

**HEAT TRANSFER, 2<sup>nd</sup> Ed.**  
**1<sup>st</sup> Printing ERRATA, January 21, 2002**

**Page**

- 7 Line 8: 0.65  $\rightarrow$  0.065
- 136 Exercise 2-102: in figure 2 mm  $\rightarrow$  1 cm
- 193 Line 12: Bi = 40; 2.321  $\rightarrow$  2.349
- 260 Exercise 3-88:  $0.2 \times 10^{-4} \rightarrow 0.2 \times 10^4$
- 304 Equation (4.49): 0.017  $\rightarrow$  0.033  
Line 12: 340  $\rightarrow$  660
- 377 Table 4.10, Items 1-3: Comments, Turbulent Liquids  
Heating n = -0.25  $\rightarrow$  -0.11  
Cooling n = -0.11  $\rightarrow$  -0.25
- 520 Exercise 5-18: increase  $\rightarrow$  change
- 607 Line 11: Insert: RAD3 cannot be used to extrapolate  $\epsilon_g$  outside the temperature ranges of Figs. 6.34(a), 6.35(a) and 6.36(a).
- 631 Line 17: increases  $\rightarrow$  decreases
- 670 Line 20: 1.2946  $\rightarrow$  1.2936  
Line 21: 2.5892  $\rightarrow$  2.5872
- 710 Line 17:  $10^{-6} \rightarrow 10^6$
- 721 Last line: [24]  $\rightarrow$  [23]
- 822 Line 11: 0.017  $\rightarrow$  0.033; 1  $\rightarrow$  2.
- 831 Eqs. (8.86), (8.88): n  $\rightarrow$  m
- 841 Line 6:  $A_f/A_w \rightarrow A_f/A$
- 853 Line 3: steam  $\rightarrow$  stream
- 866 Exercise 8-87, line 3: 8-89 and 8-90  $\rightarrow$  8-88 and 8-89  
Exercise 8-88, line 8: ...unity. Take a maximum allowable chip temperature of 90°C.
- 868 Exercise 8-96: 1.25 kg/s  $\rightarrow$  0.31  
500 J/kg K  $\rightarrow$  2015

(Most of these errors have been corrected in later printings of HT)

### Additional items, March 10, 2004

- 60 Exercise 1-62, line 5:  $50 \rightarrow 2500$
- 133 Exercise 2-92, line 7: kg/s meter
- 173 The superposition analysis is incorrect: see HEAT TRANSFER: COMMENTS at <http://www.mae.ucla.edu/academics/faculty/mills.htm> for the correct analysis.
- 203 Equation 3.84a: delete.
- 204 Lines 15, 16: delete mention of Eq. 3.84a
- 290 2 lines f.b.:  $(\rho - \rho_e) \rightarrow (\rho_e - \rho)$ ; also pg. 291, line 1
- 334 Last line:  $10^5 \rightarrow 10^8$  for air. For liquids the limit is  $10^5$  – see pg. 336, line 2
- 396 Exercise 4-57 figure: 150 m/s  $\rightarrow$  50 m/s
- 495 Line 13:  $\partial t \rightarrow \partial z$
- 496 3 and 2 lines f.b. should read ... Taylor series and canceling terms gives
- 501 Line 6: force  $\rightarrow$  stress
- 522 4 lines f.b.:  $\phi \rightarrow \phi'$
- 523 2<sup>nd</sup> line:  $\phi' \rightarrow \phi$
- 602 Figure 6.33: ordinate is %
- 624 Exercise 6-11: W/L  $\rightarrow$  L/W
- 629 Exercise 6-27, (iii) line 1: aluminumized  $\rightarrow$  aluminized
- Exercise 6-28, 3<sup>rd</sup> line: gas  $\rightarrow$  pipe
- 640 Exercise 6-83: 2<sup>nd</sup> line: 2.4m
- 646 Exercise 6-110, 6-111:  $\Delta I_\lambda / I_\lambda \rightarrow \Delta I_\lambda / I$  (4 places)
- 648 Exercise 6-122: add computer icon
- 689 Figure 7.18b: reverse arrow on abscissa; also  $T_{\text{sat}}(P_\infty)$
- 728 Line 16: of  $\rightarrow$  at
- 733 Equation (7.124) and lines 10, 13: Strictly speaking, we should replace capillary head by capillary pressure, and gravitational head by gravitational force per unit area.
- 754 Exercise 7-40: use a cavity size of  $7.5 \mu\text{m}$
- 756 Exercise 7-61, line 2: delete “of steam”
- 768 Figure 8.7(c): curvature is incorrect—slopes should be higher where  $\Delta T$  is larger.
- 782 Figure 8.14(a): counterflow: same as for p.768 above
- 886 Line 6: 149, 387  $\rightarrow$  14,387
- 942 Fo: add Eq. (3.107)
- 949 Fo: add, 222

