Additions and Corrections
to
Feynman and Hibbs

http://www.oberlin.edu/physics/dstyer/FeynmanHibbs/errors.pdf

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The following errors or omissions appear in *Quantum Mechanics and Path Integrals* by Richard P. Feynman and Albert R. Hibbs (McGraw-Hill, New York, 1965). Please send additions to the address above. My thanks to the following for pointing out errors that I had missed: Daniel Keren of the University of Haifa, Israel, Jozef Hanc of the Technical University of Košice, Slovakia, Jürgen Struckmeier of the Gesellschaft für Schwerionenforschung in Darmstadt, Germany, and especially Tim Hatamian of Mathematicus Laboratories, Sound Beach, New York.

Front Cover: In at least one printing, the title of the book is incorrectly given on the front cover as "Quantum Mechanics and Integrals".

Throughout: The book is often careless in distinguishing between "probability," "relative (i.e. unnormalized) probability," and "probability density". Similarly for amplitude.

Chapter 1: The Fundamental Concepts of Quantum Mechanics

Page 3, six lines above bottom: "This particular experiment has never been done in just this way." This statement was true at the date of publication (1965). The remarkable experimental progress since that date can be glimpsed through the following publications:

Claus Jönsson, "Elektroneninterferenzen an mehreren künstlich hergestellten Feinspalten" *Zeitschrift für Physik* **161** (1961) 454–474. Translated as "Electron diffraction at multiple slits," *American Journal of Physics* **42** (1974) 3–11. (Wave-like properties of electrons.)

A. Tonomura, J. Endo, T. Matsuda, T. Kawasaki, and H. Ezawa, "Demonstration of single-electron buildup of an interference pattern," *American Journal of Physics* **57** (1989) 117–120. (Simultaneous wave-like and particle-like properties of electrons.)

Movies of the above experiments are at http://www.hqrd.hitachi.co.jp/em/doubleslit.cfm.

R. Gähler and A. Zeilinger, "Wave-optical experiments with very cold neutrons," *American Journal of Physics* **59** (1991) 316–324. (Wave-like properties of neutrons.)

Olaf Nairz, Markus Arndt, and Anton Zeilinger, "Quantum interference experiments with large molecules," *American Journal of Physics* **71** (2003) 319–325. (Wave-like properties of C_{60}.)

Michael S. Chapman, David E. Pritchard, *et al.*, "Photon scattering from atoms in an atom interferometer: Coherence lost and regained," *Physical Review Letters* **75** (1995) 3783–3787. (Observing atoms as they pass through the double slits, as on page 7.)

E. Buks, R. Schuster, M. Heiblum, D. Mahalu, and V. Umansky, "Dephasing in electron interference by a 'which-path' detector," *Nature* **391** (1998) 871–874. (More on observing electrons, as or after they pass through the double slits.)

Paul R. Berman, editor, *Atom Interferometry* (Academic Press, San Diego, 1997).

Helmut Rauch and Samuel A. Werner, *Neutron Interferometry: Lessons in Experimental Quantum Mechanics* (Oxford University Press, New York, 2000).

Page 4, six lines above figure 1-2: "As a consequence..." should start a new paragraph.

Page 5, figure 1-3: Inaccurate figure: (1) The wavelength should be the same on both sides of the screen with two holes. (2) The drawing shows only a tiny interference region (where the two sets of arcs overlap) at the observation plane, whereas the graph shows a large interference region. (3) The caption should make clear that to the left of the screen with two holes, each arc represents a wave crest, whereas to the right of that screen, each arc represents where a crest would be if only one hole were open. (4) Planes should be labeled A, B, and C, as in figure 1-1.

Page 7, figure 1-4: Right-hand plane should be labeled C.

Page 9, footnote: The current value of $\hbar$ is $1.054\,571\,596 \times 10^{-27}$ erg·sec.

Page 16, equation (1-11): In two places, ϕ should be ϕ_{AB}.

Page 21, figure 1-10: Right-most two planes should be labeled B and C.

Pages 22–23: The desired "statistical mechanics of [the] amplifying apparatus" is being worked out under the name of *decoherence*. The vast technical literature of this field is best approached through:

W.H. Zurek, "Decoherence and the transition from quantum to classical," *Physics Today* **44** (10), (October 1991) 36–44.

Serge Haroche, "Entanglement, decoherence and the quantum/classical boundary," *Physics Today* **51** (7), (July 1998) 36–42.

Page 24, line 16: Change "...other branches of physics" to "...other branches of physics (Chaps. 10–12)."

Summary: 6 errors.

Chapter 2: The Quantum-mechanical Law of Motion

Page 26, line 13: The entity called the kernel here is often called the "propagator" or the "Green's function". (See, for example, L.S. Schulman, *Techniques and Applications of Path Integration* (Wiley, New York, 1981) page 3.)

Page 26, two lines above equation (2-2): The phrase "moving in a potential $V(x,t)$" should be "moving in a potential energy $V(x,t)$".

Page 27, two lines above problem 2-1: The phrase "both the form of the integral and the value of the extremum are important" should read "both. . . are again important".

Page 28, problem 2-2: *Hint:* This problem can be solved directly, but it is easier if you first integrate by parts to prove the theorem that, for a harmonic oscillator,

$$S_{cl} = \frac{m}{2}\left[x(t)\dot{x}(t)\right]_{t_a}^{t_b}.$$

Page 28, first line: Missing parenthesis. Should be $L = (m/2)(\dot{x}^2 - \omega^2 x^2)$.

Page 28, equation (2-9): Missing brackets. Should be

$$S_{cl} = \frac{m\omega}{2\sin\omega T}\left[(x_a^2 + x_b^2)\cos\omega T - 2x_a x_b\right].$$

Page 28, problem 2-3: Sign error. The lagrangian is $L = m\dot{x}^2/2 + Fx$.

Page 28, answer to problem 2-3:

$$S_{cl} = \frac{m(x_b - x_a)^2}{2T} + \frac{x_a + x_b}{2}FT - \frac{F^2T^3}{24\,m}$$

where $T = t_b - t_a$.

Page 28, problem 2-4, equation (2-11): Sign error. The correct result is that the momentum at the initial point x_a is

$$\left(\frac{\partial L}{\partial \dot{x}}\right)_{x=x_a} = -\frac{\partial S_{cl}}{\partial x_a},$$

while the momentum at the final point x_b is

$$\left(\frac{\partial L}{\partial \dot{x}}\right)_{x=x_b} = +\frac{\partial S_{cl}}{\partial x_b}.$$

Page 28, problem 2-5: Sign errors. The energy is

$$E = \dot{x}p - L.$$

The correct result is that the energy at the initial point x_a is

$$\frac{\partial S_{cl}}{\partial t_a},$$

while the energy at the final point x_b is

$$-\frac{\partial S_{cl}}{\partial t_b}.$$

Page 28, fifth line of section 2-2: "They contribute equal amounts to the total amplitude" should be "They contribute equal magnitudes. . . ".

Page 29, three lines above bottom: The phrase "at phase S_{cl}" should be "at phase $S_{cl}/\hbar$".

Page 30, figure 2-1: The horizontal axis label X should be x.

Page 32, figure 2-2: On the horizontal axis, $x_i + 1$ should be x_{i+1}.

Page 32: Note that we don't really sum over all paths, but over all paths moving forward in time.

Page 33, equation (2-21): Note that the A defined here is a complex quantity with phase $\pi/4$ and with the dimensions of length.

Page 33: Suggested additional problem: In the Riemann integral Eq. (2-18), the normalizing factor h approaches zero as we pass to increasingly representative subsets. Show that this is *not* true for the path integral normalizing factor A^{-N}. (For the path integral, we rely on interference to produce convergence.)

Page 33, figure 2-3: In order to be typical, the curve shown should slope sometimes to the left as well as to the right and vertically.

Page 34, equation (2-25): Caution! In contrast to the ordinary integral, where the differential dx carries the dimensions of [length], the path integral differential $\mathcal{D}x(t)$ carries the dimensions of 1/[length]. (In s-dimensional configuration space, the kernel $K(b, a)$ has the dimensions of $1/[\text{length}]^s$.)

Page 35, figure 2-4, caption: The phrase "traveling in two dimensions" should be "traveling in one dimension".

Page 36, seventh line: The result $\exp[(imc^2/\hbar)(t_a - t_b)]$ is more clearly expressed as $\exp\{-(i/\hbar)mc^2(t_b - t_a)\}$.

Summary: 12 errors.

Chapter 3: Developing the Concepts with Special Examples

Page 43: Within the arguments of the five "exp" functions in the first four equations, $m/2i\hbar$ should be $im/2\hbar$. For example, equation (3-5) should have

$$\exp\left\{\frac{im}{2\hbar\epsilon}(x_3 - x_2)^2\right\}.$$

Page 43, problem 3-1: Note also that the expression on the right-hand side has the wrong dimensions for a probability.

Page 44, figure 3-1 and sentence below equation (3-7): The function sketched is not $\Re e\{K\}$ versus x but $\Re e\{\sqrt{i}K\}$ versus x. The argument in the text is correct despite this error in phase.

Page 45, four lines above bottom, and page 46, figure 3-2: The function sketched is not $\Re e\{K\}$ versus t but $\Re e\{\sqrt{i}K\}$ versus t. The graph is qualitatively incorrect for small times: It should diverge at the origin and oscillate very rapidly there — it does not intersect the axis as shown. The argument in the text involves the regime where t is large, so it is correct despite these errors.

