(Version: 16 October 2001)

Corrigenda for Transport Phenomena (2d Edition, 1st Printing)

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

Page	Location	Reads	Should Read
14	Table 1.1-2	The kinematic viscosities for air and water are too large by a factor of 100	
22	Fig. 1.3-1	On the horizontal axis, the T_r values after 1.0 should be 2, 3, 4, 5, 6, 8	
23	Fn 1, line 2a	kinetic energy	kinetic theory
31	Eq 1.5-9	exp 0.408	exp (0.408
37	Prob 1A.1, Ans	$1300\times 10^{-7}\ \text{lb}_m/\text{ft}\cdot\text{s}$	$1.4\times 10^{-4}\ \text{lb}_m/\text{ft}\cdot\text{s}$
38	Prob 1A.3	The predicted viscosities of oxygen, nitrogen, and methane in centipoises are 0.0202, 0.0172, & 0.0107 respectively	
38	Prob 1A.4, Ans	0.013515 cp	0.01317 cp
38	Prob 1A.5, Ans	0.0131 cp	0.0130 cp.
44	3 lines above Eq. 2.2-10	$\partial_z/\partial z$	$\partial v_z/\partial z$
49	After Eq. 2.3-7	$r\tau_{rz}$	$r\phi_{rz}$
59	Eq 2.6-5	$\left[-\left(\frac{R}{r}\right)^2+\left(\frac{R}{r}\right)^4\right]$	$\left[-\left(\frac{R}{r}\right)^2+\left(\frac{R}{r}\right)^4\right]\cos\theta$

59	Eq 2.6-6	$\frac{3}{2}\frac{\mu v_\infty}{r}\left(\frac{R}{r}\right)^4 \sin\theta$	$\frac{3}{2}\frac{\mu v_\infty}{R}\left(\frac{R}{r}\right)^4 \sin\theta$
62	Prob 2A.1	wall length	wall width
62	Prob 2A.3, Ans	$0.108\ \text{ft}^3/\text{s}$	$0.110\ \text{ft}^3/\text{s}$
64	Fig 2B.6	$2\pi\tau\Delta rL$	$2\pi r\Delta rL$
65	Prob 2B.7	rod of diameter	rod of radius
65	Prob 2B.7 Ans. (c),(d)	F 2	F_z -2
77	Eq 3.1-2, line 2	$y+\Delta x$	$y+\Delta y$
104	Prob 3A.3	32.19 ft/s	32.19 ft/s^2
104	Prob 3A.3	712	713 (if the pressure dependence of the density is included)
105	Prob 3A.6 (Ans)	60°	60°C
115	4 lines before Eq 4.1-1	Fig. 4.4-1	Fig. 4.1-4
123	Table 4.2-1 2nd column	with $v_z = 0$ with no	with $v_z = 0$ and no
141	Prob 4A.1 (title)	steady flow	steady state
141	Prob 4A.1 (Ans)	22 s	0.22 s
142	Prob 4A.6 (title)	equations	formulas

146	Prob 4C.1 (b-e)	4.4-14 and 15	4C.1-1 and 4C.1-2
172	Prob 5A.1 (Ans)	42 and 1.8	26 and 1.1
173	Last line of text	...for the fluid.	...for the fluid, and J is the total momentum flow defined analogously to Eq. 5.6-2.
174	Line 1a	Eq. 5.4-2	Eq. 5.4-3
174	Prob 5C.2(j)	line z = constant	plane z = constant
174	Eq. 5C.1-10	$w = 2\sqrt[3]{3\lambda}\sqrt{\frac{J\rho z}{W}}$	$w = 2\sqrt[3]{3\lambda}\sqrt{J\rho W z}$
180	1 line after Eq. 6.2-3	flow in circular tubes	flow in smooth circular tubes
186	Table in text	The only contribution to f, is the friction drag	The only contribution to f is the friction drag (if the tubes are smooth)
189	Line 1a	near flow around	flow near
193	Prob 6A.1	1.97 m/s	1.97 m^3/s
193	Prob 6A.1	82 diameters	32 diameters
193	Prob 6A.1	4630 and 21.5	4700 and 33
193	Prob 6A.3	4070 gal/hr	68 U. S. gal/hr
193	Prob 6A.4	5.00 mm $f = 396$ μ = 370 cp	0.5 cm $f = 3.96 \times 10^2$ $\mu = 3.7 \times 10^2$ cp

