ERRATA

Authors' note: Despite our best efforts, *Quantum Paradoxes* is not free of errors. Below, we correct errors that we found. We will be grateful to readers who bring additional errors to our attention (via Wiley-VCH).

•

Missing dedication, "for Nili/for Babette/and in memory of David Bohm".

On p. 36, interchange A and A' in Fig. 3.6 and in the second line of text under it. Also, "CSHS" (near the end of Sect. 3.4) should be "CHSH".

On p. 57, in Prob. 4.1, the second equation contains an integral with a prefactor $-Qr_c^2/2ch$; the prefactor should be $-Qr_c^2/2cl$.

On p. 68, four lines above the bottom equation, "it depends only on p mod nh/L" should be "in depends only on p mod h/L". In the middle line of the footnote, the expectation value should be $\langle e^{inpL/\hbar}\rangle$.

On p. 74, in Prob. 5.3, replace the first line by "Let Δx be less than or equal to L in the sense that, for some x_0,". In Prob. 5.8, replace "is a multiple of h" with "equals h/n for some positive integer n".

On p. 75, the third line of Prob. 5.13 should have "xy-plane" instead of "xy-axis".

On p. 79, the lowest equation, and the sentence containing it, both have $e^{i2p|\delta L|/\hbar}$ which should be $e^{-i2p|\delta L|/\hbar}$. Two lines below the equation, $e^{i2\langle p\rangle|\delta L|/\hbar}$ should be $e^{-i2\langle p\rangle|\delta L|/\hbar}$. Five lines below the equation, "of roughly $-2\langle p\rangle|\delta L|/T$" should be "of roughly $2\langle p\rangle|\delta L|/T$", i.e. the change in energy is positive.

On p. 81, in the line immediately following Eq. (6.6), "$\delta(p/\hbar)$" should be "$\delta(pL/\hbar)$".

On p. 83, the numerator in Eq. (6.8) should be $\sin(\mu B_z T/2g_0 - \omega T/2g_0)$ (i.e. the argument of the sine should be halved).

On p. 90, the expression for the probability in Prob. 6.11 should be divided by 4 (i.e. "g_0^2" should be "$g_0^2/4$"). Add the following parenthetical sentence at the end of Prob. 6.12: "(When the Hamiltonian H_s of a measured system depends on the time t, we can generalize the definition of E_{mod} according to $e^{-iE_{mod}T/\hbar} = e^{-i\int_0^T dt\ H_s(t)/\hbar}$.)" Add the following parenthetical sentence at the end of Prob. 6.13: "(See also Prob. 6.12.)"

On p. 101, the sentence ending the second paragraph of Sect. 7.4 is not precise. Replace it with, "It does not help if we substitute $p/m + g(t)P_d/m$ for p/m in H_{int}; we merely find again that our measuring device no longer measures velocity."

On p. 102, change "(for T nonzero)" to "(for T nonzero and $M = m = 1$)" in Prob. 7.3; also, the definition of H in Prob. 7.4 should contain "$-g(t)$" instead of "$+g(t)$".

On p. 103, the definition of H in Prob. 7.5 should contain "$-g_1(t)$" instead of "$+g_1(t)$" and "$-\alpha g_2(t)$" instead of "$+\alpha g_2(t)$". In Prob. 7.6, in H replace L_x with L_z.

On p. 114, Prob. 8.1(b) should end "$a \leq 2\Delta x/T^2$" (i.e. double the right side of the inequality); in the second line of Prob. 8.1(c), "$2e^2a^2/3c^2$" should be "$2e^2a^2/3c^3$".

On p. 117, in the first line of Prob. 8.6, replace "velocity $v = dx/dt$" with "position x". Replace "12" with "$12m$" in the definition of H and replace "average velocity $[x(T) - x(0)]/T$" with "average position $x(0) + p(0)T/2m$". In the last line, as well, replace "velocity" with "position".