Page 46, first line: The word "increase" should be "decrease".

Page 46, equation (3-16) and one line below equation (3-16): In two places, $\partial S_{cl}/\partial t$ should be $-\partial S_{cl}/\partial t$.

Page 47, rule 2: Note that without the two previous corrections and the correction of problem 2-5 on page 28, it would not make sense to have the minus sign in $e^{-i\omega t}$.

Page 47, fourth line of section 3-2: The phrase "Suppose a particle is liberated..." should read "Suppose a free particle is liberated...".

Pages 47–56: In sections 3-2 and 3-3 the variable x means distance from x_0, not distance from the origin. (The single exception is the first line of the second paragraph of section 3-2, "...the origin $x = 0$".) That is,

$$x_{\text{sections 3-2 and 3-3}} = x_{\text{rest of book}} - x_0.$$

Page 47, seven lines above bottom: The expression $t + \tau$ should be $T + \tau$.

Page 49, equation (3-20): The argument of the first "exp" function is missing a τ in the denominator. It should be

$$\left\{ \exp\left[\frac{im(x-y)^2}{2\hbar\tau} \right] \right\}.$$

Page 50, equation (3-25): Missing brackets. The expression

$$\exp -\frac{\beta^2}{4\alpha} \quad \text{should be} \quad \exp\left\{ -\frac{\beta^2}{4\alpha} \right\}.$$

Page 51, equation (3-27): In the upper right side of the second line of the equation, the expression $(x - v_0\tau)$ should be $(x - v_0\tau)^2$.

Pages 50 and 51, equations (3-26) and (3-27): When I use this wave function (for example, in deriving equation (3-37)), I like to organize it somewhat by defining the complex quantity

$$\alpha = \frac{2\hbar}{m}\left(\frac{1}{\tau} + \frac{1}{T} + i\frac{\hbar}{mb^2} \right)$$

(with the dimensions of [speed]^2) and then writing equation (3-27) as

$$\psi(x) = \frac{1}{\sqrt{i\pi T\tau\alpha}} \exp\left[\frac{im}{2\hbar}\left(v_0^2 T + \frac{x^2}{\tau}\right) - \frac{i(x - v_0\tau)^2}{\alpha\tau^2}\right].$$

Page 51, equation (3-29): In the first line of the equation, the expression

$$\left(1 + \frac{\tau}{T}\right) \quad \text{should be} \quad \left(1 + \frac{\tau}{T}\right)^2.$$

Page 53, equation (3-33): The right-hand side is not a probability because it has the dimensions of 1/[length]. This reflects the book's casual handling of probability versus relative probability versus probability density.

Page 53, equation (3-36): This integral equals $2\pi\delta(a)$.

Page 54, first line: The reference to equation (3-26) should be to (3-27).

Page 54, equation (3-37): In the denominator,

$$\sqrt{1 + \tau\hbar/2mb^2} \quad \text{should be} \quad \sqrt{1 + i\tau\hbar/mb^2}.$$

Also, the denominator of the right-hand part of the "exp" argument is written in a correct but needlessly complicated way. It is simpler to use

$$2\hbar^2\tau^2(im/\hbar\tau - 1/b^2).$$

Page 54, five lines above bottom: "slit with" should be "slit width".

Page 55, figure 3-6: There's been yet another shift in the x axis such that the new origin is at τv_0. All three of these figures have small inaccuracies. (Not to mention that they use an unnormalized probability density and hence give the wrong impression.)

Page 56: In case you've forgotten, the Fresnel integrals are

$$C(u) \equiv \int_0^u \cos(\pi y^2/2)\,dy \quad \text{and} \quad S(u) \equiv \int_0^u \sin(\pi y^2/2)\,dy.$$

Page 56, equation (3-40): Missing brackets. Equation should be

$$P(x)\,dx = \frac{m}{2\pi\hbar(\tau + T)}\left[\frac{1}{2}[C(u_1) - C(u_2)]^2 + \frac{1}{2}[S(u_1) - S(u_2)]^2\right] dx$$

Page 56, equation (3-41): Two missing square roots. For both u_1 and u_2, the denominator

$$(\pi\hbar\tau/m)(1 + \tau/T) \quad \text{should be} \quad \sqrt{(\pi\hbar\tau/m)(1 + \tau/T)}.$$

Page 56, three lines below equation (3-41): The reference to equation (2-6) should be to (3-6).

Page 58, equation (3-45): The expression

$$\int_{t_a}^{t_b} L(\dot{x}, x, t) \quad \text{should be} \quad \int_{t_a}^{t_b} L(\dot{x}, x, t)\, dt.$$

Page 60, equation (3-51): Wrong sequence. The function $F(t_a, t_b)$ should be $F(t_b, t_a)$.

Page 62, fourth line of section 3-6: The expression $e^{-iS_{cl}/\hbar}$ should be $e^{+iS_{cl}/\hbar}$.

Page 63, one line above (3-60): The reference to section 3-7 should be to section 3-11.

Page 63, equation (3-60): This expression is correct in magnitude, but the phase (i.e. the branch of $i^{1/2}$) is ambiguous. The correct expression (see N.S. Thorber and E.F. Taylor, "Propagator for the simple harmonic oscillator," *American Journal of Physics* **66** (1998) 1022–1024) is

$$e^{-i\theta} \left(\frac{m\omega}{2\pi\hbar\,|\sin\omega T|} \right)^{1/2}$$

where

$$\theta = \frac{\pi}{4}[1 + 2\,\mathrm{trunc}(\omega T/\pi)].$$

Here "trunc" denotes the "truncation" function: $\mathrm{trunc}(x)$ is the largest integer less than or equal to x.

Page 64, equation (3-62): The term in square brackets is dimensionally incorrect. The expression

$$\frac{fT^3}{24} \quad \text{should be} \quad \frac{f^2T^3}{24\,m}.$$

(See the entry "Page 28, answer to problem 2-3" above.)

Page 64, equation (3-64): In the argument to "exp", the factor

$$\frac{im\omega}{2\hbar} \quad \text{should be} \quad \frac{im}{2\hbar}.$$

Page 64, problem 3-10: *Hint:* The classical motion is of course a spiral with an axis in the z-direction. A useful intermediate result is that, if the equation of the axis is (x_C, y_C, z), then the classical action is

$$S_{cl} = \frac{m}{2}\frac{(z_b - z_a)^2}{T} + \frac{m\omega}{2}[x_C(y_b - y_a) - y_C(x_b - x_a)].$$

Page 64, problem 3-11: *Hint I:* This problem is much easier if you first prove the theorem that, for this forced harmonic oscillator,

$$S_{cl} = \frac{m}{2}\,[x(t)\dot{x}(t)]_{t_a}^{t_b} + \frac{1}{2}\int_{t_a}^{t_b} f(t)x(t)\, dt.$$

Hint II: The Green's function solution to the classical problem is

$$x(t) = A\sin\omega t + B\cos\omega t + \frac{1}{m\omega}\int_{t_a}^{t} f(s)\sin\omega(t - s)\, ds.$$

Page 64: Suggested additional problem: Show that equation (3-66) reduces to equation (3-62) in the limit that $\omega \to 0$.

Page 67, equation (3-73): On the second line, $\mathcal{D}\mathbf{x}(t)$ should be $\mathcal{D}^3\mathbf{x}(t)$ and $\mathcal{D}\mathbf{X}(t)$ should be $\mathcal{D}^3\mathbf{X}(t)$.

Page 68, equation (3-75): The second + sign should be a − sign. That is,

$$+\frac{i}{\hbar}\int_{t_a}^{t_b} V(x,X,t)\,dt \quad \text{should be} \quad -\frac{i}{\hbar}\int_{t_a}^{t_b} V(x,X,t)\,dt.$$

Page 68, equation (3-77): The + sign should be a − sign. That is,

$$+V(x,X,t) \quad \text{should be} \quad -V(x,X,t).$$

Also, the expression "$]\})dt$" should be "$]dt\})$".

Pages 69–71: Most of the expressions in section 3-10 are written in boldface, suggesting that they apply in three dimensions, yet the main results, equations (3-81) and (3-82), apply only in one dimension. I think the simplest resolution of this problem is to turn all the boldface $\mathbf{x}$s and $\mathbf{X}$s into regular xs and Xs.

Page 70, equation (3-78): The right-most + sign should be a − sign. That is,

$$+\omega^2\mathbf{X}^2 \quad \text{should be} \quad -\omega^2\mathbf{X}^2.$$

Page 70, equation (3-81): Sign error. Within the exponent the expression

$$\left\{\frac{i}{\hbar m\omega\sin\omega T}\cdots\right\} \quad \text{should be} \quad \left\{\frac{-i}{\hbar m\omega\sin\omega T}\cdots\right\}.$$

Pages 70 and 71, equations (3-81) and (3-82): In four places, $m\omega$ should be $M\omega$.