194	Eq 6A.7-3	$(\langle \overline{v}_z \rangle$	$\langle \overline{v}_z \rangle$
194	Prob 6A.7 (a)	Verify...§2.4.	Verify that, for developed laminar flow, Eqs. 6A.7-1 and 3 with the tabulated *K* values are consistent with Eq. 2.4-16.
194	Table ($\kappa = 0.4$)	*K* =0.6759	*K* = 0.6757
194	Prob 6A.8	17,000	1.7×10^4 (since the result uses a 400-fold extrapolation of Fig. 6.3-1)
194	Prob 6A.9	480 g/s	679 g/s
195	Prob 6B.6	47%	49%
224	Prob 7A.1	0.056 psi $386 \ \text{N/m}^2$	1.64 psi $1.13 \times 10^4 \ \text{N/m}^2$
224	Prob 7A.2	2.3 hp 1.7 kW	2.4 hp 1.8 kW
224	Prob 7A.3	behavior.	behavior and radially uniform velocity distribution.
224	Prob 7A.3	$6.12 \times 10^3 \ \text{J/kg}$	$6.12 \times 10^4 \ \text{J/kg}$
226	Prob 7B.2, 3rd line	straight channel	straight horizontal channel
226	Prob 7B.2 5th line	the force $F_{f \to s}$ is	the drag force is

226	Eq 7B.2-1	Ref: R. B. Bird, *CEP Symposium Series*, #58, Vol. 61 (1965), pp. 14-15	
228	Prob 7B.10	It should be stated that the datum plane for potential energy is taken to be $z = 0$, and that Eq. 7B.10-1 must be used to get the result in Eq. 7B.10-2.	
242	3 lines above Eq. 8.3-5	developing	developed
247	Eq 8.4-15	$\eta_k \lambda_k$	$\eta_k \lambda_k \omega$
259	Eq 8B.5-1	t	τ
259	Prob 8B.5(a)	Eq. 8.3-5	Eq. 8B.5-1
260	Prob 8B.7	(G) and (H)	(F) and (G)
261	Eq 8C.2-1	$\frac{2(n+1)}{\pi m R^{n+3}}$	$\frac{(n+1)}{2\pi m R^{n+3}}$
276	Fn 3	"Eukcer"	"Eucken"
287	Prob 9A.4, Ans.	2850×10^{-7} cal/cm·s·K	0.1204 W/m·K
288	Prob 9A.7 table	$k_e \times 10^6$ 4.6 6.9 1.69 2.62	$(1/k_e)$ 4.6×10^{-6} 6.9×10^{-6} 1.69×10^{-6} 2.62×10^{-6}
288	Prob 9A.8 Ans. (a)	5.08×10^{-4} cal/cm·s·K	5.06×10^{-4} cal/cm·s·K

288	Prob 9A.9	Change the last $\tilde{C}_p$ value from 6.74 to 8.74	
288	Prob 9A.11 Table Heading	Volume fraction	Volume fraction ϕ_i
288	Eq 9A.11-1	$\alpha_i \phi_i (k_i/k_0)$	$\alpha_i (k_i/k_0) \phi_i$
288	Eq 9A.11-2	$\sum_{i=1}^{3}$	$\sum_{j=1}^{3}$
288	Eq 9A.11-2	g_i	g_j
289	Prob 9A.12(c)	using $\varepsilon/\kappa = 124 K$	using ε/κ from Table E.1
289	Prob 9A.12 Ans	1.88Å 3.425Å	1.86Å 3.409Å
304	Fig 10.6-1	k^{01}, k^{12}, k^{23}	k_{01}, k_{12}, k_{23}
320	Prob 10A.2	2080 Btu/hr	2074 Btu/hr
320	Prob 10A.3	0.055 cal/s·cm·C	0.0055 cal/s·cm·C
320	Prob 10A. 4	13.7 amp	13.4 amp
321	Prob 10A.6	14.4 Btu/hr·ft^2 4.24 ft^2·hr·F/Btu	14.3 Btu/hr·ft^2 4.2 ft^2·hr·F/Btu
321	Prob 10A.8	surrounding air film	surrounding air
322	Ans to 10B.2	v_0	v_b^2
323	Eq 10B.5-1	T_0	$(T_b - T_0)$