Page

- 13 7 Lines from bottom: Delete flux, two places.
- 115 Exercise 2-6 figure: the arrows at each end of the specimen indicate force applied in load cell.
- 173 Nonsymmetrical Boundary Conditions  
The analysis is incorrect: to do the analysis we let the slab be of thickness L with  $0 \leq x \leq L$ , and specify temperatures  $T_{s'}$  at  $x = 0$  and  $T_s$  at  $x = L$ . Again, we let:

$$T(x,t) = T_1(x) + T_2(x,t)$$

$$\frac{d^2 T_1}{dx^2} = 0$$

$$x = 0, T_1 = T_{s'}; \quad x = L, T_1 = T_s$$

$$\text{then } T_1 = T_{s'} + (T_s - T_{s'}) \frac{x}{L}$$

$$\frac{\partial T_2}{\partial t} = \alpha \frac{\partial^2 T_2}{\partial x^2}$$

$$x = 0, L : T_2 = 0$$

$$t = 0, T_2 = T_0 - T_1$$

Referring to the analysis following Eq. (3.38),

$$T_2(\zeta, \eta) = e^{-\lambda^2 \zeta} (A \cos \lambda \eta + B \sin \lambda \eta)$$

$$T_2 = 0 \text{ at } \eta = 0, 1$$

$$T_2 = 0 \text{ at } \eta = 0 : 0 = e^{-\lambda^2 \zeta} (A + 0), A = 0$$

$$T_2 = 0 \text{ at } \eta = 1 : 0 = e^{-\lambda^2 \zeta} B \sin \lambda$$

$$\sin \lambda = 0, \lambda = n\pi, n = 0, 1, 2, \dots$$

$$T_2 = \sum_{n=1}^{\infty} B_n e^{-n^2 \pi^2 \zeta} \sin n\pi \eta$$

$$T_2 = \sum_{n=1}^{\infty} B_n e^{-n^2 \pi^2 F_0} \sin n\pi\eta \frac{x}{L}$$

And the constants  $B_n$  must be determined from:

$$\sum_{n=0}^{\infty} B_n \sin n \pi \frac{x}{L} = T_0 - T_s' - (T_s - T_s') \frac{x}{L}$$

- 281 Line 2. For an incompressible liquid we take  $c_p = c_v = c$ , and neglect  $\Delta P/\rho$ ; see Eq. (1.6b)
- 426 Line 17: Notice that for constant density and fully developed velocity profile there is no change in kinetic energy along the tube.
- 433 Line 6: The statement “negligible work done by the viscous stresses” applies only to the derivation of the energy equation: of course the viscous stresses do work to reduce the kinetic energy of the freestream fluid as it enters the boundary layer. Consistent with the negligible work is a negligible change in kinetic energy when using Eq. (1.4) to derive Eq. (5.40).
- 458 Figure 5-24: The indicated value of  $u_{\max}/U$  is too high—should be 0.146.
- 512 Figure 5.44: The indicated thermal boundary layer thickness for  $Pr = 10$  is too small—should be about twice the indicated value.
- 520 Exercise 5.19: Some texts interpret the  $\frac{1}{2} \rho u_b^2$  in the definition of  $f$  as kinetic energy; others interpret  $\rho u_b^2$  as the dynamic pressure. Actually, both are incorrect. The Darcy friction factor essentially applies to fully developed turbulent flow in a tube. The governing equation is the time-averaged momentum conservation equation (see Exercise 5-48): if this equation is made dimensionless it is seen that  $\rho u_b^2$  is properly interpreted as scaling the turbulent shear stress. For laminar flow, the laminar (molecular) shear stress is appropriate.
- 520 Exercise 5-20:  $k$  in the table is the conductivity of the fluid inside the tube when obtaining the temperature profile. However, it is not neglected when obtaining the film thickness, i.e., in Eq. (7.10).
- 563 The exact value of  $F_{13} = 0.447$
- 568 Of course,  $G_0$  is the flux incident on a surface held normal to the sun’s rays.
- 574 Example 6.10: By assuming a well-insulated roof we obtain an upper limit on  $T_s$ . Of course, if the roof were perfectly insulated there would be no additional load on the cabin air conditioner.
- 669 Equation (7-38): the coordinate  $x$  is measured from  $\phi = 0$ .
- 830 Comment No. 1: Note also that  $St/f$  is independent of Reynolds number so no iteration is required.

## Additional items, February 20, 2005

### Page

- 203 Line 22: delete "initial and"  
Line 23: delete Eq. (3.84a)  
Lines 24 and 25: renumber equations 3.84a, 3.84b
- 204 Lines 15-16: should read...fit the boundary conditions. Equation (3.84a) is satisfied since erf 0 = 0; Eq. (3.84b) requires that...
- 708 Equation (7.87): replace by  $\frac{1}{\rho} = \frac{x}{\rho_v} + \frac{1-x}{\rho_\ell}$
- 710 Use of the corrected Eq. (7.87) yields  $\rho = 56.0 \text{ kg/m}^3$

$$\left(\frac{dP}{dz}\right)_F = -706 \text{ Pa/m}; \quad \left(\frac{dP}{dz}\right)_G = -549 \text{ Pa/m};$$
$$\left(\frac{dP}{dz}\right)_M = 3752 \text{ Pa/m}; \quad \frac{dP}{dz} = 5007 \text{ Pa/m}.$$

- 711 Use of the corrected Eq. (7.87) yields:  $\rho = 105 \text{ kg/m}^3$

$$\left(\frac{dP}{dz}\right)_F = -673 \text{ Pa/m}; \quad \left(\frac{dP}{dz}\right)_M = 247 \text{ Pa/m};$$
$$\frac{dP}{dz} = -426 \text{ Pa/m};$$