On p. 118, in Prob. 8.8(a) (top equation on p. 118) the last term in the definition of $\mathbf{\Pi}(\mathbf{x})$ should be $\nabla V/4\pi c$. In Prob. 8.8(b), the middle line in the definition of $\mathcal{L}(\mathbf{x})$: there should not be a factor 1/2 multiplying $(\nabla \times \mathbf{A})^2$. In the next equation, defining $\mathcal{H}(\mathbf{x})$, the factor $1/16\pi$ multiplying $(\nabla \times \mathbf{A})^2$ should be $1/8\pi$. At the bottom of the page, in Prob. 8.10(a), the square root in the equation for $\mathbf{A_k}$ should be $\sqrt{\hbar/2\omega}$.

On p. 119, Prob. 8.10(a), the bracketed term in the definition of $\mathbf{\Pi}(\mathbf{x})$ should be $\left[\mathbf{a}_\mathbf{k}^\dagger e^{-i\mathbf{k}\cdot\mathbf{x}} - \mathbf{a_k} e^{i\mathbf{k}\cdot\mathbf{x}}\right]$, and the last term should be $\nabla V/4\pi c$.

On p. 125, on the next-to-last line, replace "$\lambda = 10^{-16}$" with "$\lambda = 10^{-16}$/sec" and remove "each second" from the preceding line.

On p. 126, just below Eq. (9.9), the use of N conflicts with its use later; so let "N values, with N of order 10^{22}" be simply "some 10^{22} values". Also, in Eq. (9.10) let "$d\mathbf{x}$" be "d^3x".

On p. 133, in Fig. 9.2 and (twice) in its caption, replace "$|\psi_L\rangle$" with '$|\psi_R\rangle$". Also, in the first line of Prob. 9.4 replace "to the initial state Eq. (9.9)" with "to the steel needle considered at the top of p. 127".

On p. 135, the mathematical expression at the end of Prob. 9.7 should be "$[1 + |\langle\psi_N^L|\psi_N^D\rangle|^2]/2$".

On p. 142, the left-hand side of Eq. (10.9) should be $\mathcal{P}(c_j/a, b)$.

On pp. 142-144, and on p. 147 (in Probs. 10.6-7), all citations of Eqs. (10.10), (10.11), (10.12) and (10.13) should cite, respectively, Eqs. (10.9), (10.10), (10.11) and (10.12).

On p. 156, the last line of the big paragraph including Eqs. (11.10-11) should begin, "Assuming we can make..." instead of "Since we can make...". In the bottom paragraph, the beginning of the sentence "We can express either $|NR\rangle$ or $|R\rangle$ as a superposition of a fermion and a boson..." should be changed to "We can express either $|NR\rangle$ or $|R\rangle$ as a fermion or as a boson...".

On p. 163, five lines from the bottom: $|\Psi_i(\mathbf{R}[t])\rangle$ and $|\Psi_i(\mathbf{R}'[t])\rangle$ are missing the subscript i.

On p. 183, at the end of the second paragraph of Sect. 13.3, there should be a reference to Y. Aharonov et al., *Phys. Rev. Lett.* **73** (1994) 918 (and the list of references on pp. 190-191 should list this reference).

On p. 187, two lines above Eq. (13.15), the reference number is missing: "[?]" should be "[6]".

On p. 207, Prob. 14.3(b), the word "operator" is missing from the second sentence, and a hint should be added: "Show that no instantaneous operator measurement can verify the state without changing it. (Hint: two of the observers could get together.)" Also on this page, in the first sentence of Prob. 14.4(c), the reference to "Eq. (14.4)" should be to "Eq. (14.14)".

On p. 208, Prob. 14.8(a), the last sentence should be "Show that Alice and Bob can eliminate the phases $e^{\pm i\varphi}$ by applying local unitary transformations of the form $e^{\pm i\varphi S_z/\hbar}$ such that $|0,0\rangle$ is unchanged."

On p. 223, the last two sentences in Prob. 15.6 should be changed to read as follows: "Does this statement derive from (nonrelativistic) quantum mechanics? Show that the statement actually implies that Alice's measurement yields $|\Psi_0(0)| = 0$ with the same probability whether or not Bob looks for the particle a distance L away."

On p. 246, Prob. 16.9(b), "probablility" should be "probability".

