Errata and changes in "Phase Transition Dynamics" (December 10, 2003)

Chapter 1

p.7, end of footnote 4, change "confusion" to "cumbersome notation"
p.14, (1.2.23), change "$+dT$" to "$-dT$"
p.14, (1.2.24), change
$H = \frac{1}{2}\mu + \frac{d}{2}T\ln\lambda_{\text{th}} - \frac{1}{4}z\epsilon = \frac{1}{2}\mu - \frac{d}{4}T\ln T + \text{const.}$" to
$H = \frac{1}{2}\mu - \frac{d}{2}T\ln\lambda_{\text{th}} + \frac{1}{4}z\epsilon = \frac{1}{2}\mu + \frac{d}{4}T\ln T + \text{const.}$
p.19, (1.2.58), change "$g(r)$" and "$g(|\boldsymbol{r}'|)$" to "$g(r)-1$" and "$g(|\boldsymbol{r}'|)-1$"
p.22,footnote 10, change "Fig.11.34" to "Fig.11.33"
p.25, change "Fig.11.24" to "Fig.11.26".
p.25, 2 lines below (1.3.12), change "Fig.11.24" to "Fig.11.26"
p.28, (1.3.43), change "$= T$" to "$= T/n$"
p.29, (1.3.55), change "$g_{ij}(r)$" and "$g_{ij}(|\boldsymbol{r}'|)$" to "$g_{ij}(r)-1$" and "$g_{ij}(|\boldsymbol{r}'|)-1$"

Chapter 2

p.47, 2nd line, add "A simple example of the relations (2.2.7) and (2.2.8) will be given in Section 3.4." after "...Ref.[17]."
p.48, line above (2.2.19), insert a new footnote as "diameter[2]". This new footnote is as follows: "If a fifth-order term is present in the Landau expansion of the free energy, it can also give rise to the first singular term in (2.2.19)[40]. See discussions in Section 3.4." Then the following footnote should be renumbered (plus one).
p.48, line below (2.2.18), change "b" to "b_{c}".
p.48, 3 line below (2.2.19), change "[40, 41]" to "[41]".
p.62, (2.3.48), change "α_n" to "α_1".
p.76, References [40] and [41] should be united into [41].
p.76, Add the following new Reference "[40]":
"[40] J.F. Nicoll, *Phys. Rev. A*, **24** (1981) 2203."

Chapter 3

p.79, (3.1.4), change "-" before "$V\cdots$" to "+".
p.84, 1st line, change "δT" to "$\delta\hat{T}$".
p.102, the sentences from the first line and before the headinng "*Gradient free energy*", should be replaced by those in the last page of this document.
p.121, 2 line below (3A.17), change "$\cdots C_2)_{\lambda=1}$" to "$\cdots C_2)_{\gamma=0}$".
p.121, 2 line from below, change "...representation, although there" to "...representation. There ...".

Chapter 4

p.125, 2 line above (4.1.5), after "$(n=1)$, insert "above two dimensions $(d>2)$"
p.141, 2 line above (4.2.52), after "non-ionic" insert ", non-polar".
p.149, 2 line below (4.3.35), change "...$\gamma r/\tau$" to "...$\gamma r_{\text{R}}/\tau$". (attach the roman subscript "R" to "r").
p.169, line below (4.4.42), change "χ" to χ_{c}"
p.170, 2 lines above (4.4.52), change "a_{g}" to "a_{ca}"
p.171, 1st line, change "$\beta/2$ to β/ν
p.172, 3 lines below (4.4.61), delete "/"
p.183, line below (4F.5), delete "are" after "and".
p.187, [94], change "Rershan" to "Pershan".

Chapter 5

p.211, (5.3.35) and two line below it, change "$C(\Lambda)$" to "$C_0(\Lambda)$" (two places).

p.218, line below (5.B.2), change ”$\mathcal{QQ}$” to ”$\mathcal{Q}^2$”.
p.223, 2nd line, change ”X^2” after ”$3\ln(4/3)$” to ”X”
p.228, line below (6.1.6), insert ”3D” before ”is microscopic”.

