

# Errata of Soft Matter Physics

Masao Doi

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page 26, eq.(2.79)

$$\mu_i = \mu_i^0(T) + Pv_i + k_B T \ln \phi_i + \sum_{j=1}^n (2v_i A_{ij} - k_B T) \phi_j$$

→

$$\mu_i = \mu_i^0(T) + Pv_i + k_B T \ln \phi_i + \sum_{j=1}^n (2v_i A_{ij} - \frac{v_i}{v_j} k_B T) \phi_j$$

page 26, problem (2.6)

eq.(2.63) → eq.(2.62)

page 27, eq.(2.82)

$$f(\phi) = \frac{k_B T}{v_c} \left[ \sum_{i=1,2} \frac{1}{N_i} \phi_i \ln \phi_i - \chi \left( \sum_{i=1,2} \phi_i \right)^2 \right]$$

→

$$f(\phi) = \frac{k_B T}{v_c} \left[ \frac{(1-\phi) \ln(1-\phi)}{v_c} + \sum_{i=1,2} \frac{1}{N_i} \phi_i \ln \phi_i - \chi \left( \sum_{i=1,2} \phi_i \right)^2 \right]$$

page 34

The paragraph after eq.(3.15) must be corrected. The text says "any tensor  $\mathbf{E}$  can be written as  $\mathbf{E} = \mathbf{Q} \cdot \mathbf{L}$ , where  $\mathbf{L}$  is a diagonal tensor, and  $\mathbf{Q}$  is an orthogonal tensor." This statement is not correct. The correct statement is: "any tensor  $\mathbf{E}$  can be written as  $\mathbf{E} = \mathbf{Q} \cdot \mathbf{S}$ , where  $\mathbf{S}$  is a symmetric tensor, and  $\mathbf{Q}$  is an orthogonal tensor." This correction is needed since from eq.(3.17) one cannot conclude that  $\mathbf{E}$  is written as  $\mathbf{Q} \cdot \mathbf{L}$ . In fact, eq.(3.17) is satisfied by  $\mathbf{Q} \cdot \mathbf{q} \cdot \mathbf{L} \cdot \mathbf{q}^t$  for any orthogonal tensor  $\mathbf{q}$ .

Despite the correction, the subsequent statement "any uniform deformation is equivalent to a combination of orthogonal stretching (represented by  $\mathbf{L}$ ) and rotation" is correct ( although the rotation here must be understood to be described by  $\mathbf{Q}$  and  $\mathbf{q}$ ).

*The author thanks Dr. Konstantin Volokh for pointing out this error.*

page 49, problem (3.4)

$\lambda_1 = 1 \rightarrow \lambda_3 = 1$

page 50, problem (3.7)

*Add the following sentence at the end of the problem.*

*"Assume that the polymer in the solution cannot get into the gel."*

page 92, eq.(5.71)

$$F[\psi] = N \left[ k_B T \int d\mathbf{u} \psi(\mathbf{u}) \ln \psi(\mathbf{u}) + \frac{U}{2} \int d\mathbf{u} \int d\mathbf{u}' (\mathbf{u} \cdot \mathbf{u}') \psi(\mathbf{u}) \psi(\mathbf{u}') \right]$$

→

$$F[\psi] = N \left[ k_B T \int d\mathbf{u} \psi(\mathbf{u}) \ln \psi(\mathbf{u}) - \frac{U}{2} \int d\mathbf{u} \int d\mathbf{u}' (\mathbf{u} \cdot \mathbf{u}') \psi(\mathbf{u}) \psi(\mathbf{u}') \right]$$

page 92, eq.(5.74)

$$\frac{k_B T}{U} x = \coth x$$

→

$$\frac{k_B T}{U} x = \coth x - \frac{1}{x}$$

page 111, eq.(6.85)

$$\zeta_{\alpha\beta} \frac{dx_\beta}{dt} + F_{r\alpha} = 0$$

→

$$-\zeta_{\alpha\beta} \frac{dx_\beta}{dt} + F_{r\alpha} = 0$$

page 113, eq.(6.105)

$$G(n, m, t) = \frac{1}{\sqrt{2\pi\lambda t}} \exp\left[-\frac{(n-m)^2}{2\lambda t}\right]$$

→

$$G(n, m, t) = \frac{1}{\sqrt{4\pi\lambda t}} \exp\left[-\frac{(n-m)^2}{4\lambda t}\right]$$

page 132, eq.(7.105)

$$\frac{\partial\psi}{\partial t} = D_r \mathcal{R} \cdot \left( \mathcal{R}\psi + \frac{\mu_m \mathbf{u} \times \mathbf{H}}{k_B T} \psi \right)$$