Page 71, equation (3-82): Wrong subscript. In the middle line,

$$\sin\omega(t_a - t) \quad \text{should be} \quad \sin\omega(t_b - t).$$

Page 72, equation (3-88): The right-hand side is missing an overall factor of $1/A$. The sum in the exponent is missing a factor of $T/2$. That is,

$$J \quad \text{should be} \quad J/A,$$

while

$$\sum_{n=1}^{N}\cdots \quad \text{should be} \quad \frac{T}{2}\sum_{n=1}^{N}\cdots.$$

Page 73, equation (3-89): Two errors. On the left-hand side

$$\frac{im}{2\hbar} \quad \text{should be} \quad \frac{T}{2}\frac{im}{2\hbar}.$$

On the right-hand side

$$\left(\frac{n^2\pi^2}{T^2} - \omega^2\right)^{-1/2} \quad \text{should be} \quad \left(\frac{2}{\epsilon T}\right)^{1/2}\left(\frac{n^2\pi^2}{T^2} - \omega^2\right)^{-1/2}.$$

Page 73, equation (3-94): This equation must be dimensionless. It should be

$$J\left(\frac{\pi}{\sqrt{2}}\right)\left(\frac{2T}{\pi^2\epsilon}\right)^{(N+1)/2}\left(\prod_{n=1}^{N}\frac{1}{n}\right) \to 1.$$

Summary: 47 errors.

Chapter 4: The Schrödinger Description of Quantum Mechanics

Page 77, equation (4-4): Two errors. The argument of the first "exp" function is missing a 2; it should be

$$\exp\left[\frac{i}{\hbar}\frac{m(x-y)^2}{2\epsilon}\right].$$

The argument to the second "exp" function contains an extra ϵ; it should be

$$\exp\left[-\frac{i}{\hbar}\epsilon\, V\left(\frac{x+y}{2}, t\right)\right].$$

Page 77, equation (4-5): The argument of the second exponential is wrong due to incorrect parentheses; the argument should be

$$-(i\epsilon/\hbar)V(x+\eta/2, t).$$

Page 78, first line: The expression $\epsilon V[(x+\eta)/2, t]$ should be $\epsilon V(x+\eta/2, t)$.

Page 84, problem 4-7: The qualifier $t_1 < t_3$ should be $t_2 > t_3 > t_1$. If, for example, $t_3 > t_2 > t_1$, then it is still true that $t_1 < t_3$, but the proper result for $K^*(3,1)$ in this case is

$$\int K^*(2,1)K^*(3,2)\,dx_2 = K^*(3,1).$$

Page 86, three lines below equation (4-46): "Later we shall learn…" should be "In section 5-2 we shall learn…".

Page 86, three lines above problem 4-8: $e^{iE_1t/\hbar}$ should be $e^{-(i/\hbar)E_1t}$.

Page 86, one line above problem 4-8: $e^{iE_2t/\hbar}$ should be $e^{-(i/\hbar)E_2t}$.

Page 87, equation (4-56): On rightmost side, below the summation symbol $n-1$ should be $n=1$, and in the exponent E should be E_n. That is

$$\sum_{n-1}^{\infty} a_n e^{+(i/\hbar)E(t_1-t_2)}\phi_n(x) \quad \text{should be} \quad \sum_{n=1}^{\infty} a_n e^{+(i/\hbar)E_n(t_1-t_2)}\phi_n(x).$$

Page 88, equation (4-60): In the subscript, scalar p should be vector $\mathbf{p}$. That is, ϕ_p should be $\phi_{\mathbf{p}}$.

Page 88, equation (4-61): Subscripts as above: $\phi_p^* \phi_{p'}$ should be $\phi_{\mathbf{p}}^* \phi_{\mathbf{p}'}$.

Page 88, equation (4-62): In the exponent, $-(i/\hbar)$ should be $+(i/\hbar)$.

Page 88, equation (4-63): The bar over the summation symbol should not be there.

Page 88, equation (4-64): In the first exponential, the sign should change and the symbols $\mathbf{p}$, $\mathbf{r}_1$, and $\mathbf{r}_2$ should be bold to read

$$e^{+(i/\hbar)\mathbf{p}\cdot(\mathbf{r}_2-\mathbf{r}_1)}.$$

Page 91, figure 4-1: The wave functions graphed for $n = 2$ and $n = 3$ are the negative of what they should be.

Page 91, equation (4-69):

$$\sum_{n=0}^{\infty} \quad \text{should be} \quad \sum_{n=1}^{\infty} \quad \text{and} \quad \int_{\infty}^{0} \quad \text{should be} \quad \int_{0}^{\infty}.$$

Page 91, bottom line: The expression $\sqrt{2L}\sin kx$ should be $\sqrt{2/L}\sin kx$.

Summary: 23 errors.

Chapter 5: Measurements and Operators

Pages 97–98: The argument leading from the probability density (5-4) to the wave function (5-5) is suggestive, not definitive. Any argument of this sort cannot uncover the phase of the wave function. This phase might be a physically insignificant constant $e^{i\theta}$, in which case ignoring it would be perfectly permissible. But the phase factor might be a function of momentum $e^{i\theta(p)}$, which does not change the probability density for momentum, $P(p)$, but which can dramatically change the probability density for position, $P(x)$.

Pages 98–99, figures 5-1 and 5-2: The function plotted with the solid line is $\Re e\{\sqrt{i}K\}$.

Page 101, equation (5-9): This expression should not have the integral from t_1 to t_2 nor the corresponding differential dt.

Page 101, equation (5-10): This expression should not have the integral from t_1 to t_2 nor the corresponding differential dt_1.

Page 102, figure 5-3: At five places, P should be p.

Page 102, equation (5-12): For the second exponential in the first line,

$$e^{(i\hbar)\mathbf{p}_1\cdot\mathbf{R}_1} \quad \text{should be} \quad e^{(i/\hbar)\mathbf{p}_1\cdot\mathbf{R}_1}.$$

Page 103, equation (5-13): The differential product $d^3\mathbf{R}_1\, d^3\mathbf{R}_2\, dt_1\, dt_2$ should be $dt_2\, dt_1\, d^3\mathbf{R}_2\, d^3\mathbf{R}_1$.

Page 103, four lines below equation (5-15): "When both ω and ϵ are real numbers,…" should be "When both ω and ϵ are real numbers, with $\epsilon > 0$,…".

Page 104, one line above equation (5-18): The expression $E_2 - p^2/2m$ should be $(E_2 - p^2/2m)/\hbar$.

Page 104, equation (5-18): The expression $\delta(E_2 - E_1)i$ should be $\delta(E_2 - E_1)i\hbar$.

Page 105, figure 5-4: In the caption K_0 should be $\mathcal{K}_0$ and $t = 0$ should be $T = 0$.

Page 105, equation (5-19): The expression E_1^2 should be E_1 (three times). The expression p^2 should be p_1^2 (two times).

Page 105, two lines and four lines below equation (5-19): The expression $t = 0$ should be $T = 0$ (two times).

Page 105, equation (5-21): Dimensionally incorrect. The expression $2\pi\hbar$ should be $2\pi\hbar^2$.

Page 107, equation (5-25): The argument going from a probability to an amplitude has the defect remarked upon above concerning pages 97–98.

Page 107, figure 5-5: In caption line 8, the expression $g(x)$ should be $g^*(x)$. In caption line 9, the expression $f(x)g(x)$ should be $g^*(x)f(x)$.

Page 108, three lines above bottom: "For all of this…" should be "From all of this…".

Page 109, first line of problem 5-4: $\psi(x_1)$ should be $\psi(x)$.

Page 111, equation (5-35): Missing ellipsis. The expression $\delta(c - c')$ should be $\delta(c - c')\cdots$.

Page 116, equation (5-57): The three $-$ signs should be $+$ signs.

Summary: 32 errors.

Chapter 6: The Perturbation Method in Quantum Mechanics

Page 121, equation (6-7): The first occurrence of $V[x(s)]$ should be $V[x(s), s]$.

Page 123, fourth line of caption for figure 6-2: $K^{(2)}(b, c)$ should be $K^{(2)}(b, a)$.

Page 126, equation (6-17): Wrong subscript: $d\tau_a$ should be $d\tau_d$.

Page 127, figure 6-3: In part (2), the five jagged paths beginning at point a should all terminate at point c. In order to be typical, some of these lines should head to the left as well as to the right, and they should occasionally cross. Furthermore, there should be one straight line path from a to c.

Page 127, equation (6-21): Sign error. The expression $+V(b)K_V(b, a)$ should be $-V(b)K_V(b, a)$.

Page 128, two lines above equation (6-23): The reference to equation (6-18) should be to (6-17).

Page 128, equation (6-25): In the second line,

$$+\frac{i}{\hbar^2} \quad \text{should be} \quad -\frac{1}{\hbar^2}.$$

Page 129, equation (6-27): Sign error. The expression $+V\psi$ should be $-V\psi$.

Page 131, equation (6-28): Swap $\mathbf{R}_a$ and $\mathbf{R}_b$. Although this is the only outright *error* in this equation, the entire rightmost expression is written gracelessly and so as to impede understanding. It should be replaced by

$$-\frac{i}{\hbar}\int_0^T \int^{\mathbf{r}} \left[\sqrt{\frac{m}{2\pi i\hbar(T-t)}}\right]^3 \left[\exp\left(\frac{im(\mathbf{R}_b-\mathbf{r})^2}{2\hbar(T-t)}\right)\right]$$
$$\times V(\mathbf{r}) \left[\sqrt{\frac{m}{2\pi i\hbar t}}\right]^3 \left[\exp\left(\frac{im(\mathbf{r}-\mathbf{R}_a)^2}{2\hbar t}\right)\right] d^3\mathbf{r}\, dt.$$

Page 133, one line below (6-38): The phrase “the change in momentum” should be “the negative change in momentum”.