Chapter 6

p.228, line below (6.1.6), insert ”in 3D” before ”is”.
p.236, (6.1.51), insert ”T” after ”2”.
p.236, (6.1.53), insert ”T” after ”=”.
p.242, line below (6.2.19), insert ”$C_p = \alpha_s^2\chi$ after ”where”, and delete ”and $C_p = \alpha_s^2\chi$ after ”system”.
p.243, 2nd line from bottom, change ”T_C” to ”T_c”.
p.245, 4 lines below (6.2.35), change ”under” to ”for”
p.246, line below (6.2.40), change ”$\overleftrightarrow{\Lambda}$” to ”$\Lambda$”.
p.252, left hand side of (6.2.67), change ”$I(q) =$” to ”$I_1(q) =$”.
p.261, (6.3.31), change ”A_0” to ”c^2A_0”.
p.261, (6.3.32), change ”A_0” to ”$\frac{k^2}{\kappa_D^2}A_0$”.
p.261, line below (6.3.32), change ”The” to ”If $(\gamma_s - 1)k^2 \ll |k_D|^2$, the”.
p.290, (6.6.54), change ”$\int dt$” to $\int_0^\infty dt$”
p.310, line below (6.D.1), change ”$\mathcal{T}(x,t)$” to ”$\mathcal{T}(x,\Omega)$”.
p.314, in [74] (Y. Chiwata and A. Onuki...), add one references as follows:
”[74] Y. Chiwata and A. Onuki, *Phys. Rev. Lett.* **87**, 144301 (2001); A. Furukawa and A. Onuki, *Phys. Rev. E* **66**, 016302 (2002).”

Chapter 7

p.322, line above (7.1.26), insert ”with $\phi \ll 1$, after ”solutions”.
p.320, 2 line above (7.1.10), change ”[4, 5]” to ”[4]”.
p.323, 4 line below (7.1.33), after ”...[17].” insert the following sentence:
”Harden *et al.* [5] studied hydrodynamic surface modes in polymer solutions and gels on the basis of the two-fluid model.”
p.327, (7.1.60), insert ”q^2” before the period ”.”
p.334, 4 lines below (7.1.101), change ”either class of time derivative also satisfy” to ”there is a class of time derivatives satisfying”
p.334, (7.1.102), second line, change ”$\frac{1}{4}$” to ”$\frac{1}{2}$”
p.344, line above (7.2.29), insert ”$\boldsymbol{v}_p = \boldsymbol{v}_1$” after ”network velocity” and ”$\boldsymbol{v}_s = \boldsymbol{v}_2$” after ”solvent velocity”.
p.344, (7.2.29), change ”$\boldsymbol{v}$” to ”$\boldsymbol{v}_p - \boldsymbol{v}_s$”.
p.344, (7.2.30), change ”$\boldsymbol{v}$” to ”$\boldsymbol{v}_p$”, and insert ”$\boldsymbol{v}_s$” before ”$-\zeta^{-1}$”.
p.344, line below (7.2.30), insert ”Use has been made of (7.2.7) and (7.2.8).” before ”This”.
p.344, 2 line above (7.2.31), change ”$\boldsymbol{v}$”and ”v_i” (two places) to ”$\boldsymbol{v}_p$” and ”v_{pi}”, respectively.
p.344, (7.2.31), (7.2.32) and (7.2.33), change ”$\boldsymbol{v}$” to ”$\boldsymbol{v}_p$” (three places).
p.344, 2 line above (7.2.33), change ”The” to ”If $\boldsymbol{v}_s$ is neglected, the”.
p.345, line above (7.2.34), change ”From (7.2.33)” to ”If $\boldsymbol{v}_s$ is neglected, from (7.2.29)”.
p.347, line below (7.2.44), change ”ν” to ”(η_0/ρ)”.
p.351, last line of the caption of Fig.7.12, change ”blobs” to ”units”.
p.360, line below (7.B.2), change ”$G_K(T)$” to ”$G_K(t)$”.
p.369, ”[91] M. Rubinstein...”, change ”1977” to ”1997”.
p.367, combine Refs.4 and 5 to new Ref.4 as follows:
”[4] M. Doi and A. Onuki, J. Phys. II **2**, 1631 (1992); A. Onuki, J. Non-Crystalline Solids **172-174**, 1151 (1994).” Then insert the following paper as new Ref.5:
”[5] J.L. Harden, H. Pleiner and P.A. Pincus, J. Chem. Phys. **94**, 5208 (1991).”
p.375, 4 th line in the 2nd paragraph (”Notice ...”), after ”$\delta(\boldsymbol{r} - \boldsymbol{r}')$”, insert ”$\delta(t - t')$”.

