

**Errata for**  
**“Random Heterogeneous Materials: Microstructure and Macroscopic Properties”**  
**by S. Torquato (Springer-Verlag, New York, 2002)**

**Updated on July 18, 2005**

- Page 36:  $\phi_2^2$  on the right side of Eq. (2.28) should be  $\phi_1^2$ .
- Page 45: in Eq. (2.67),  $p^{(i)}(z)$  should be  $p^{(i)}(z)dz$ .
- Page 54: In the sentence immediately above Eq. (2.105), “... for any system” should be “... for any statistically homogeneous and isotropic system ...”
- Page 54: three lines below Eq. (2.106),  $E_V(0) = H_V(0) = G_V(0) = 0$  should be replaced by  $E_V(0) = G_V(0) = 1, H_V(0) = \rho s_1(0)$ .
- Page 62: On the line above Eq. (3.7),  $\rho_n(\mathbf{r}^N)$  should be  $\rho_n(\mathbf{r}^n)$ .
- Page 69: Fig. 3.9, left panel: the symbol  $r$  is missing from the horizontal axis.
- Page 72: immediately below Eq. (3.31),  $r_{ij} = \mathbf{r}_j - \mathbf{r}_i$  should be replaced by  $\mathbf{r}_{ij} = \mathbf{r}_j - \mathbf{r}_i$ .
- Page 79: two lines above Eq. (3.47),  $v_2^{\text{int}}$  should be replaced by  $v_n^{\text{int}}$ .
- Page 86: Equation (3.76) should read:

$$g_2(x+1, \infty) = -2[\eta(\infty)]^{-2} \exp(-2\gamma) \ln x, \quad x \rightarrow 0.$$

- Page 87:  $g(x+1, \eta)$  in Eq. (3.77) should be  $g_2(x+1, \eta)$ .
- Page 93: Third line from bottom: “we compressed the system” should read “the system was compressed.”
- Page 98: third line from the bottom of the page: the phrase “the fourth sum ...” should be changed to “the third sum ...”
- Page 102: line above (4.17): “...sphere given by” should be “...sphere is given by”
- Page 106: second to the last line: “... a mixture of  $p$  test particles of radii  $b_1, \dots, b_p$  ...” should read “... a mixture of  $n$  test particles of radii  $b_1, \dots, b_n$  ...”
- Page 122: last line:  $\phi_2^2$  should be replaced by  $\phi_1^2$ .
- Page 126: in Figure 5.4, the curve labeled  $p(z)$  should be labeled  $Dp(z)$ . In the caption, “... radius  $R$  at ...” should be “... radius  $R = D/2$  at ...”
- Page 132: in Eq. (5.45), the quantity  $2\phi_2$  should be replaced by  $\phi_2^2$ .
- Page 151: the region above the uppermost (solid) curve in Fig. 5.15 should be shaded.

- Page 171: the argument of the exponential in Eq. (6.36) should contain a minus sign.
- Page 172:  $\omega_d$  in the first denominator of Eq. (6.40) should be  $\omega_{d-1}$ .
- Page 184: the four occurrences of the phrase “phase 1” between Eqs. (7.24) and (7.25) should be replaced by “phase 2” and Eq. (7.25) should be replaced by

$$\phi_2 = 1 - \phi_1 = \phi_2^{(1)} \phi_2^{(2)}.$$

- Page 189: last paragraph: Change “composed of vertices and lines (or edges) connecting some subset of them” to “composed of a set of vertices and lines (or edges) connecting some subset of the vertices.”
- Page 195: three lines above (8.11):  $S_2^{(2)}(\mathbf{x}^n)$  should be  $S_n^{(2)}(\mathbf{x}^n)$ .
- Page 229: in Eq. (9.38), each  $\phi$  should be  $\phi_2$ .
- Page 231: in Eq. (9.46),  $\phi_2 \rightarrow \phi_{2c}^-$  should be  $\phi_2 \rightarrow \phi_{2c}^+$ .
- Page 284: “... employs a *cell list* (Haile et al. 1985) that ...” should read “... using a *cell list* (Haile et al. 1985), which ...”
- Page 284, fifth line: “... check the condition (12.10) only for those particle centers located in the subvolume.” should read “... check the condition (12.10) only for those particle centers located in the subvolume and the immediate neighboring subvolumes.”
- Page 327: the constant  $C_{33}$  should be replaced by the constant  $C_{23}$  in Eqs. (13.75), (13.76), (13.77), and (13.79).
- Page 327: fourth line: “... we find from (13.75) ...” should should read “... we find from (13.74) ...”
- Page 327: third line of the first full paragraph: “... (13.75) reveals that” should read “... (13.74) reveals that.”
- Page 327: line immediately above Eq. (13.77): “... we have from (13.75) ...” should read “... we have from (13.74) ...”
- Page 355: in Eq. (13.221),  $\partial\mathcal{V}_1(\omega)$  should be  $\partial\mathcal{V}(\omega)$ .
- Page 364: The label Eq. (14.41) for the identity should be removed and placed in the third line of the equation immediately below it at the bottom of the page. Also, in the sentence immediately below this identity, “... middle of (14.41) ...” should read “... middle of this identity ...”
- Page 365: (14.42), which appears in the first and third line, should be (14.41).
- Page 365: Eq. (14.45) is missing a dot product.

