7.7 Water at 10°C flows over a 3 cm O.D. cylinder at 70°C. The velocity is 1 m/s. Evaluate $\overline{h}$.

7.27 Water at 27°C flows at 2.2 m/s in a 0.04 m I.D. thin-walled pipe. Air at 227°C flows across it at 7.6 m/s. Find the pipe wall temperature.

7.30 Water at 37°C flows at 3 m/s across at 6 cm O.D. tube that is held at 97°C. In a second configuration, 37°C water flows at an average velocity of 3 m/s through a bundle of 6 cm O.D. tubes that are held at 97°C. The bundle is staggered, with $S_T/S_L = 2$. Compare the heat transfer coefficients for the two situations.

Consider a cold plate of width $W = 100$ mm and height $H = 10$ mm, with 10 square channels of width $w = 6$ mm and a spacing of $\delta = 4$ mm between channels. Water enters the channels at a temperature of $T_{m,i} = 300$ K and a velocity of $u_m = 2$ m/s. If the top and bottom cold plate surfaces are at $T_s = 360$ K, what is the outlet water temperature and the total rate of heat transfer to the cold plate? The thermal conductivity of the copper is 400 W/m·K, while average properties of the water may be taken to be $\rho = 984$ kg/m^3, $c_p = 4184$ J/kg·K, $\mu = 489 \times 10^{-6}$ N·s/m^2, $k = 0.65$ W/m·K, and $Pr = 3.15$. Is this a good cold plate design? How could its performance be improved?