→

$$\frac{\partial\psi}{\partial t} = D_r \mathcal{R} \cdot \left( \mathcal{R}\psi - \frac{\mu_m \mathbf{u} \times \mathbf{H}}{k_B T} \psi \right)$$

page 135, eq.(7.126)

$$\Phi = \frac{\eta}{4} h \int_0^a dr 2\pi r \left( \frac{dv}{dr} \right)^2$$

→

$$\Phi = \frac{\eta}{2} h \int_0^a dr 2\pi r \left( \frac{dv}{dr} \right)^2$$

page 135, problem (7.1) (b)

$$\Phi = (\pi/2)\eta h \dot{h}^2 \rightarrow \Phi = 4\pi\eta h \dot{h}^2$$

page 136, eq.(7.132)

$$\mu(x, x') = -\frac{\partial}{\partial x} \left[ \frac{n(x)}{\zeta} \frac{\partial}{\partial x'} \delta(x - x') \right]$$

→

$$\mu(x, x') = -\frac{\partial}{\partial x} \left[ \frac{n(x)}{\zeta} \frac{\partial}{\partial \underline{x}} \delta(x - x') \right]$$

page 162, three lines below eq.(8.126)

by eq.(8.20) → by eq.(8.20) except for numerical factor  $\sqrt{3}$

page 163, eq.(8.137)

$$\chi(\mathbf{r}, \mathbf{r}', t) = \frac{\bar{n}}{k_B T} [g_{md}(\mathbf{r} - \mathbf{r}', 0) - g_{md}(\mathbf{r} - \mathbf{r}', t)]$$

→

$$\chi(\mathbf{r}, \mathbf{r}', t) = \frac{\bar{n}}{k_B T} [\underline{g}_d(\mathbf{r} - \mathbf{r}', 0) - \underline{g}_d(\mathbf{r} - \mathbf{r}', t)]$$

page 164, eq.(8.141)

$$\frac{\partial \delta \phi}{\partial t} = \frac{\phi_c}{\xi} \nabla^2 [a(T - T_c) \delta \phi + \phi_c \kappa_s \nabla^2 \delta \phi - h(\mathbf{r})]$$

→

$$\frac{\partial \delta \phi}{\partial t} = \frac{\phi_c^2}{\xi} \nabla^2 [a(T - T_c) \delta \phi - \kappa_s \nabla^2 \delta \phi - h(\mathbf{r})]$$

page 164, eq.(8.142)

$$S_d(\mathbf{k}, t) = \frac{k_B T}{a(T - T_c) + \phi_c \kappa_s \mathbf{k}^2} \exp[-\alpha \mathbf{k} t]$$

→

$$S_d(\mathbf{k}, t) = \frac{k_B T}{a(T - T_c) + \kappa_s \mathbf{k}^2} \exp[-\alpha \mathbf{k} t]$$

page 164, eq.(8.143)

$$\alpha_{\mathbf{k}} = \frac{\phi_c \mathbf{k}^2}{\xi} [a(T - T_c) + \phi_c \kappa_s \mathbf{k}^2]$$

→

$$\alpha_{\mathbf{k}} = \frac{\phi_c^2 \mathbf{k}^2}{\xi} [a(T - T_c) + \kappa_s \mathbf{k}^2]$$

page 164, eq.(8.145)

$$A = \int_0^h dx \frac{K_e}{2} \left( \frac{\partial u}{\partial x} \right)^2 - [u(h) - u(0)] w$$

→

$$A = \int_0^h dx \frac{K_e}{2} \left( \frac{\partial u}{\partial x} \right)^2 \pm [u(h) - u(0)] w$$

page 164, eq.(8.146)

$$\Phi = \frac{1}{2} \int_0^h dx \frac{\dot{u}^2}{2\kappa}$$

→

$$\Phi = \frac{1}{2} \int_0^h dx \frac{\dot{u}^2}{\kappa}$$

page 196, problem (9.7)

$d = 1\text{nm}$  in water →  $d = 5\text{nm}$  in water

**page 199, 3 lines below eq.(10.8)**

*Delete the following last sentence of the paragraph "The pK of acid is less than 7 and the pK of base is larger than 7."*

*This is completely my mistake. I may add the following in the text.*

*The dissociation of base BOH*



*is described by*

$$\log_{10} \frac{1 - \alpha}{\alpha} = \text{pK}_{\text{BOH}} - \text{pOH} = \text{pK}_{\text{BOH}} - 14 + \text{pH} \quad (2)$$

**page 221, problem (10.1)**

*pK=9.3 for NH<sub>4</sub>OH → pK=4.7 for NH<sub>4</sub>OH*

**page 221, problem (10.4)**

*by eq.(10.30) → by eq.(10.27)*

**page 235, line 2**

*(see eq.(5.11)) → (see eqs.(5.11) and (5.23))*

**page 246, Fig.E.1**

*The label of the y-axis:  $\langle F_j(t) \rangle_{x+\delta x} \rightarrow \langle F_{\underline{i}}(t) \rangle_{x+\delta x}$*