Quantum Theory, Groups and Representations: Errata

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The following are errata for the version of the book published by Springer. These may or may not have yet been fixed in versions of the book available from Springer.

Page viii:
To the list of those helpful with suggestions for improving the text, add Alain Bossavit, Lasse Schmieding and John Stronghair.

Page 8:
The first line of the equation at the bottom of the page would more clearly be written as
\[ g_1 \cdot (g_2 \cdot f)(x) = (g_2 \cdot f)(g_1^{-1} \cdot x) \]

Page 64:
In the figure, replace “x” with “X”.

Page 85:
Last equation should be
\[
\Phi\left( \begin{array}{c}
\alpha \\
\beta
\end{array} \right) = \left( \begin{array}{cc}
\text{Re}(\alpha^2 - \beta^2) & \text{Im}(\alpha^2 + \beta^2) \\
-\text{Im}(\alpha^2 - \beta^2) & \text{Re}(\alpha^2 + \beta^2)
\end{array} \right)
\left( \begin{array}{cc}
2\text{Re}(\alpha \beta) \\
2\text{Im}(\alpha \beta)
\end{array} \right)
\left( \begin{array}{c}
2|\alpha|^2 - |\beta|^2
\end{array} \right)
\]

Page 100: The first itemized section should read

· One can check that it satisfies
\[ u_+(Rx) = \Omega u_+(x) \]

where \( R = \Phi(\Omega) \) is the rotation corresponding to an \( SU(2) \) element
\[
\Omega = \left( \begin{array}{cc}
\cos \frac{\theta}{2} & -e^{-i\phi} \sin \frac{\theta}{2} \\
e^{i\phi} \sin \frac{\theta}{2} & \cos \frac{\theta}{2}
\end{array} \right)
\]
$u_+(x)$ is determined by setting it to be $\begin{pmatrix} 1 \\ 0 \end{pmatrix}$ at the North pole, and defining it at other points $x$ on the sphere by acting on it by the element $\Omega$ which, acting on vectors by conjugation (as usual using the identification of vectors and complex matrices), would take the North pole to $x$.

The formula for $u_-(x)$ should be

$$u_-(x) = \frac{1}{\sqrt{2(1+x_3)}} \begin{pmatrix} -(x_1 - ix_2) \\ 1 + x_3 \end{pmatrix} = \begin{pmatrix} -e^{-i\phi} \sin \frac{\theta}{2} \\ \cos \frac{\theta}{2} \end{pmatrix}$$

Page 106:
The first equation on the page should be

$$\begin{pmatrix} e^{i\theta} & 0 \\ 0 & e^{-i\theta} \end{pmatrix} \in SU(2) \rightarrow \begin{pmatrix} \cos 2\theta & \sin 2\theta & 0 \\ -\sin 2\theta & \cos 2\theta & 0 \\ 0 & 0 & 1 \end{pmatrix} \in SO(3)$$

Page 119:
The first matrix equation on the page should be

$$\begin{pmatrix} \frac{\partial}{\partial r} & \frac{\partial}{\partial \theta} & \frac{\partial}{\partial \phi} \\ \frac{\partial}{\partial x_1} & \frac{\partial}{\partial x_2} & \frac{\partial}{\partial x_3} \end{pmatrix} = \begin{pmatrix} \sin \theta \cos \phi & \sin \theta \sin \phi & \cos \theta \\ r \cos \theta \cos \phi & r \cos \theta \sin \phi & -r \sin \theta \\ -r \sin \theta \sin \phi & r \sin \theta \cos \phi & 0 \end{pmatrix} \begin{pmatrix} \frac{\partial}{\partial r_1} \\ \frac{\partial}{\partial r_2} \\ \frac{\partial}{\partial r_3} \end{pmatrix}$$

Page 119:
The last equation in the page should be

$$L_3 = i\rho'(l_3) = i \left( x_2 \frac{\partial}{\partial x_1} - x_1 \frac{\partial}{\partial x_2} \right) = -i \frac{\partial}{\partial \phi}$$

Page 159:
The last equation in the page should be

$$A^T : f \in \mathcal{S}(\mathbf{R}) \rightarrow (A^T)[f] = T[Af] \in \mathbb{C}$$

Page 168:
The reference to equation 4.7 in the middle of the page should be to equation 4.6.