- Page 366: The label for Eq. (14.47) for the identity should be removed and placed in the third line of the equation below it. Also, in the first and fourth lines below the new Eq. (14.47), (14.48) should be (14.47).

- Page 370, two lines under Eq. (14.70):  $\sigma'$  should be replaced by  $\tau'$ .

- Page 379: Each equation in the second line of the proof is missing a minus sign.

- Page 412: in the first line of text, replace “... in the  $j$ th stage.” with “... in the  $j$ th stage with  $\phi_2 = \phi_2^{(1)}\phi_2^{(2)}$ .”

- Page 412: the unnumbered equations immediately below Eq. (16.17) should read:

$$(\sigma_e)_{11} = \sigma_1\phi_1^{(1)} + (\sigma_e^{(2)})_{11}\phi_2^{(1)}, \quad (\sigma_e)_{22} = \left[ \frac{\phi_1^{(1)}}{\sigma_1} + \frac{\phi_2^{(1)}}{(\sigma_e^{(2)})_{22}} \right]^{-1}.$$

- Page 412: Eq. (16.18) should be replaced by the following:

$$\phi_1^{(1)} = \frac{\phi_1^{(2)}}{\phi_2^{(2)}}.$$

- Page 420: Equations (16.46) and (16.47) for  $(E_e)_{11}$  and  $(E_e)_{22}$ , respectively, are wrong as written. The correct expressions are

$$(E_e)_{11} = \left\langle \frac{1 - \nu^2}{E} \right\rangle^{-1} \left[ \frac{\langle \nu^2 \rangle - \langle \nu \rangle^2 + \langle E \rangle \left\langle \frac{1 - \nu^2}{E} \right\rangle}{\langle \nu^2 \rangle + \langle E \rangle \left\langle \frac{1 - \nu^2}{E} \right\rangle} \right],$$

$$(E_e)_{22} = \langle E \rangle + (\langle \nu^2 \rangle - \langle \nu \rangle^2) \left\langle \frac{1 - \nu^2}{E} \right\rangle^{-1}.$$

- Page 421: two lines below Eq. (16.48): replace “... of the phase Young moduli.” with “... of the phase Young moduli when  $\nu_1 = \nu_2$ .”

- Page 426: In the expression for  $\gamma$  in Eq. (16.64),  $\phi_2$  should multiply the second term within the large square brackets.

- Page 436: five lines below Eq. (16.99), Kozeny-Carmen should be Kozeny-Carman.

- Page 451: Eq. (17.104) should read:

$$\mathcal{D} \frac{\partial c}{\partial r} = \kappa c, \quad r = R$$

- Page 452: the minus sign in the equation for  $B$  immediately above Eq. (17.107) should be a plus sign.

- Page 452: the minus sign in Eq. (17.107) should be a plus sign.

- Page 452: the minus sign in the second line of Eq. (17.108) should be a plus sign.
- Page 453: Eq. (17.112) should read:

$$\mathcal{D} \frac{\partial c}{\partial r} = \kappa c, \quad r = R$$

- Page 453: in Eq. (17.114), the minus sign immediately before  $\kappa$  in the denominator should be a plus sign.
- Page 453: in the second line of Eq. (17.115), the minus sign immediately after  $R$  in the denominator should be a plus sign.
- Page 511: in the fourth line immediately below Section 20.1.1, the word “stiffness” should be “conductivity.”
- Page 533: in Eq. (20.109), the term  $[d(\mathbf{n} \cdot \mathbf{m})^4 - 3]$  should be replaced by the term  $[d(d + 2)(\mathbf{n} \cdot \mathbf{m})^4 - 3]$ .
- Page 545: in Eq. (20.171),  $\zeta_2$  should be  $\zeta_p$ .
- Page 562, three lines below Eq.(21.46):  $(\gamma_1 = \gamma_2)$  should be replaced by  $(\gamma_1 = \gamma_2 = 0)$ .
- Page 618: in the legend of Fig. 22.13,  $G_2/K_1 = 0.66$  should be replaced by  $G_2/K_2 = 0.66$ .
- Page 628: in Fig. 22.18, “Kozeny Equation” should be “Kozeny-Carman Relation.” Also, in the figure caption, “Kozeny” should be “Kozeny-Carman.” The same applies to the fifth line in the text.
- Page 654: three lines below Eq. (23.71), “Kozeny-Carmen” should be “Kozeny-Carman.”
- Page 696: “Kozeny-Carmen” should be “Kozeny-Carman.” Also, add the page numbers 628 and 654.