO_2 interface.	
607	Prob 19B.6	which it undergoes	which A undergoes
608	Eq 19B.6-2	Eq. 19B.6-2 should read as follows:	

$$\sqrt{\frac{k_1'''}{\mathcal{D}_{AB}}}(R-R_0)-\ln\frac{1+\sqrt{k_1'''/\mathcal{D}_{AB}}R}{1+\sqrt{k_1'''/\mathcal{D}_{AB}}R_0}=-\frac{k_1'''c_{A0}M_A}{\rho_{\text{sph}}}(t-t_0)$$

[*Note*: In a previous list of corrigenda, Eq. 19B.6-2 was given incorrectly]

617	1 line after Eq 20.1-23	is given by	now depends on x_{A0}, $x_{A\infty}$, and the ratio N_{Bz0}/N_{Az0} :
617	Eq 20.1-24	$\varphi(x_{A0})$	φ
617	Example 20.1-1, last line	...calculations.	...calculations (see §22.8).
618	Line 3b of text	shown in Fig. 20.1-2	shown in Figure 20.1-2 (for $a = b$)
618	Fig 20.1-2	by Eqs. 20.1-36 to 38	by Eqs. 20.1-35 to 37 (for $a = b$)
620	Eq 20.1-59	$\omega_A^{(2)}$ [Make the same change one line above the equation as well as two lines above the equation]	$\overline{\omega}_A^{(2)}$
631	Line 4b	Figures 22.8-6 and 7	Figures 22.8-5 to 7

643	Footnote 2	P. C. Chatwin...(1985)	H. B. Fisher, *Ann. Rev. Fluid Mech.*, **5**, 59-78, (1973)
649	Prob 20A.5(a)	Eq. 20.1-38	Eq. 20.1-37
649	Prob 20A.6	...and Sc = 2.0.	...$n_{B0}(x) = 0$, and Sc = 2.0.
649	Prob 20A.6	Replace the last 2 sentences by: Use Fig. 22.8-5, with *R* calculated as R_ω from Eq. 20.2-51, to find the dimensionless mass flux ϕ (denoted by ϕ_ω for diffusional calculations with mass fractions). Then use Eq. 20.2-1 to calculate *K*, and Eq. 20.2-48 to calculate $n_{A0}(x)$	
649	Prob 20A.7 title	forced convection	forced-convection
649	Prob 20A.7	...accuracy.	...accuracy against that of Eq. 20.2-47
649	Prob 20A.7(c)	Table 20.2-2	Table 20.2-1
650	Prob 20B.2 line 1a	with α constant	(delete this phrase)
650	Prob 20B.2 line 1a	provided that	provided that *k*, *p*, and *c* (or ρ) are essentially constant, and that
650	Prob 20B.2 line 1a	= constant.	= constant; consequently α is then a constant
650	Eq 20B.2-2	$\dfrac{1-\text{erf}(Z_T-\varphi_T)}{1-\text{erf}\,\varphi_T}$	$\dfrac{\text{erf}(Z_T-\varphi_T)+\text{erf}\,\varphi_T}{1+\text{erf}\,\varphi_T}$

650	Prob 20B.6	Delete part (a) of the problem, and relabel (b) and (c) as (a) and (b)	
651	Prob 20B.7	...to obtain equations	...to obtain implicit equations
651	Prob 20B.7	...cases:	...steady-state operations:
651	Prob 20B.7(b) solution	(incorrect in book)	$K=\frac{1}{\text{Sc}}\omega_{A\infty}\Pi'(0,\text{Sc},K)$
652	Prob 20B.8	$n=1,2,\ldots$	$n=0,1,2,\ldots$
652	Prob 20C.1(a)	a spherical bubble	the spherical bubble of Problem 20A.2(a)
656	Prob 20D.5,title	embedded	interfacially embedded
668	Prob 21A.1(a)	ln*sc*	ln *sc*
681	Line 10b	The heat transfer … are	For forced convection around a solid sphere, Eq. 14.4-5 and its mass-transfer analog are:
705	Table 22.8-1, heading	...in §22.8.	...in §22.8. Mass-based versions appear in §20.2 and §22.9.
707	Eq 22.8-11	φ	φ_x (3 times!)
707	Eq 22.8-12	φ	φ_T (3 times!)

707	Line above Eq 22.3-13	both formulas is the dimensionless	each formula is a dimensionless
707	Eq 22.3-13	Delete the entire equation and replace by the following two equations, all on one line:	

$$\varphi_x = \frac{N_{A0} + N_{B0}}{c}\sqrt{\frac{t}{\mathcal{D}_{AB}}} \qquad \varphi_T = \frac{N_{A0} + N_{B0}}{c}\sqrt{\frac{t}{\alpha}}$$

707	Eq 22.3-13	(22.8-13)	(22.8-13a,b)
707	3 lines after Eq 22.3-13	subsection,	subsection:
707	3 lines after Eq 22.8-13	which...model	(delete this phrase)
715	Eq 22.8-53	Insert the coefficient 0.6205 on the r.h.s.	
722	Prob 22A.3	Add at end of problem statement: See §14.5 for forced-convection heat transfer coefficients in fixed beds.	
722	Prob 22A.3, title	air temperature	inlet air temperature
737	Line 4b	$t >> t_{\text{res}}$ ... t_{obs}	$t_{\text{res}}/t_0 << 1$ and t
738	Line 1a	duration of an observation, t_{obs}.	, t_{obs}, the time at which the observations of the effluent concentration begin.
738	Eq 21.3-66	$t_{\text{obs}} >> t_0 >> t_{\text{res}}$	$t_0 >> t_{\text{res}}$ and $t_{\text{obs}} \geq t_{\text{res}}$
756	After Eq 23.6-30	finite	nonzero