330	Line 1a	L	L^2
330	Line 10b	$\alpha_1 = \beta_1 = 1$	$\alpha_1 = \beta_1 - 1$
330	Eq 10C.1-12	$((\beta_1 - 2)$	$(\beta_1 - 2)$
330	Line 8b	9.4	10.4
331	Line 8a	heat balance	energy
340	Table 11.4-1	Bottom rule should be extended all the way to the left margin	
344	Eq 11.4-18	$T_0 - T$ in 2 places	$T_0 - T_\delta$ in 2 places
351	Line 13a	Kappa is in the wrong font; should be like the kappa in Eq. 1.2-7	
359	9 lines after Eq 11.5-25	$\rho^2 g\beta(T_1 - T_0)l_0^3\hat{C}_p/\mu k$	$\rho^2 g\beta(T_1 - T_0)h^3\hat{C}_p/\mu k$
361	Prob 11A.1	225°C	217°C (from both Eqs. 11.4-13 and 10.4-9)
368	Prob 11B.14(e)	multiply both sides by $\sin(m\pi r/R)$	multiply both sides by $(r/R)\sin(m\pi r/R)$
392	2 lines above Eq 12.4-26	of x and z.	of x and z, evaluated at $y = 0$, with $h_y = 1$.
393	Eq 12.4-34	The right parenthesis should be larger so as to match the left parenthesis	
399	Fig 12B.6	The θ coordinate should be measured from the stagnation locus rather than from the separation locus	

399	Prob 12B.6 Ans (c)	$f(0)=\left(\frac{2}{3}\right)^{1/3}, f\left(\frac{\pi}{2}\right)=1.1981, f(\pi)=\infty$	
420	Fn 5	Thomas Hamilton Chilton	**Thomas Hamilton Chilton**
436	Fig. 14.3-2	10 (on abscissa)	10^5
440	2 lines above Eq 14.4-8	corelation	correlation
440	Fiug. 14.4-2	The abscissa should be labeled "Reynolds number"	
445	1 line before Eq 14.6-14	Eqs. 14.6-1 to 3	Eqs. 14.6-4 to 6
445	Eq 14.6-14	4.68 46.51 18.6	3.4 42.9 17.1
445	Eq 14.6-15	18.6 0.57	17.1 0.52
445	Eq 14.6-16	0.57 18	0.52 16
448	Fig 14.7-2, abscissa	$\mu^{2/3}$	$\mu^{5/3}$
450	Prob 14A.4 Ans	-6.25	-7.8
450	Prob 14A.6 Ans	(a) 3.35 cal/s ---	(a) 12.9 W = 3.1 cal/s (b) 16.8 W = 4.0 cal/s
450	Prob 14A.7 Ans	0.332 cal/s	0.80 W = 0.20 cal/s

450	Prob 14A.8 Ans	32	1930
451	Prob 14B.1(a)	cooling a fluid	heating a fluid
451	Eq 14B.5-1	dT	dT_b
457	2 lines after Eq 15.2-4	$\hat{C}^V$	$\hat{C}_V$
460	Eq 15.3-6	$w_1 = w_{1a} + w_{1b}$	$w_1 = w_{1a} + w_{1b} = w_2$
474	Eq 15.5-46	$\left[1 - \left(\frac{\rho_1}{\rho_0}\right)^{(1-\gamma)/2}\right]$	$\left[\left(\frac{\rho_1}{\rho_0}\right)^{(1-\gamma)/2} - 1\right]$
474	Eq 15.5-46	$(p_0/\rho_0)\gamma$	$\gamma RT_0/M$
474	Prob 15A.1 Title	Rates...exchanger	Heat transfer in double-pipe heat exchangers
475	Prob 15A.3 (a)	7.0	6.97
475	Prob 15A.3 (a)	Stream 1 Stream 2	Stream 1a Stream 1b
475	Prob 15A.3 (a)	88°F	86.5°F
475	Prob 15A.3 (b)	flow...possible	fluid density were treated as constant
476	Prob 15A.6 Ans	355 °F	354 °F
476	Prob 15A.7(a)	0.108 $\text{lb}_m/\text{hr}\cdot\text{ft}$	1.09 $\text{lb}_m/\text{hr}\cdot\text{ft}$
476	Prob 15A.7(b)	combined is 0.001	is 0.001