On p. 247, in Prob. 16.15(a), replace "yields its position along the z-axis" with "along the z-axis yields its position". In Prob. 16.15(b), replace "Derive $\sqrt{N}D^2\Delta E \gg 2q$ as the condition for a weak measurement in this case, assuming $\langle v_z\rangle_w > c$" with "Assuming $D > ct$ and $\langle v_z\rangle_w = 2c$, derive $\sqrt{N}D^2\Delta E \gg 4q$ as a sufficient condition for the weak measurement". In Prob. 16.15(c), replace "$\hbar c > 4q^2/N$" with "$\hbar c > 12\pi q^2/N$".

On p. 258, replace

$$\frac{\partial}{\partial t^2}$$

with

$$\frac{\partial^2}{\partial t^2}$$

in Eq. (17.10). Also on p. 258, in the second line after Eq. (17.10), $\mathbf{B} = \nabla\mathbf{A}$ should be $\mathbf{B} = \nabla \times \mathbf{A}$.

On p. 262, the equation displayed in Prob. 17.7(a) should be

$$a(t) = a_0(t) - i\frac{\lambda}{\sqrt{2\hbar\omega}}\int_{-\infty}^{t} f(t')e^{-i\omega(t-t')}dt' \quad ,$$

i.e. including a factor $\sqrt{2\hbar\omega}$ instead of $\sqrt{\hbar/2\omega}$. In Prob. 17.8, replace "Compute" with "For $t > 0$, compute". In Prob. 17.9, the notation is not consistent with the notation elsewhere in the book (mainly Sects. 8.4 and 17.5) so replace "$[A_i^{(\mathbf{k})}, \Pi_j^{(\mathbf{k}')}] = i\hbar(\delta_{ij} - k_i k_j/k^2)\delta^{\mathbf{k},\mathbf{k}'}$" with "$[A_{\mathbf{k},i}, \Pi_{\mathbf{k}',j}] = i\hbar(\delta_{ij} - k_i k_j/k^2)\delta_{\mathbf{k},\mathbf{k}'}$" and replace $\mathbf{A}^{(\mathbf{k})}$ with $\mathbf{A}_\mathbf{k}$ everywhere in the rest of Prob. 17.9 (four replacements). In Prob. 17.11, replace the phrase "on the PPS ensemble of Sect. 17.1," with "on the PPS ensemble of Sect. 17.1 (initial state $|\Psi_{in}\rangle$ and final state in which D_- and D_+ click together),". Replace "non-overlapping paths" with "non-overlapping paths $|no\rangle_-$ and $|no\rangle_+$".

Sections 18.5-6, pp. 276-280, need revision in light of more recent research, but the revision cannot be included in this list of errata. We plan to include it in a new edition of the book. Until the new edition appears, the following essay is relevant: D. Rohrlich, "Three attempts at two axioms for quantum mechanics", in *Probability in Physics*, Y. Ben-Menahem and M. Hemmo eds. (Berlin: Springer), 2011, in press.

On p. 279, in the line just above Eq. (18.17), "0of" should be "of".

On p. 282, replace

$$\mathbf{n}\cdot\sigma = \begin{pmatrix} \cos\theta & e^{-i\phi}\sin\theta \\ e^{i\phi}\sin\theta & -\cos\theta \end{pmatrix} \quad ,$$

with

$$\mathbf{n}\cdot\sigma = \begin{pmatrix} \cos\theta & e^{-i\phi}\sin\theta \\ e^{i\phi}\sin\theta & -\cos\theta \end{pmatrix} \quad .$$

and remove the words "each time choosing the unit vector $\mathbf{n}$ at random.".

On p. 285, the displayed equation in Prob. 18.8 (a) should be

$$2^{N/2}\langle\Psi_{fin}|U_d U|\Psi_{in}\rangle = e^{-(i/\hbar)g_0 P_d \cos P}$$

On p. 286, Ref. [7] is eprint arXiv:quant-ph/0507269, and the second work in Ref. [12] is now H. Buhrman and S. Massar, *Phys. Rev.* **A72** (2005) 052103.

On p. 289, in the Index entry for "weak values": following the subheading "complex," the page numbers "237, 256" should replace "256".

Finally, the reader is warned that our use of $\mu B\hbar$ for the interaction of a magnetic moment with a magnetic field (e.g. in the first equation on p. 82) contradicts the usual convention that μ already contains $\hbar$.