Page 173:
The equation in the middle of the page should be

$$\psi(q_0, 0) = \frac{1}{\sqrt{2\pi}} e^{i\kappa' q_0}$$

Page 176:
The last equation in the page should be

$$\hat{U}(\omega, k) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{+\infty} \left( \frac{1}{\sqrt{2\pi}} e^{-i \frac{m}{2\pi} k^2 t} \right) e^{i\omega t} dt = \delta(\omega - \frac{1}{2m} k^2)$$
Page 177:
The equation above equation 12.12 should be
\[ U_+(t, q_t - q_0) = \lim_{\epsilon \to 0^+} \left( \frac{1}{2\pi} \right)^2 \int_{-\infty}^{+\infty} \int_{-\infty}^{+\infty} \frac{i}{\omega' - \frac{1}{2m} k^2 + i\epsilon} e^{-i\omega't} e^{ik(q_t-q_0)} d\omega' dk \]

Page 177:
After equation 12.16, should be “\( \hat{D} \) is zero”, not “\( \hat{G} \) is zero”.

Page 179:
The equation for \( \hat{U}(\omega, k) \) should be
\[ \hat{U}(\omega, k) = \frac{i}{2\pi} \hat{G}_+(\omega, k) \]

Page 195:
Next to last line, the equation should be \( \omega(v, v') = -\omega(v', v) \)

Page 221:
Equation 16.14 should be
\[ -q \cdot A p = -p \cdot A^T q \]

Page 247:
Second part of equation 19.1 should be
\[ \Gamma'(p_2) = -iP_2 = -\frac{\partial}{\partial q_2} \]

Page 288:
Last two equations should be
\[ q(0) = c_+ + c_- = 2 \text{Re}(c+), ~ p(0) = im\omega(c_+ - c_-) = -2m\omega \text{Im}(c+) \]
\[ c_+ = \frac{1}{2} q(0) - i \frac{1}{2m\omega} p(0) \]

Page 289:
First two equations should be
\[ q(t) = \left( \frac{1}{2} q(0) - i \frac{1}{2m\omega} p(0) \right) e^{i\omega t} + \left( \frac{1}{2} q(0) + i \frac{1}{2m\omega} p(0) \right) e^{-i\omega t} \]
\[ p(t) = \left( \frac{im\omega}{2} q(0) + \frac{1}{2} p(0) \right) e^{i\omega t} + \left( \frac{-im\omega}{2} q(0) - \frac{1}{2} p(0) \right) e^{-i\omega t} \]
Page 356:
Near middle of page, replace $\mathcal{H}_B \otimes \mathcal{F}_d^+$ by $\mathcal{H}_B \otimes \mathcal{F}_1^+$.

Page 600:
Instead of

\[ \mathcal{H}_1 \otimes \mathcal{C} = \mathcal{M}_{j_r}^+ \oplus \mathcal{M}_{j_r}^- \]

read

\[ \mathcal{M} \otimes \mathcal{C} = \mathcal{M}_{j_r}^+ \oplus \mathcal{M}_{j_r}^- \]

Page 601:
First line, replace $\alpha_\mu(p)$ by $\alpha = (\alpha_0(p), \alpha(p))$.

Replace equation 46.22 by

\[ \langle \alpha, \alpha' \rangle = \int_{\mathbb{R}^3} (-\bar{\alpha}_0(p)\alpha'_0(p) + \bar{\alpha}(p) \cdot \alpha'(p))d^3p \]

Replace occurrences of $\mathcal{H}_1^{++}$ and $\mathcal{H}_1^{++}$ with $\mathcal{H}_1'$ and $\mathcal{H}_1''$ respectively.

Page 622:
Last paragraph, replace “$A_R$ and $A_R$” by “$A_L$ and $A_R$”.

Page 642:
Near bottom of page, $su(2)$ should be $su(2)$.