Chapter 8

p.385, "Coasening .....($n \geqq$2)" should be a new subsection. This should appear as **8.1.5 Coarsening in many component systems** $n \geqq$2).
p.391, Fig.8.9, make (a) and (b) written in the same size.
p.415, (8.4.45), change "$\delta(\boldsymbol{r})$" to "$\hat{\delta}(\boldsymbol{r})$".
p.415, (8.4.46), change "$\dot{\Delta}_s$" and "Δ_s" to "$\dot{\Delta}$" and "Δ", respectively.
p.421, 3 lines above (8.4.80), change "we should recover the result (8.2.68) for the case $\Delta m = 0$." to "the conservation of m does not affect the interface motion."
p.447, line above the heading "8.9.1 *Early-stage ....*", change "Section 8.5" to "Section 9.6".
p.470, 3 line above (8A.5), change "$\boldsymbol{r} \cdot \boldsymbol{n}$" to "$-\boldsymbol{r} \cdot \boldsymbol{n}_1$".
p.471, line above (8.A.11), change "$I(k) = I_1(k)/k^2$" to "$\hat{I}(k) = \hat{I}_1(k)/k^2$".
p.473, (8B.6), insert "π^{-2}" before "$\int dx$".

Chapter 9

p.492, 2 line below (9.1.9), after "...slowly" add "outside the interface region".
p.492, 2 line below (9.1.11), change "(9.1.9)" to "(9.1.10".
p.501, 2 line below (9.2.18), at the end of the paragraph, insert "We will use (9.2.16) in Appendix 9A."
p.505, 2 line above (9.2.36), change "$Z \equiv \log$" to "$Z \equiv \ln$".
p.511, first line in the caption of Fig.9.10, insert "at the peaks" after "above".
p.511, line above (9.3.27), change "condition" to "conditions".
p.524, Fig.9.19, the line staring from "Line of electron bubble explosions" wrongly indicates the spinodal line (bold line). In the original paper [54] it reaches the line formed by the circles, but it was erased by the designer of Cambridge.
p.515, 1st line, delete "the Stokes-Kawasaki formula" and change "the diffusion constant" to "D".
p.515, 2nd line, after "..(2.1.10)." insert "The x is defined in (9.3.41) below."
p.533, (9.5.27), change "$E_g/\Delta_Q^{3/2}$" to "$E_g\Delta_Q^{3/2}$".

Chapter 10

p.606, line above the heading "**10.4.6. Proper ...**, insert "such" before "phase transitions".
p.611, (10.4.72), change "g_0^2" to "$g_{\rm JT}^2/C_0'$"
p.613, footnote 11, change "$\sigma_a\sigma_{\rm t}$" to "$\sigma_a/\sigma_{\rm t}$"
p.614, last line, change "$\psi_{\rm H}$" to "$\psi_{\rm B}$".

Chapter 11

p.642, caption of Fig.11.1, 1st line, change "u_x", "u_y", and "u_z" by "$\langle v_x\rangle$", "$\langle v_y\rangle$", and "$\langle v_z\rangle$", respectively.
p.643, (11.1.8), change "$I_0(q)$" to "$I_{\rm eq}(q)$"(two places) and change "," to "." .
p.643, line below (11.1.8), delete "where ....factor."
p.652, line below (11.1.32), change "ϕ" to "Δ".
p,654, below (11.1.35), add "The ϕ is the volume fraction of the droplets."
p.657, line below (11.42), change "a small dynamic exponent" to "the small dynamic exponent in (6.1.42)".
p.659, 2 line above (11.1.48), change "it" to "its space average".
p.663, 3rd line of the caption of Fig.11.10, change "the curves" to "$a_T = 1$ at $T = T_0$ and the curves at various T".
p.667,6 line in 11.1.10, change "Ref.[64]" to "Ref.[68]".
p.673, line below (11.2.10), change "$q_z \neq 0$" to "$q_x \neq 0$".
p.674, 2 nd line in footnote 4, change "expand" to "shrink" and "decrease" to "increase".
p.678, 3rd line in 11.2.3, insert "density" after "elastic energy".
p.686, 16 line in 11.4, change "using" before"immobile" to "with".
p.687, 11 line, delete "the" before "application".

p.689, 2 line above (11.4.4), change "...0.235) in 3D." to "...0.235 in 3D)."
p.697, 4 line from below, insert "large" before "constituent".
p.698, 5 lines above (11.4.26), insert "[230]" after "... quiescent states".
p.698, 3 lines above (11.4.26), change "[230]" to "[231]".
p.699, caption of Fig.11.33, at the end add "The noisy behavior of the curves of $G(t)$ at long times ($t \gtrsim \tau_R$)) arises from the thermal fluctuations of the stress in a finite system [230].".
p.699, 2 line from below, change "τ_d" to "τ_α".
p.701, 2nd line, change "$\phi(\boldsymbol{r}, t)$" to "$\psi(\boldsymbol{r}, t)$".
p.701, change "[231, 232]" and "[233]" to "[232, 233]" and "[234]", respectively.
p.708, [210], change "Aragon" to "Argon".
p.709, below [229], insert the new reference, "[230] R. Yamamoto and A. Onuki, *J. Chem. Phys.* **117**, 2359 (2002)".
p.709, because of the above addition, change [230], [231], [232], and [233] to [231], [232], [233], and [234], respectively.