Page 134, three lines below (6-40): Scalars R_a and R_b should be vectors $\mathbf{R}_a$ and $\mathbf{R}_b$.

Page 135, fifth line of “The Cross Section for Scattering”: σ should be $d\sigma/d\Omega$.

Page 136, figure 6-8: The area at the atom O is given as $R_a^2\, d\sigma$ but it should be $d\sigma$. The area at point d is not presented — it should be given as

$$\frac{(R_a+R_b)^2}{R_a^2}\, d\sigma.$$

Page 137, equation (6-46): (1) This equation gives the cross section per unit solid angle (i.e. the differential cross section), not the total cross section. (2) In the center and right-hand expressions, Z should be Z^2. (3) In the right-hand expression, $(mu^2/2)$ should be $(mu^2/2)^2$. (See, for example, Albert Messiah, *Quantum Mechanics* (Wiley, New York, 1958) volume 1, equation (VI.29).) Putting all these together, the equation should be

$$\frac{d\sigma_{\text{Ruth}}}{d\Omega} = \frac{4Z^2e^4m^2}{q^4} = \frac{Z^2e^4}{16(mu^2/2)^2[\sin(\theta/2)]^4}.$$

Page 138, two lines above equation (6-50): Scalar r should be vector $\mathbf{r}$.

Page 138, equation (6-53): The left-hand side σ should be $d\sigma/d\Omega$.

Page 138, equation (6-54): The integrand σ should be $d\sigma/d\Omega$.

Page 139, equation (6-55): The numerator

$$Z^2e^4/(2u\hbar)^2 \quad \text{should be} \quad (2Ze^2/u\hbar)^2.$$

Page 140, second line: Scalar q should be vector $\mathbf{q}$.

Page 140, third line: The expression $\mathbf{q}\cdot\mathbf{d}$ should be $\mathbf{q}\cdot\mathbf{d}/\hbar$.

Page 140, third line of problem 6-11: In two places, $\mathbf{q}\cdot\mathbf{d}$ should be $|\mathbf{q}||\mathbf{d}|/\hbar$.

Page 140, equation (6-58): There should be a “1/2” in front of the right-hand side.

Page 140, two lines above equation (6-59): The expression σ should be $d\sigma/d\Omega$.

Page 140, equation (6-59): In front of the second term, "+" should be "$-1/2$".

Page 141, three lines above equation (6-60): Scalar p_a should be vector $\mathbf{p}_a$.

Page 142, equation (6-62): Two sign errors, plus E_b should be E_a. The equation should be

$$\psi(\mathbf{R}_b, t_b) = e^{-(i/\hbar)E_a t_b} \left[e^{(i/\hbar)\mathbf{p}_a \cdot \mathbf{R}_b} - \frac{m}{2\pi\hbar^2} \int^{\mathbf{r}_c} \cdots d^3\mathbf{r}_c \right].$$

(Note that p is the same as p_a.) This result holds in the limit that

$$\frac{mR_b^2}{2\hbar t_b} \to 0.$$

Hint: Use the substitution

$$x^2 = \frac{mr_{bc}^2}{2\hbar(t_b - t_c)},$$

and then the third integral on page 357 (or, better, the third form replacing that integral in these corrections).

Page 142, equation (6-63): In light of the corrections to equation (6-62), this equation should be

$$\psi(\mathbf{R}_b, t_b) = e^{-(i/\hbar)E_a t_b} \left[e^{(i/\hbar)\mathbf{p}_a \cdot \mathbf{R}_b} + f \frac{e^{(i/\hbar)pR_b}}{R_b} \right].$$

Page 142, equation (6-64): In light of the corrections to equation (6-62), this equation should be

$$f = -\frac{m}{2\pi\hbar^2} v(\mathbf{q}).$$

Page 143, two lines below equation (6-65): "$+\omega$ or $-\omega$" should be "$+\hbar\omega$ or $-\hbar\omega$".

Page 144, equation (6-67): The expression

$$V(x_3, t_3) e^{-(iE_n/\hbar)(t_2 - t_3)} \quad \text{should be} \quad e^{-(iE_m/\hbar)(t_2 - t_3)} V(x_3, t_3).$$

Page 146, equation (6-76): The factor $e^{(i/\hbar)(E_m - E_k)t_2}$ should be omitted.

Page 147, third line: t_3 should be t_2.

Page 147, fourteenth line: n should be m.

Page 147, one line above equation (6-77): Change "from m to n" to "from n to m".

Page 147, equations (6-77) and (6-78): Swap E_m and E_n (five times). [It is a good idea, although not essential, to execute this swap in equation (6-79) also — it makes that equation easier to remember and to interpret.]

Page 148, figure 6-12: This figure should, but does not, have $f(T) = \frac{1}{2}$.

Page 148, figure 6-12 caption: Change "from m to n" to "from n to m".

Pages 148–149: Replace the bottom two lines of page 148 and the top line of page 149 with: "The rise time of the function $f(t)$ is $1/\gamma$. Supposing that $1/\gamma \ll T$, show that the probability given by Eq. (6-79) is reduced by a factor $\{\gamma^2/[\gamma^2 + (E_m - E_n)^2/\hbar^2]\}^2$."

Page 150, equation (6-83): dE_n should be dE_m.

Page 151, nine lines above equation (6-88): In "central potential", omit "central".

Page 151, one line below equation (6-88): Sign error. $\mathbf{q} = \mathbf{p}_2 - \mathbf{p}_1$ should be $\mathbf{q} = \mathbf{p}_1 - \mathbf{p}_2$.

Page 153, equation (6-95): Right-hand side should be divided by $\hbar^2$.

Page 153, equation (6-96): In the denominator $d\pi$ should be 2π.

Page 155, equation (6-101): In the two right-hand integrals, the lower limit of integration should of course be $-\delta T/\hbar$.

Page 157, equation (6-109): The rightmost expression $i\pi(E_k - E_m)$ should be $i\pi\delta(E_k - E_m)$.

Page 157, one line below equation (6-109): Change "The last bracket can be written..." to "In light of Eq. (5-17), the last bracket can be written...".

Page 158, equation (6-110): In two places, E_m should be E_n.

Page 158, equation (6-111): E_m should be E_n.

Page 159, eight lines below equation (6-112): $\exp(-i/\hbar)E_m t$ should be $\exp\{-(i/\hbar)E_m t\}$.

Page 159, equation (6-114): On the left-hand side, $e^{-(i/\hbar)E_m T}$ should be $e^{+(i/\hbar)E_m T}$.

Page 160, equation (6-115): On the left-hand side, $e^{-(i/\hbar)E_m T}$ should be $e^{+(i/\hbar)E_m T}$.

Page 160, equation (6-116): Sign error. $V_{mm} - \sum \cdots$ should be $V_{mm} + \sum \cdots$.

Page 161, two lines above equation (6-119): $-i\gamma/2$ should be $-i\hbar\gamma/2$.

Page 161, one line above equation (6-119): Should be "(the $\hbar/2$ is for convenience later)".

Page 161, equation (6-119): Two sign errors and one dropped factor of $\hbar$. This equation should be

$$\Delta E_m - \frac{i\hbar\gamma}{2} = V_{mm} + \sum_k \frac{|V_{mk}|^2}{E_m - E_k + i\epsilon}.$$

Page 161, display equation three lines below equation (6-119): Three missing $\hbar$s. This display equation should be

$$\exp\left\{-\frac{i}{\hbar}\left(\Delta E_m - \frac{i\hbar\gamma}{2}\right)T\right\} = \exp\left\{-\frac{i}{\hbar}\Delta E_m T\right\}\exp\left\{-\frac{\gamma T}{2}\right\}.$$

Page 161, equation (6-120): 2π should be $(2\pi/\hbar)$.

Page 161, six lines below equation (6-120): γ should be $\hbar\gamma$.

Summary: 73 errors.

Chapter 7: Transition Elements

Page 165, equation (7-2): The argument x_0 should be x_2. Also, the integral signs

$$\int \int_{x_1}^{x_2} \int \cdots \mathcal{D}x(t)\, dx_1\, dx_2 \quad \text{should be} \quad \int \int \int_{x_1}^{x_2} \cdots \mathcal{D}x(t)\, dx_1\, dx_2.$$

Page 165, four lines above bottom: The word "arrive" should be "arriving".

Page 167, equation (7-7) and (7-8): Sign errors. Both right-hand sides are missing overall $-$ signs. That is, $\int \cdots$ should be $-\int \cdots$.

Page 167, equation (7-9): The expression

$$\int \int_{x_1}^{x_2} \int \cdots dx_1\, dx_2\, \mathcal{D}x(t) \quad \text{should be} \quad \int \int \int_{x_1}^{x_2} \cdots \mathcal{D}x(t)\, dx_1\, dx_2.$$

Page 167, bottom line: The expression $\langle\chi|1|\psi\rangle$ should be $\langle\chi|1|\psi\rangle_{S_0}$.

Page 168, equation (7-14): $V[x(s), x]$ should be $V[x(s), s]$.

