Quantum Chromodynamics on the Lattice

Thanks to our readers (special thanks to Meinulf Göckeler!) we list here those misprints and errors, that are important to be corrected. (We do not list trivial typos.)

Chapter 3

p 49: Eq. (3.32) should read

$$U_{\mu_1}(n_0 + \hat{\mu}_0)' = \Omega(n_0 + \hat{\mu}_0)\, U_{\mu_1}(n_0 + \hat{\mu}_0) \; .$$

p 62: Eq. (3.72) should read

$$\sigma = -\frac{1}{a^2} \ln\left(\frac{\beta}{18}\right) + \mathcal{O}(\beta) \; .$$

Chapter 4

p 81: In the 2nd line after (4.23) the inline expressions should read

$a = x_0 + \mathrm{i}x_e$ and $b = x_2 + \mathrm{i}x_1$

p 83: Comment to (4.30): If you want to stay near the unit element you do not need r_0 but just use $x_0 = \sqrt{1-\varepsilon^2}$. If one allows negative x_0 the $SU(2)$ matrix for small ε is close to the negative unit element and the $SU(3)$ matrix diagonal elements can be 1 or -1. Although that may be helpful in sampling the configuration space, it does not allow to tune the acceptance rate arbitrarily close to 1 by decreasing ε.

Chapter 5

p 117: The last sentence of the 2nd paragraph there was a "non' too much, correct it is

Again (5.64) excludes back-tracking loops.

Chapter 6

p 143: The first line of (6.50) should read

$$V_\mu(n) = (1-\alpha)\, U_\mu(n) + \frac{\alpha}{6} \sum_{\nu \neq \mu} C_{\mu\nu}(n)$$

Chapter 7

p 159: Eq. (7.13) should read

$$\psi' = \mathrm{e}^{\mathrm{i}\,\alpha_i T_i} \psi \ , \quad \overline{\psi}' = \overline{\psi}\, \mathrm{e}^{-\mathrm{i}\,\alpha_i T_i}$$

p 159: Eq. (7.15) should read

$$\psi' = \mathrm{e}^{\mathrm{i}\,\alpha_i \gamma_5 T_i}\, \psi \ , \quad \overline{\psi}' = \overline{\psi}\, \mathrm{e}^{\mathrm{i}\,\alpha_i \gamma_5 T_i}$$

p 178: Above (7.82) the reference to Eq. (7.29) should be to (7.48)

p 180: Eq. (7.89) should read

$$c_0 = \frac{1}{N} \sum_{k=0}^{N-1} r(x_k) \ , \quad c_{n>0} = \frac{2}{N} \sum_{k=0}^{N-1} r(x_k)\, T_n(x_k) \ .$$
$$\text{where} \quad x_k = \cos\left(\left(k + \frac{1}{2} \right) \frac{\pi}{N} \right) \ .$$

p 183: Ref. 7 correctly is

L. H. Karsten, Phy. Lett. B **104**, 315 (1981)

Chapter 8

p 187: In Eq. (8.7) the $|\det[A]|$ *should read* $\det[A]$

p 198: Replace eqns, (8,42) and (8.43) (and the text) by:

The resulting force is a linear combination of the T_j and therefore traceless and hermitian,

$$-\frac{\beta}{6}\sum_{i=1}^{8} T_i \operatorname{tr}\left[\mathrm{i}\, T_i \left(U\,A - A^\dagger\,U^\dagger\right)\right] \ .$$

Actually, this is just the traceless part of $\mathrm{i}\,(U\,A - A^\dagger\,U^\dagger)$ and may be written as

$$-\frac{\beta}{12}\,\mathrm{i}\,\left[\left(U\,A - A^\dagger\,U^\dagger\right) - \operatorname{tr}\left(U\,A - A^\dagger\,U^\dagger\right)/3\right] \ .$$

We have used the identity

$$\sum_j T_j \operatorname{tr}\left[T_j \sum_k c_k T_k\right] = \frac{1}{2}\sum_j c_j T_j \ .$$