476	Prob 15A.7 Ans	132 °F	136 °F
479	Eq 15B.5-1	S_2	S_0
479	Prob 15B.5	**(d)**	**(c)**

480 Prob 15B.6 The table should be modified as follows:

p (atm)	r	$r^{0.286}$	v	T	S
10	1.0	1.000	0000	560	∞
9	0.9	0.970	449	543	0.977
8	0.8	0.938	645	525	0.739
7	0.7	0.903	807	506	0.650
6	0.6	0.864	956	484	0.613
5.28*	0.528	0.833	1058	466	0.606
5	0.5	0.820	1099	459	0.607
4	0.4	0.769	1245	431	0.628
3	0.3	0.709	1398	397	0.688
2	0.2	0.631	1574	353	0.816
1	0.1	0.518	1798	290	1.171
0	0.0	0.000	2591	0	∞

*Pressure at the minimum cross-section

486	Footnote 3	Baton Rouge	Boca Raton
501	Line 1a	in referred	is referred
508	Prob 6A.6	as gray.	as a gray sphere.
515	1 line after Eq. 17.1-2	as been	has been

517	Table 17.1-1	$x_A = 1$ $x_B = 1$	$x_A \to 1$ $x_B \to 1$
540	Prob 17A.8	136 atm at 351K	136 atm and 351 K
540	First line after Eqs 17A9-6, 7	when...inserted	when the molecular parameters of each species are predicted according to Eqs. 1.4-11a,c
561	3 lines after Eq. 18.5-19	*Insert the following sentence:* This equation has been approximately confirmed[6] for gas bubbles 0.3 to 0.5 cm in diameter rising through carefully purified water.	
561	2 lines above Eq. 18.5-20	flow[6]	flow[7]
561	2 lines after Eq. 18.5-20	*Delete the sentence* Equation 18.5-20....water.	
561	Footnotes	Interchange footnotes "6" and "7"	
561	Fn 7	S18	S18-S24
569	Prob 18A.2 title	Sublimitation	Sublimation
569	Prob 18A.2 Ans	0.0887 2.43×10^{-3}	0.0888 1.06×10^{-4}
570	Prob 18A.6(b)	the results of §17.3	Eq. 17.2-1
570	Prob 18A.7(b)	100 cm/hr	117 cm/hr
570	Prob 18A.7	1.171	1.17

	Ans	1.140	1.33
		Delete the comment: (This is regarded as unusually good agreement)	
570	Prob 18A.6 table	mm Hg	mm
570	Prob 18A.6(b)	the results of §17.3	Eq. 17.2-1
570	Fn 4	518	S18-S24
571	Line 7a	18.2-1	18.2-2
571	Ans 18B.2	5%	0.78%
571	Prob 18B.4	b	ϕ
574	Eq 18B.9-1	C	c
574	Eq 18B.10-2	In the expression for D change the plus sign to a minus sign	
578	Prob 18B.15	$(1/L)$ in Ans.(c)	(z/L)
578	Eq 18B.17-1	$k''a_1$	$k_1''a$
578	Eq 18B.17-2	$k''a_1$	$k_1''a$
578	Eq 18B.17-2	$\frac{4}{3}$	4
579	Line 1a	pseudo-steady	quasi-steady
580	Eq 18C.1-3	References should be cited for this equation: H. A. Wilson, *Proc. Camb.Phil. Soc.*, **12**, 406-423 (1904); T. K. Sherwood and R. L. Pigford, *Absorption and Extraction*, 1st edition, p. 42; H. S. Carslaw and J. C. Jaeger, *Heat Conduction in Solids*, 2nd edition, p. 267, Eq 2	