Page 169, equation (7-16): Two errors. On the right-hand side there should be a factor of $V(3)$ between $K_0(4,3)$ and $\psi(3)$, and

$$\int \int \cdots \quad \text{should be} \quad \frac{1}{2\hbar^2} \int \int \cdots.$$

Page 169, four lines below equation (7-16) and six lines below equation (7-17): In two places, the reference to equation (7-4) should be to (7-6).

Page 169, equation (7-17): In the numerator, 1 should be -1. Also, m should be M (compare the correction to equation (3-82) on page 71).

Page 169, equation (7-18): Within the integrand, $\langle\,|$ should be $\langle\chi|$. In the numerator, i should be $-i$. And m should be M.

Page 171, equation (7-23): Missing commas: $\ldots x_i + \eta_i, x_{i+1} + \eta_{i+1} \ldots$ should be $\ldots, x_i + \eta_i, x_{i+1} + \eta_{i+1}, \ldots$.

Page 172, problem 7-3: In the problem statement, $\int \cdots \int$ should be $\int\int\int\int$, which is both more compact and more clear. The correct answer (equation (7-27)) is

$$\frac{\delta F}{\delta j(\mathbf{r}, s)} = F \int \int j(\mathbf{r}', t') \tfrac{1}{2} [R(\mathbf{r}' - \mathbf{r}, t' - s) + R(\mathbf{r} - \mathbf{r}', s - t')]\, d^3\mathbf{r}'\, dt'.$$

Page 172, two lines below (7-27): The reference to equation (7-14) should be to (7-20).

Page 172, four lines above equation (7-28): "beginning" should be "end".

Page 172, equations (7-29) and (7-30): In the last line of (7-29), and in the right-hand side of (7-30), the expression

$$\frac{\delta s}{\delta x(s)} \quad \text{should be} \quad \frac{\delta S}{\delta x(s)}.$$

Page 174, equation (7-37): $-$ should be $+$. Also, in $\langle \delta F \rangle_S$, omit the subscript S. (The S is optional and isn't used in other transition elements in section 7-3… not even the right-hand side of this equation!)

Page 174, equation (7-39): m should be $-m$, $+$ should be $-$.

Page 174, equation (7-40): In $-i\epsilon/\hbar$, the $-$ sign should be removed. Also, for the reasons mentioned at equation (7-37), omit the subscript S in

$$\left\langle \frac{\partial F}{\partial x_k} \right\rangle_S .$$

Page 175, equation (7-41): $-$ should be $+$.

Page 175, equation (7-44): In the first line, $-x_{k-1}$ should be $+x_{k-1}$.

Page 178, equation (7-50): The expression

$$\frac{\hbar\epsilon}{im} \quad \text{should be} \quad \frac{\hbar\epsilon}{im}\langle 1 \rangle.$$

Page 178, four lines above equation (7-53): A should be $1/A$.

Page 180, equation (7-59): The expression

$$\frac{\hbar}{i}\delta(t-s) \quad \text{should be} \quad \frac{\hbar}{i}\delta(t-s)\langle 1 \rangle.$$

Page 180, two lines above equation (7-62): $\hbar/mi$ should be $(\hbar/im)\langle 1 \rangle$.

Page 180, equation (7-63): $\delta(t-s)$ should be $\delta(t-s)\langle 1 \rangle$.

Page 181, first line of problem 7-8: The expression $x(t)x(s) = f(t,s)$ should be $\langle x(t)x(s) \rangle = f(t,s)$.

Page 182, equation (7-67): The right-hand side should be

$$\int\int\int_{x_a}^{x_b} \chi^*(x_b) e^{(i/\hbar)[S+\int f(t)x(t)\,dt]} \psi(x_a)\, \mathcal{D}x(t)\, dx_a\, dx_b.$$

Page 183, first line: The reference to equation (3-68) should be to (3-66).

Page 183, last line of second equation in problem 7-9: $(t-t_1)$ should be $(s-t_1)$.

Page 183, four lines above bottom: $\delta^2 S_{cl}/\delta f(t)\,\delta f(s)$ should be $\delta^2 S'_{cl}/\delta f(t)\,\delta f(s)$.

Page 184, second line: Extra parenthesis. $[(\bar{x}(t)\bar{x}(s)\cdots$ should be $[\bar{x}(t)\bar{x}(s)\cdots$.

Page 185, equation (7-81): dp should be $dp/2\pi\hbar$.

Page 185, one line below equation (7-82): "the whole x_1 axis is shifted to the right" should be "the x_1 origin is shifted left".

Page 186, equation (7-84): Four errors. χ should be χ^*, in two places "$x_1'-\Delta, t$" should be "$x_1'-\Delta, t_1$", and dx_2 should be dx_N.

Page 186, three lines below equation (7-84): In two places "$x_1' - \Delta, t$" should be "$x_1' - \Delta, t_1$".

Page 186, equation (7-85): Should be

$$\exp\left\{\left(\frac{i}{\hbar}\right)\sum_{k=2}^{N-1} S[x_{k+1}, t_{k+1}; x_k, t_k] + \left(\frac{i}{\hbar}\right) S[x_2, t_2; x_1', t_1]\right\}\left[1 - \left(\frac{i}{\hbar}\right)\Delta\frac{\partial}{\partial x_1'} S[x_2, t_2; x_1', t_1]\right].$$

Page 186, equation (7-86): The expression ψ_1 should be $\psi(1)$. Plus the variable x_2 sometimes means the final point and sometimes means the first intermediate point... a good argument for denoting (initial, final) as (a, b) rather than $(1, 2)$. Plus, a very bad equation break. Plus, curly brackets should be straight brackets. In sum, this equation should be

$$\begin{aligned}\langle\chi|1|\psi\rangle &= \int\int \chi^*(b)K(b,a)\psi(a)\,dx_a\,dx_b \\ &\quad -\frac{i}{\hbar}\Delta\int\int\chi^*(b)K(b,a)\left[\psi(a)\frac{\partial}{\partial x_a}S[x_2, t_2; x_a, t_a] + \frac{\hbar}{i}\frac{\partial}{\partial x_a}\psi(x_a, t_a)\right]\,dx_a\,dx_b.\end{aligned}$$

Page 186, equations (7-87) and (7-88): The bars in $|1|$ should be as tall as the enclosing angle brackets.

Page 187, equation (7-93) and page 188, equation (7-94): The expression

$$+\frac{i\epsilon}{\hbar} \quad \text{should be} \quad -\frac{i\epsilon}{\hbar}.$$

Page 188, equation (7-95): On the first line,

$$\left(1 - \frac{i\epsilon H}{\hbar}\right) \quad \text{should be} \quad \left(1 + \frac{i\epsilon}{\hbar}H\right) \quad \text{and} \quad \left(1 + \frac{i\epsilon}{\hbar}H\right) \quad \text{should be} \quad \left(1 - \frac{i\epsilon}{\hbar}H\right),$$

while on the second line

$$(xH - Hx) \quad \text{should be} \quad (Hx - xH).$$

Page 188, equation (7-96): On the right-hand side of the first line,

$$(xH - Hx) \quad \text{should be} \quad (Hx - xH).$$

Page 188, seven lines below equation (7-96): $e^{-(i/\hbar)S\,\Delta t}$ should be $e^{+(i/\hbar)L\,\Delta t}$.

Page 188, problem 7-14: Bad equation break.

Page 189, equation (7-100): $\mathbf{x}$ should be $\mathbf{r}$, V should be ϕ, and two sign errors. In summary, this equation should be

$$L = \frac{m}{2}|\dot{\mathbf{r}}|^2 - e\phi(\mathbf{r}, t) + \frac{e}{c}\dot{\mathbf{r}}\cdot\mathbf{A}(\mathbf{r}, t).$$

Page 189, one line below equation (7-100): $V = 0$ should be $\phi = 0$.

Page 189, three lines below equation (7-100): $-(e/c)$ should be (e/c).

Page 189, one line below equation (7-101): $-ie/\hbar c$ should be $ie/\hbar c$.

Page 189, equation (7-103): Two errors: $-(e/c)$ should be e/c, and t should be t_k.

Page 190, equation (7-104): $-(e/c)$ should be e/c.

Page 190, equation (7-106): Both sides should be multiplied by e/c.

Page 190, three lines below equation (7-106): $S_{cl}(\cdots)$ should be $S_{cl}[\cdots]$.

Page 190, equation (7-107): Four errors. The right-most term should be multiplied by e/m, in two places r_k should be $\mathbf{r}_k$, and the $\mathbf{A}$ and $\mathbf{r}$ terms should be swapped. In sum, the right-most term should be

$$\frac{e}{m}\frac{1}{2}(\mathbf{r}_{k+1} - \mathbf{r}_k)\cdot[\mathbf{A}(\mathbf{r}_{k+1}, t_{k+1}) + \mathbf{A}(\mathbf{r}_k, t_k)].$$

Page 190, bottom line: The reference to equation (7-99) should be to (7-102).

Page 191, three lines above equation (7-109): $-e/(2cm)$ should be $-(e/2mc)$.

Page 191, equation (7-109): Both sides should be multiplied by a $-$ sign.

Page 191, three lines below equation (7-109): $-e/(2cm)$ should be $-(e/2mc)$.

Page 191, equation (7-110): The expression

$$\frac{e^2}{2c^2} \quad \text{should be} \quad -\frac{1}{2}\left(\frac{e}{\hbar c}\right)^2.$$

Page 191, one line below equation (7-110): $ie^2/2mc^2$ should be $-(ie^2/2\hbar mc^2)$.