757	After Eq 23.6-37	at any other cross section	at every point
757	After Eq 22.6-39	very short	finite
757	3 lines before Eq 23.6-41	Eq. 23.6-31	Eq. 23.6-32
758	Line 1a	or	or, if $I^{(n)}$ is assumed constant over a cross-section,
758	Eq 23.6-44	$\left[I^{(0)}\right]_{\text{vol avg}}$	$I^{(0)}$
758	Eq 23.6-46	Change lower limit of integral from 0 to $-\infty$	
758	After Eq 23.6-46	usually	commonly
758	After Eq 23.6-46	Thus	Then
766	After Eq 24.1-6	$q^{(h)}$	$\mathbf{q}^{(h)}$
769	Eq 24.2-8	$\nabla \ln a_{\alpha}$	$(\nabla \ln a_{\alpha})_{T,p}$

[Make same change in Eqs. 24.2-9 and 10 and in Eq. 24.4-1]

773	Eq 24.2-21 (rhs)	x	z
776	Eq 24.4-5	$\mathbf{g}+$	$\mathbf{g}-$
777	1 line above Eq 24.4-11	Fick's first law for the protein	the protein flux
777	After Eq 24.4-11	since....zero.	which somewhat resembles Fick's first law.

777	Eq 24.4-12	subscript M	subscript W
777	After Eq 24.4-12	Actually....solution.	Note that the radial molar flux of water greatly exceeds that of protein, and that the convective protein flux $c_P v_{\text{migr}}$ is very small.
779	Just above fns.	electromotive	electromagnetic
781	line 1a	we	use Eqs. 24.4-24 and 5 to
781	Eq 24.4-26	Replace the last term by: $+\frac{1}{cRT}\left(\rho_{M^+}\mathbf{g}_{M^+} - \omega_{M^+}\sum_\beta \rho_\beta \mathbf{g}_\beta\right)$	
781	Eq 24.4-27	Replace the last term by: $+\frac{1}{cRT}\left(\rho_{X^-}\mathbf{g}_{X^-} - \omega_{X^-}\sum_\beta \rho_\beta \mathbf{g}_\beta\right)$	
781	1 line after Eq 24.4-27	Next...get:	Next we use the expression for $\mathbf{g}_\alpha$ in Eq. 24.4-5, as well as Eqs. 24.4-24 and 25, to get:
781	Eq 24.4-28	$+\left(\frac{x_S}{RT}\right)F\nabla\phi$	$-\left(\frac{x_S}{RT}\right)F\nabla\phi$
799	Prob 24A.1(a)	Fig. 24.3-1	Fig. 24.2-1
800	Prob 24B.3 ans	0.653	0.064

801	Prob 24C.3 table	0.507	1.507
803	Prob 24C.6	...surface	...surface (*s* and *c* indicate "sphere" and "continuum")
803	Prob 24C.6	Here...respectively.	Develop expressions for ϕ_c and ϕ_s, if $\phi_c \to Ar\cos\theta$ for large *r*.
804	Prob 24D.1	it is	it may be
808	2 lines after table	vw	$\mathbf{vw}$
808	3 lines after table	$[v \times w]$	$[\mathbf{v} \times \mathbf{w}]$
810	Eq A.1-14	*Note*	*Not*
810	Ex 5	**W**	*W*
813	3 lines after Eq A.2-20	magnitude of v	magnitude of $\mathbf{v}$
815	Line 2 of §A.3	write a vector v	write a vector $\mathbf{v}$
815	Eq A.3-4	$\{\boldsymbol{\delta}_i\boldsymbol{\delta}_j \cdot \boldsymbol{\delta}_k\boldsymbol{\delta}k_l\}$	$\{\boldsymbol{\delta}_i\boldsymbol{\delta}_j \cdot \boldsymbol{\delta}_k\boldsymbol{\delta}_l\}$
817	Line 3a	vw	$\mathbf{vw}$
820	2 lines above Eq A.4-6	if the vector v	if the vector $\mathbf{v}$
820	3 lines above Eq A.4-10	and the vector v	and the vector $\mathbf{v}$

821	Footnote 1	∇v	$\nabla \mathbf{v}$
822	Line 4a	the vector function v [That is, an equals sign needs to be inserted between the two expressions]	the vector function $\mathbf{v}$
822	Eq A.4-30	$[\mathbf{t} \cdot v]$	$[\mathbf{t} \cdot \mathbf{v}]$
822	Eq A.4-32	v_j	$v_j =$
823	Ex 2	$\mathbf{0}$	0
823	Ex 6	$\mathbf{0}$	0
823	Ex. 7(b)	$\mathbf{0}$	0
825	Eq A.5-6	S	s
825	Ex 3	Eq. A.5-6	Eq. A.5-5
828	2nd equation in Exercise 1	$\frac{4}{3}\delta$	$\frac{4}{3}\pi\delta$
829	Eqs A.7-1 to 3	$\mathbf{0}$	0
829	Eqs A.7-6 to 8	$\mathbf{0}$	0
848	Eq B.6-9	g_θ	g_ϕ
886	Curl operator	832	831, 832
887	Dissipation function	847	849
887	Divergence	832	830, 832

	operator		
887	Energy equation	847	849
888	Gamma function	853	855
890	Lennard-Jones potential	864	864, 866
892	Products of vectors …	813, 817, 827	810, 813, 817, 818, 827
893	Temperature, equation of change for	859	850
893	Tensor, unit	815	19, 817
895	Wenzel-…	Krames	Kramers