589	Eq G	C_v	C_V
593	Fig 19.4-1	Replace the rightmost "ripply" line by a dashed line	
597	Fn 6	AIChE Journal	*AIChE Journal*
601	Line 11b	be	by
606	Prob 19A.1	z (3 times)	y (3 times)
607	Prob 19B.6	k_1''	k_1'''
608	Eq 19B.6-2	Equation should read: $$\frac{1+\left(k_1'''/\mathrm{d}_{AB}\right)R^2}{1+\left(k_1'''/\mathrm{d}_{AB}\right)R_0^2}=\exp\left[-\frac{2k_1'''c_{A0}M_A}{\rho_{\mathrm{sph}}}\left(t-t_0\right)\right]$$	
617	Eq 20.1-24	$-\frac{1}{2}$	$+\frac{1}{2}$
650	Eq 20B.3-1	Left side should be multiplied by a factor $1/a$	
650	Eq 20B.3-1	v_{zA} v_{zB}	v_{Az} v_{Bz}
653	Eq 20C.3-2	erf	erfc
654 655	Prob 20D.2	All superscripts lower case italic "*o*" should be lower case Roman "o"	
668	Prob 21A.1	Add to problem statement "The molar flow rate of carbon dioxide is 1/1000 that of air"	
668	Prob 21A.1(a)	sc_A	$\ln sc_A$
668	Prob 21B.1	Eq. 13.3-7	Eq. 13.4-20

670	Prob 21B.5	Insert "for" between the equation and the qualifying statement about y	
683	Ex 22.3-2, line 2	approximate	approximate,
707	Eq 22.8-11	x_A (in denominator)	x_{A0}
707	Eq 22.8-13	$1/2$	$-1/2$
708	Eqs 22.8-20 to 22		remove two ";"
722	Prob 22A.2 Answer	0.0176	0.0158 (using $n = 0.44$ in Eq. 22.3-38)
722	Prob 22A.2	$x_{A\infty} = 0.0176$	$x_{w\infty} = 0.0158$
723	Prob 22B.6 (title)	controling	controlling
723	Fig 22B.7	$+0.0000798T^2$	$-0.0000798T^2$
759	Prob 23A.1	23.5-3	23.5-4
759	Prob 23B.2	23.5-3	23.5-4
760	Prob 23B.4 Last line	t_0	t_0^{-1}
760	Prob 23B.5	$x_W = 0.2$ $y_P = 0.75$ $P = 36.3$ lbs $\hat{H}_p = 862$ Btu/lb$_m$ $\hat{h}_W = 170$ Btu/lb$_m$	$x_W = 0.22$ $y_P = 0.713$ $P = 36.5$ lbs $\hat{H}_p = 877$ Btu/lb$_m$ $\hat{h}_W = 157$ Btu/lb$_m$
761	Prob 23B.7	1%	10%
762	Prob 23C.4	Fig. 22C.4	Fig. 23C.4

		22C.4-1	23C.4-1
769	Table titles	permutation	cyclic permutation
800	Eq 24C.1-1	$=$	$+$
810	Eq A.1-14	*Note*	*Not*
810	Line 6b	**W** (boldface Roman)	*W* (lightface italic)
825	Eq A.5-6	$\frac{d}{dt}\int_V \rho S dV$	$\frac{d}{dt}\int_V \rho s dV$
826	Eqs. A.6-4, 5, 6	Equation numbers should be aligned with the right margin	
828	2nd equation in Exercise 1	$\frac{4}{3}\mathbf{d}$	$\frac{4}{3}\pi\mathbf{d}$
869	Table F.3-3 Footnote	chemical some	some chemical
878	Entry for Darcy	**146**	**148**
Back cover (outside)		$d\omega_A$ dy	$\frac{d\omega_A}{dy}$
		dv_x dy	$\frac{dv_x}{dy}$
		dT dy	$\frac{dT}{dy}$
Back over (outside)		In each of the three figures, interchange the labeling of the abscissa and the ordinate.	