Page 191, five lines below equation (7-110): Missing parentheses. The expression

$$-e/2mc(\mathbf{p}\cdot\mathbf{A} + \mathbf{A}\cdot\mathbf{p}) + e^2/2mc^2\mathbf{A}\cdot\mathbf{A} \quad \text{should be} \quad -(e/2mc)(\mathbf{p}\cdot\mathbf{A} + \mathbf{A}\cdot\mathbf{p}) + (e^2/2mc^2)\mathbf{A}\cdot\mathbf{A}.$$

Page 191, one line below (7-111): The free particle hamiltonian $(1/m)\mathbf{p}\cdot\mathbf{p}$ should be $(1/2m)\mathbf{p}\cdot\mathbf{p}$.

Page 192, equation (7-113): H_k should be H.

Page 192, equation (7-116): $V(x_{i+1})$ should be $V(x_i)$.

Page 194, equation (7-121): $V(x_{k+1})$ should be $V(x_k)$.

Page 195, equation (7-123): A sign error, a bar-height error, and a poor fraction break. This equation should be

$$-\delta\left\langle \chi \middle| 1 \middle| \frac{\partial\psi}{\partial t}\right\rangle = \langle H_k\rangle\frac{i\delta}{\hbar}.$$

Page 195, equation (7-124): The right-hand side should be $-H\psi$.

Summary: 90 errors.

Chapter 8: Harmonic Oscillators

Page 199, three lines below (8-4): Sign error. The expression $\exp(iE_n t/\hbar)$ should be $\exp\{-(i/\hbar)E_n t\}$.

Page 199, equation (8-5): Sign error. The expression

$$\frac{\hbar^2}{2m} \quad \text{should be} \quad -\frac{\hbar^2}{2m}.$$

Page 199, equation (8-7): The expression $(2^n n!)$ should be $(2^n n!)^{-1/2}$.

Page 200, equation (8-10): Add brackets so that the function "exp" applies to all the rest of the left-hand side, as in equation (8-1).

Page 200, equation (8-12): Inside the square brackets, all three occurrences of $e^{2i\omega T}$ should be $e^{-2i\omega T}$.

Page 201, equation (8-15): Two errors. On the first line, $(1 + \frac{1}{2}e^{-2i\omega T})$ should be $(1 + \frac{1}{2}e^{-2i\omega T} + \cdots)$. At the end of the last line, $e^{-2i\omega T} \cdots]$ should be $e^{-2i\omega T} + \cdots]$.

Page 201, equation (8-18): The expression

$$\frac{m\omega}{\pi\hbar} \quad \text{should be} \quad \left(\frac{m\omega}{\pi\hbar}\right)^{1/2}.$$

Page 201, equation (8-19): The expression

$$\frac{2m\omega}{\hbar} \quad \text{should be} \quad \left(\frac{2m\omega}{\hbar}\right)^{1/2}.$$

Page 201, equation (8-20): The expression

$$\left[\frac{2m^2\omega^2}{\hbar^2} \cdots\right] \quad \text{should be} \quad \left[\frac{1}{2} + \frac{2m^2\omega^2}{\hbar^2} \cdots\right].$$

Page 203, one line below equation (8-28): The reference to equation (8-24) should be to (8-23).

Page 205, equation (8-35): This kernel has the dimensions of $1/[\sqrt{\text{mass}} \times \text{length}]^n$. (Note that for path integrals over variables q, the normalization constant A of equation (2-21) is $(2\pi i\hbar\epsilon)^{1/2}$ with dimensions $\sqrt{\text{mass}} \times \text{length}$.)

Page 207, lines two and three: The phrase "we obtain n solutions for the j constants $a_{j\alpha}$" should be "we obtain the solutions for the n constants $a_{j\alpha}$".

Page 208, two lines above equation (8-49): The phrase "sum over values of α" should be "sum over values of j".

Page 209, equation (8-53): The expression

$$\frac{1}{2}\sum_{j=1}^{n} a_{j\alpha}a_{j\beta}\dot{Q}_\alpha\dot{Q}_\beta \quad \text{should be} \quad \frac{1}{2}\sum_{j=1}^{n}\sum_{\alpha=1}^{n}\sum_{\beta=1}^{n} a_{j\alpha}a_{j\beta}\dot{Q}_\alpha\dot{Q}_\beta.$$

Page 209, equation (8-56): The middle two terms

$$\frac{1}{2}\omega_\beta^2 Q_\beta Q_\alpha = \sum_{j=1}^{n} a_{j\alpha} a_{j\beta}$$

should be one term

$$\frac{1}{2}\sum_{\alpha=1}^{n}\sum_{\beta=1}^{n}\omega_\beta^2 Q_\beta Q_\alpha \sum_{j=1}^{n} a_{j\alpha} a_{j\beta}.$$

Page 210, equation (8-59): $\hbar$ should be $2\hbar$, ω should be ω_α.

Page 210, three lines below equation (8-59): The expression $\mathcal{D}Q_1, \ldots, \mathcal{D}Q_n$ should be $\mathcal{D}Q_1 \cdots \mathcal{D}Q_n$.

Page 210, seven lines below equation (8-59): The expression $\mathcal{D}Q_1(t)\mathcal{D}Q_2(t)\cdots$ should be $\mathcal{D}Q_1(t)\cdots\mathcal{D}Q_n(t)$.

Page 210, equation (8-60): ω should be ω_α.

Page 210, six lines above equation (8-61): The expression $\exp(iE_n t/\hbar)$ should be $\exp\{-(i/\hbar)E_n t\}$.

Page 210, five lines above equation (8-61): The expression $\exp[(it/\hbar)\sum_n E_n]$ should be $\exp\{-(i/\hbar)(\sum_n E_n)t\}$.

Page 211, equation (8-63): This equation should be

$$\Phi_0 = \prod_{\alpha=1}^{n} \exp\left(-\frac{\omega_\alpha Q_\alpha^2}{2\hbar}\right) = \exp\left(-\frac{1}{2\hbar}\sum_{\alpha=1}^{n}\omega_\alpha Q_\alpha^2\right) = \exp\left(-\frac{1}{2\hbar}\sum_{\alpha=1}^{n}\sum_{j=1}^{n}\sum_{k=1}^{n}\omega_\alpha a_{j\alpha} a_{k\alpha} q_j q_k\right).$$

Page 211, equation (8-64): This equation should be

$$M_{jk} = \frac{1}{\hbar}\sum_{\alpha=1}^{n}\omega_\alpha a_{j\alpha} a_{k\alpha}.$$

Page 211, problem 8-2 (corrected): Show that the matrix $\tau_{jk} = \sum_\alpha a_{j\alpha} a_{k\alpha}/\omega_\alpha$ is the reciprocal square root of the v_{ij} matrix. That is, show

$$\sum_{k=1}^{n}\sum_{l=1}^{n}\tau_{jk}\tau_{kl} v_{lm} = \delta_{jm}$$

Page 213, one line below (8-68): The equation $n = N$ should be $j = N$.

Page 214, equation (8-70): The expression $\omega^2 q_j$ should be $-\omega^2 q_j$.

Page 214, equation (8-72): In the middle, the expression ν^2 should be $-\nu^2$.

Page 215, two lines above equation (8-75): "the constants A" should be "the constant A".

Page 216, one line below equation (8-77): The summation $\sum_{\alpha=1}^{N}$ should be $\sum_{\alpha=0}^{N-1}$. (And, of course, a "$\Re e\{\quad\}$" of the right-hand side is implied.)

Page 216, equation (8-78): The summation $\sum_{\alpha=1}^{N}$ should be $\sum_{\alpha=0}^{N-1}$.

Page 216, equation (8-82): Two errors: q_j should be $\sqrt{N}\,q_j$, and $+$ should be $-$.

Page 217, equation (8-83): This equation should be

$$\Phi = A\exp\left(-\frac{1}{2\hbar}\sum_{\alpha=0}^{N-1}\omega_\alpha Q_\alpha^* Q_\alpha\right).$$

Page 217, equation (8-84): The differential dQ_N should be dQ_{N-1}.

Page 217, equation (8-85): $1/2\omega_\alpha$ should be $\hbar/2\omega_\alpha$.

Page 218, equation (8-89): The meaning of

$$\sum_{k=1}^{N} f(k) \quad \text{is} \quad \sum_{\alpha=0}^{N-1} f\left(\frac{2\pi}{L}\alpha\right).$$

Page 219, five lines above equation (8-91): $q(x_j+1)$ should be $q(x_{j+1})$.

Page 219, equation (8-93): The meaning of the summation over k is given above.

Page 220, equation (8-97): The expression

$$\frac{\sqrt{mL}}{\sqrt{N}} \quad \text{should be} \quad \frac{L}{\sqrt{mN}}.$$

Page 221, equation (8-103): The expression

$$\frac{V}{\epsilon L} \quad \text{should be} \quad \frac{\partial V}{\partial(\epsilon L)}.$$

Page 221, equation (8-105): Both integrals should extend from 0 to L.