"**Revised page of p.102**"

We expand the free energy density f in (3.4.9) in powers of the volume fraction deviation,

$$\phi_1 = \phi - \phi_c = v_0(n - n_c). \tag{3.4.17}$$

However, f is not even with respect to ϕ_1; as a result, its Taylor expansion contains a term of order ϕ_1^5 as

$$\frac{v_0}{T_c}(f - f_c) = -h_{vw}\phi_1 + \frac{1}{2}r_{vw}\phi_1^2 + \frac{1}{4}u_{vw}\phi_1^4 + +w_{vw}\phi_1^5 + \frac{1}{6}v_{vw}\phi_1^6 + \cdots, \tag{3.4.18}$$

where f_c is the critical value of f, a_{vw} vanishes at the critical point, and h_{vw} vanishes along the coexistence line as

$$r_{vw} = \frac{27}{4}\Big(\frac{T}{T_c} - 1\Big), \quad h_{vw} = \frac{\mu - \mu_c}{T_c} - \Big(\frac{\partial \mu}{\partial T}\Big)_{cx}\Big(\frac{T}{T_c} - 1\Big). \tag{3.4.19}$$

If $\mu - \mu_c$ is removed using the pressure deviation $p - p_c$, we also have $h_{vw} = [p - p_c - (\partial p/\partial T)_{cx}(T - T_c)]/n_c T_c$, where $(\partial p/\partial T)_{cx} = (2v_0)^{-1}$ in the van der Waals model. The other coeffcients are constants calculated as

$$u_{vw} = \frac{243}{16}, \quad w_{vw} = -\frac{3}{5}u_{vw}, \quad v_{vw} = \frac{27}{5}u_{vw}. \tag{3.4.20}$$

Here we may define the *true* order parameter as

$$\psi = \phi_1 + (w_{vw}/u_{vw})(\phi_1^2 - r_{vw}/u_{vw}) \quad \text{or} \quad \phi_1 = \psi - (w_{vw}/u_{vw})(\psi^2 - r_{vw}/u_{vw}), \tag{3.4.21}$$

where the terms of order ϕ_1^3 or $|r_{vw}|^{3/2}$ are neglected. If f is treated as a function of ψ, the fifth-order term vanishes in the expansion as

$$\frac{v_0}{T_c}(f - f_c) = -h_{vw}\psi + \frac{1}{2}r'_{vw}\psi^2 + \frac{1}{4}u_{vw}\psi^4 + O(\psi^6), \tag{3.4.22}$$

where $r'_{vw} = r_{vw} + 2w_{vw}h_{vw}/u_{vw}$. In the mapping relationship between fluids and spin systems in Section 2.2, ψ is the spin variable in the corresponding Ising system. From (3.4.4) the energy deviation from the critical value in fluids is written as

$$(e - e_c)/T_c = C_0(T/T_c - 1) - \frac{3}{4}v_0^{-1}\phi_1 - \frac{27}{8}v_0^{-1}\phi_1^2 + \cdots, \tag{3.4.23}$$

where $C_0 = 3n_c/2 = 1/2v_0$ is the critical value of C_V. As in (3.1.23) we may define the energy density m in the corresponding Ising system with $a_0 = 3(9/2 - w_{vw}/u_{vw})C_0$. The mapping relations (2.2.7) and (2.2.8) hold with

$$\alpha_1 = v_0^{-1}, \quad \beta_1 = \frac{2w_{vw}}{u_{vw}a_0 v_0} = -\frac{8}{51}, \quad \alpha_2 = -\frac{3}{4}v_0^{-1}, \quad \beta_2 = 1. \tag{3.4.24}$$

In this manner, if the free energy density of fluids is expanded in powers of the density deviation, the asymmetric fifth-order term arises and gives rise to the mixing term ($\beta_1 \neq 0$) in (2.2.7) and, after renormalization, the singular coexistence-curve diameter in (2.2.19). This scenario holds for general coefficients in the expansions (3.4.18) and (3.4.23). See Ref.[40] in Chapter 2.