The trace projects out the contribution of T_j (introducing a factor of 1/2) and the sum reconstructs the expression. If the argument has a non-vanishing trace, this has to be accounted for as shown.

p 193: The footenote should read

For notational convenience we use $Q(n\varepsilon) \equiv Q_n$ and $P(n\varepsilon) \equiv P_n$.

p 193: Eq. (8.24) correctly reads

$$P(\varepsilon - \varepsilon) \ = \ P_0 \ = \ P_1 + \frac{1}{2}\left(\left.\frac{\partial S}{\partial Q}\right|_{Q_1} + \left.\frac{\partial S}{\partial Q}\right|_{Q_0}\right)\varepsilon \ = \ P_0 \ .$$

p 195: In Eq. (8.31) the term $S_G[U] - \phi^\dagger(D\,D^\dagger)^{-1}\phi$ *should read* $S_G[U] + \phi^\dagger(D\,D^\dagger)^{-1}\phi$

p 203: The exponent of the pion mass in (8.58) should be negative: $-z_\pi$

Chapter 10

p 244: Eq. (10.4) should read

$$S_F\left[\psi', \overline{\psi}'\right] \ = \ a^4 \sum_{n\in\Lambda} \overline{\psi}(n)'\mathbb{1}\left(\sum_{\mu=1}^{4} \eta_\mu(n)\,\frac{\psi(n+\hat{\mu})' - \psi(n-\hat{\mu})'}{2\,a} + m\,\psi(n)'\right)$$

p 244: Eq. (10.6) should read

$$S_F[\chi,\overline{\chi}] = a^4 \sum_{n\in\Lambda} \overline{\chi}(n) \left(\sum_{\mu=1}^{4} \eta_\mu(n) \frac{U_\mu(n)\chi(n+\hat{\mu}) - U_\mu^\dagger(n-\hat{\mu})\chi(n-\hat{\mu})}{2\,a} + m\chi(n) \right)$$

p 245: Eq. (10.7) should read

$$\overline{\psi}(n)\,\gamma_5\,\psi(n) = \eta_5(n)\,\overline{\psi}(n)'\,\gamma_5\,\psi(n)' \;,$$

p 252: Eq. (10.37) should begin with

$$S_F^{\mathrm{pf}}[\Phi,\overline{\Phi},U]\ldots$$

p 265: Ref. 13 should read

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Chapter 11

p 275: Eqs. (11.42) - (11.44) should read

$$\sum_{\mu=1}^{4} \frac{1}{a}\big(V_\mu^a(n) - V_\mu^a(n-\hat{\mu})\big) = \frac{1}{2}\overline{\psi}(n)[M,\tau^a]\psi(n) \;, \qquad (11.42)$$

$$\begin{aligned} V_\mu^a(n) \;&=\; \frac{1}{4}\;\; \big(\overline{\psi}(n+\hat{\mu})(\mathbb{1}+\gamma_\mu)U_\mu(n)^\dagger\tau^a\psi(n) \\ &\qquad\qquad - \overline{\psi}(n)(\mathbb{1}-\gamma_\mu)U_\mu(n)\tau^a\psi(n+\hat{\mu})\big) \;. \qquad (11.43) \end{aligned}$$

We can write (11.42) as

$$\Delta_\mu^* V_\mu^a(n) = \tfrac{1}{2}\overline{\psi}(n)[M,\tau^a]\psi(n) \;, \qquad (11.44)$$

where Δ_μ^* is the backward lattice derivative $\Delta_\mu^* f(n) \equiv \big(f(n) - f(n-\hat{\mu})\big)/a$.

Chapter 12

p 315: Eqs. (12.37) should read

$$-\frac{1}{2a}\left(f(a\mu)(\mathbb{1}-\gamma_4)_{\alpha\beta}U_4(n)_{ab}\delta_{n+\hat{4},m} + f(a\mu)^{-1}(\mathbb{1}+\gamma_4)_{\alpha\beta}U_4(n-\hat{4})^\dagger_{ab}\delta_{n-\hat{4},m} \right) \;,$$