Page 221, equation (8-106): Missing integral limits and absolute magnitude signs. Should be

$$L = \frac{\rho}{2}\int_{-\infty}^{+\infty}\left|\frac{\partial U(k,t)}{\partial t}\right|^2 \frac{dk}{2\pi} - \frac{\rho c^2}{2}\int_{-\infty}^{+\infty} k^2 |U(k,t)|^2 \frac{dk}{2\pi}.$$

Page 222, equation (8-109): The expression

$$\left(\frac{da}{dx}\right)^2 \quad \text{should be} \quad \frac{d^2a}{dx^2}.$$

Page 222, five lines above equation (8-111): In the expression $h(\omega_1+\omega_2+2\omega_3)$, h should be $\hbar$.

Page 223, equation (8-113): Two errors. The expression $\hbar/2$ should be $\hbar$. Above the summation sign, $k = k_{\max}$ should be simply $k_{\max}$.

Page 223, equation (8-114): The expression $2\pi/d$ should be π/d.

Page 223, equation (8-115): Above the left-hand summation sign, $n = N/2$ should be simply $N/2$.

Page 223, equation (8-116): *Hint:* Approximate the sum $\sum_{n=0}^{N/2} e^{i\pi n/N}$ by an integral to evaluate it as $(N/\pi)(1+i)$.

Page 226, five lines above equation (8-118): $u(\mathbf{r}, t)$ should be $\mathbf{u}(\mathbf{r}, t)$.

Page 226, one line below equation (8-119): "U in the direction of k" should be "$\mathbf{U}$ in the direction of $\mathbf{k}$".

Page 226, equation (8-122): Because U_1 is complex, this equation should have absolute value signs to read

$$L = \frac{\rho}{2} \iiint \left[\left| \frac{\partial U_1(\mathbf{k}, t)}{\partial t} \right|^2 - c^2 k^2 |U_1(\mathbf{k}, t)|^2 \right] \frac{d^3\mathbf{k}}{(2\pi)^3}$$

Also, the typeface for ρ in this equation differs from the typeface used elsewhere in the book.

Page 227, equations (8-124) and (8-126): The $-$ signs should not be there.

Page 227, equation (8-128): The expression

$$-\frac{i\rho}{2\hbar} \quad \text{should be} \quad \frac{i}{\hbar}\frac{\rho}{2}.$$

Page 227, one line below equation (8-128): $\mathbf{u}(\mathbf{x}, t)$ should be $\mathbf{u}(\mathbf{r}, t)$.

Page 228, line 13: The reference to equation (8-123) should be to (8-124).

Page 228, equation (8-129): The expression

$$-\frac{i\rho}{2\hbar} \quad \text{should be} \quad \frac{i}{\hbar}\frac{\rho}{2V}.$$

Page 228, one line above equation (8-131): The reference to equation (8-10) should be to (8-1).

Page 228, equation (8-131): In two places, $\hbar$ should be $\hbar V$.

Page 229, second line: The expression $2\pi n_x/L$ should be $2\pi n_x/L_x$.

Page 229, third line: The expression $N = L_x/d$ should be $N_x = L_x/d$.

Page 229, equation (8-132): The expression

$$\frac{i}{2\hbar} \quad \text{should be} \quad \frac{i}{\hbar}\frac{\rho}{2}.$$

Page 231, equation (8-133): First, the differential dt shouldn't be there. Second, the expression

$$\frac{\mu^2 c^4}{\hbar^2}\phi \quad \text{should be} \quad \frac{\mu^2 c^4}{\hbar^2}\phi^2.$$

Page 233, equation (8-136): The expression $-\gamma(t)$ should be $+\gamma(t)$.

Page 233, equation (8-138): The denominator $2m\omega\hbar$ should be $2M\omega\hbar$.

Page 233, equation (8-139): In the bottom line, $e^{-i\omega T/2}$ should be $e^{-i\omega(m+1/2)T}$.

Page 234, equation (8-140): In front of the integral signs should be a factor of

$$\left(\frac{M\omega}{\pi\hbar}\right)^{1/2}.$$

Page 234, equations (8-142) and (8-143): The prefactor is wrong and the limits of integration are not shown. These equations should be

$$\beta = \frac{1}{\sqrt{2\hbar M\omega}} \int_0^T \gamma(t) e^{-i\omega t}\, dt$$

$$\beta^* = \frac{1}{\sqrt{2\hbar M\omega}} \int_0^T \gamma(t) e^{+i\omega t}\, dt$$

Page 234, one line below equation (8-143): "The values of G_{00}" should be "The value of G_{00}".

Page 234, one line below equation (8-145): The word "larger" should be "smaller".

Summary: 79 errors.

Chapter 9: Quantum Electrodynamics

Page 236, equation (9-1): In the exponent, (i/h) should be $(i/\hbar)$.

Page 238, equation (9-12): On the right-hand side

$$\mathbf{a}_{\mathbf{k}}(t)e^{i\mathbf{k}\cdot\mathbf{R}} \quad \text{should be} \quad \sqrt{4\pi}\, c \int \mathbf{a}_{\mathbf{k}}(t) e^{i\mathbf{k}\cdot\mathbf{R}} \frac{d^3\mathbf{k}}{(2\pi)^3},$$

as in the first line of equation (9-14).

Pages 238–262: Equations (9-12) and (9-14) introduce the Fourier transforms $\mathbf{a}_{\mathbf{k}}$, $\phi_{\mathbf{k}}$, $\mathbf{j}_{\mathbf{k}}$, and $\rho_{\mathbf{k}}$. These are functions of the vector $\mathbf{k}$. Unfortunately the book prints such subscripts sometimes in roman typeface (e.g. ϕ_{k}) and sometimes in italic (ϕ_k) but never in the desired boldface. Such wavevector subscripts appear in pages 238–262 dozens of times in various guises [for example $\mathbf{E}_{\mathbf{k}}$ and $\mathbf{B}_{\mathbf{k}}$ on page 239; $a_{1\mathbf{k}}$ and $j_{1\mathbf{k}}$ in equation (9-21); $n_{2\mathbf{k}}$ in equation (9-46); $a^*_{1\boldsymbol{l}}$ in equation (9-48); $a_{1\mathbf{L}}$ in equation (9-93)] and in all such cases the wavevector should be in boldface.

Page 239, below (9-16): The quantities $\mathbf{E}_{\mathbf{k}}$ and $\mathbf{B}_{\mathbf{k}}$ are never introduced. They should be defined via

$$\mathbf{E}(\mathbf{R},t) = \int \mathbf{E}_{\mathbf{k}}(t) e^{i\mathbf{k}\cdot\mathbf{R}} \frac{d^3\mathbf{k}}{(2\pi)^3} \quad \text{and} \quad \mathbf{B}(\mathbf{R},t) = \int \mathbf{B}_{\mathbf{k}}(t) e^{i\mathbf{k}\cdot\mathbf{R}} \frac{d^3\mathbf{k}}{(2\pi)^3}.$$

Page 239, one and two lines below equation (9-18): Bad equation break. The equation for $\dot{\mathbf{E}}_{\mathbf{k}}$ should not be split across two lines.

Page 240, equation (9-21): On the right-hand side, $j_{2\mathbf{k}}$ should be $j_{1\mathbf{k}}$.

Page 240, equation (9-25): Both of the right-hand sides should have $-$ signs to be

$$\begin{aligned} S_2 &= -\int \Big[\cdots\Big]\, d^3\mathbf{R}\, dt \\ &= -\sum_i \mathrm{e}_i \int \Big\{\cdots\Big\}\, dt \end{aligned}$$

Page 241, equation (9-27): In the last line ϕ_k^2 should be $|\phi_{\mathbf{k}}|^2$.

Page 241, equation (9-28): The right-hand side should have a $-$ sign to be

$$S_2 = -\int (\cdots) \frac{d^3\mathbf{k}\, dt}{(2\pi)^3}.$$

Page 241, equation (9-29): Both the center and right-hand sides should be integrated over time to be

$$S_c = -\frac{4\pi}{2} \int\int \frac{\rho_{\mathbf{k}}\rho_{-\mathbf{k}}}{k^2} \frac{d^3\mathbf{k}}{(2\pi)^3}\, dt = -\frac{1}{2} \sum_i \sum_j \int \frac{\mathrm{e}_i \mathrm{e}_j}{|\mathbf{q}_i - \mathbf{q}_j|}\, dt.$$

Page 241, one line below equation (9-29): $d^3\mathbf{k}$ should be $d^3\mathbf{k}/(2\pi)^3$.

Page 241, equation (9-30): Append the expression dt to the extreme right.

Page 242, equation (9-33): The expression

$$\sum_j \int \cdots \quad \text{should be} \quad \sum_j \mathrm{e}_j \int \cdots.$$

Page 242, six lines below (9-33): $e^{i\hbar/S}$ should be $e^{iS/\hbar}$.

Page 243, problem 9-5: Since this problem is purely classical, it should be placed at the end of section 9-1 ("Classical Electrodynamics") rather than near the start of section 9-2 ("The Quantum Mechanics of the Radiation Field").

Page 243, problem 9-5: Missing factor of i. In the last line, $\int \cdots d^3\mathbf{k}/(2\pi)^3$ should be $i \int \cdots d^3\mathbf{k}/(2\pi)^3$.

Page 246, equation (9-42): 2.10^{15} should be 2×10^{15}.

Pages 246–262: In pages 238 through 243, the quantity $\mathbf{a}_{\mathbf{k}}$ is integrated with respect to $\mathbf{k}$ and has the dimensions (in the Gaussian system) of $[\text{length}]^{5/2} \times [\text{mass}]^{1/2}$. In pages 246 through 262, it is summed over values of $\mathbf{k}$ and has the dimensions of $[\text{length}] \times [\text{mass}]^{1/2}$. Since these are two different quantities, I distinguish them by writing the page 246–262 version as, for example, $\bar{a}_{1,\mathbf{k}} = a_{1,\mathbf{k}}/\sqrt{\text{Vol}}$ where Vol represents the volume of the normalizing box (see section 4-3).

Page 246, three lines above equation (9-43): The expression $\exp[-(ck/2\hbar)/a^*_{1\mathbf{k}}a_{1\mathbf{k}}]$ should be $\exp\{-(kc/2\hbar)\bar{a}^*_{1,\mathbf{k}}\bar{a}_{1,\mathbf{k}}\}$.

Page 247, third line of problem 9-8: The equation $\phi_1(q) = q\phi_0(q)$ should be $\phi_1(q) = \sqrt{2}\,q\phi_0(q)$.

Page 247, eighth line of problem 9-8: The expression $\int \Phi^*_0 a_{1k}a^*_{1k}\Phi_0$ means

$$\int\!\!\int \Phi^*_0(\bar{a}_{1,\mathbf{k}'}, \bar{a}_{2,\mathbf{k}'})\bar{a}_{1,\mathbf{k}}\bar{a}^*_{1,\mathbf{k}}\Phi_0(\bar{a}_{1,\mathbf{k}'}, \bar{a}_{2,\mathbf{k}'})\prod_{\mathbf{k}'} d\bar{a}_{1,\mathbf{k}'}\, d\bar{a}_{2,\mathbf{k}'}.$$

But how to express this using a brief in-line formula? I suggest $\int \Phi^*_0\bar{a}_{1,\mathbf{k}}\bar{a}^*_{1,\mathbf{k}}\Phi_0\, d\bar{a}$.

Page 247, two lines above bottom: e_N should be E_N.

Page 247, bottom line: $\Psi_N(\mathbf{q})$ should be $\psi_N(\mathbf{q})$.

Page 248, equation (9-45): e_N should be E_N.

Page 248, equation (9-48): $\Psi_N(\mathbf{q})$ should be $\psi_N(\mathbf{q})$.

Page 248, equation (9-49): Starting from equation (9-32), we have, for polarization 1,

$$\begin{aligned}
L_{int} = -V_{int} &= \sqrt{4\pi}\int j_{1,-\mathbf{k}}a_{1,\mathbf{k}}\frac{d^3\mathbf{k}}{(2\pi)^3} \\
&= \sqrt{4\pi}\sum_{\mathbf{k}} j_{1,-\mathbf{k}}a_{1,\mathbf{k}}\frac{1}{\mathrm{Vol}} \\
&= \sqrt{4\pi}\sum_{\mathbf{k}} \bar{j}^*_{1,\mathbf{k}}\bar{a}_{1,\mathbf{k}} \\
&= \sqrt{4\pi}\sum_{\mathbf{k}} \bar{j}_{1,\mathbf{k}}\bar{a}^*_{1,\mathbf{k}} \\
&= \sqrt{\pi}\sum_{\mathbf{k}} (\bar{j}^*_{1,\mathbf{k}}\bar{a}_{1,\mathbf{k}} + \bar{j}_{1,\mathbf{k}}\bar{a}^*_{1,\mathbf{k}}),
\end{aligned}$$

where $\bar{j}_{1\mathbf{k}} = j_{1\mathbf{k}}/\sqrt{\mathrm{Vol}}$. Thus equation (9-49) should be

$$V = -\sqrt{\pi}\sum_{\mathbf{k}} (\bar{j}^*_{1,\mathbf{k}}\bar{a}_{1,\mathbf{k}} + \bar{j}_{1,\mathbf{k}}\bar{a}^*_{1,\mathbf{k}}).$$

Page 248, equations (9-50) and (9-51): Where to begin? The signs are wrong, the bars are missing, the subscripts aren't bold, the symbol $\mathbf{k}$ has two different meanings, the $\sqrt{4\pi}$ should be $\sqrt{\pi}$, and, in (9-51), a constant is written inexplicably within the integral sign. Here are my preferred forms:

$$V_{fi} = -\int\!\!\int \psi^*_N\Phi^*_0\sqrt{\frac{2lc}{\hbar}}\bar{a}_{1,\boldsymbol{l}}\sum_{\mathbf{k}}\sqrt{\pi}(\bar{a}^*_{1,\mathbf{k}}\bar{j}_{1,\mathbf{k}} + \bar{a}_{1,\mathbf{k}}\bar{j}^*_{1,\mathbf{k}})\psi_M\Phi_0\, dq\prod_{\mathbf{k}'} d\bar{a}_{1,\mathbf{k}'}$$

and

$$\begin{aligned}
V_{fi} &= -\sqrt{\frac{2\pi lc}{\hbar}}\sum_{\mathbf{k}}\int \Phi^*_0\bar{a}_{1,\boldsymbol{l}}\bar{a}^*_{1,\mathbf{k}}\Phi_0\prod_{\mathbf{k}'} d\bar{a}_{1,\mathbf{k}'}\int \psi^*_N\bar{j}_{1,\mathbf{k}}\psi_M\, dq \\
&\quad -\sqrt{\frac{2\pi lc}{\hbar}}\sum_{\mathbf{k}}\int \Phi^*_0\bar{a}_{1,\boldsymbol{l}}\bar{a}_{1,\mathbf{k}}\Phi_0\prod_{\mathbf{k}'} d\bar{a}_{1,\mathbf{k}'}\int \psi^*_N\bar{j}^*_{1,\mathbf{k}}\psi_M\, dq
\end{aligned}$$

Page 249, three lines above equation (9-52): The equation $k = l$ should be $\mathbf{k} = \pm\boldsymbol{l}$.

Page 249, two lines above equation (9-52): $\int \psi_N^* \mathbf{j} \psi_M$ should be $\int \psi_N^* \mathbf{j} \psi_M \, dq$.

Page 249, two lines above equation (9-52): Our matrix element is $-\sqrt{2\pi\hbar/lc}\,(\bar{j}_{1,\boldsymbol{l}})_{NM}$.

Page 249, equation (9-52): j_{1l} should be $\bar{j}_{1,\boldsymbol{l}}$ and $-hlc$ should be $-\hbar lc$. (The future uses of j in this subsection — from (9-53) to the beginning of "Elimination of Electromagnetic Field Variables" — are correct and should not have the overbar.)

Page 249, four and five lines below equation (9-52): In four places, $\mathbf{1}$ should be $\boldsymbol{l}$.

Page 249, one line below equation (9-54): Direction $\mathbf{1}$ should be $\boldsymbol{l}$.

Page 249, equation (9-56): In the exponent, $\mathbf{q}b$ should be $\mathbf{q}_b$.

Page 249, bottom line: $\exp(i\mathbf{k}\cdot\mathbf{q}_b/\hbar)$ should be $e^{-i\mathbf{k}\cdot\mathbf{q}_b}$.

Page 250, equation (9-57): $j_{1\mathrm{k},NM}$ should be $(j_{1,\mathbf{k}})_{NM}$.

Page 250, equation (9-60): In the exponent, $(1/\hbar)$ should be $(i/\hbar)$. The expression $\mathcal{D}q$ should be understood to mean $\prod_i \mathcal{D}\mathbf{q}_i$.

Page 250, equation (9-61): The expression $da_{1\mathrm{k}}\, da_{2\mathrm{k}}$ should be $\mathcal{D}a_{1,\mathbf{k}}\, \mathcal{D}a_{2,\mathbf{k}}$.

Page 250, equation (9-62): $\sqrt{4\pi}$ should be $\sqrt{\pi}$.

Pages 250–251: Replace a and j by $\bar{a}$ and $\bar{j}$ in equations (9-62), (9-63), (9-64) and three lines above (9-64) — a total of 24 changes.

Page 250, equation (9-64): In front of the summation, $1/2$ should be $i/2$.

Page 250, equation (9-65): In the exponent (i/h) should be $(i/\hbar)$.

Page 250, two and three lines below equation (9-65): "in the next section" should be "in Sec. 9-7".

Page 251, equation (9-63): In the first line, $\sqrt{4\pi}$ should be $\sqrt{\pi}$ (twice). In the second line

$$\int \quad \text{should be} \quad \int_{t_i}^{t_f}\int_{t_i}^{t_f}.$$

Page 251, equation (9-64):

$$\int \quad \text{should be} \quad \int_{t_i}^{t_f}\int_{t_i}^{t_f}.$$

Page 252, equation (9-67): In the middle line, the first

$$\int \quad \text{should be} \quad \int_{t_i}^{t_f}.$$

The second

$$\int \quad \text{should be} \quad \int_{t_i}^{t_f}\int_{t_i}^{t_f}.$$

Page 252, fourth line: Should be "which in dimensionless form, for the electron's charge, is the fine-structure constant."

Page 252, equation (9-66): t should be T.

Page 252, equation (9-67): In the first line, $\dfrac{1}{\hbar}$ should be $\dfrac{i}{\hbar}$. In the second and third lines, j should be $\bar{j}$ (four times).

Page 252, equation (9-68): In the first line, i should be $-i$ and four js should be $\bar{j}$s. In the second line, j_{k} should be $j_{1,\mathbf{k}}$. In addition, there are a number of poor choices for equation breaks, order of symbols, etc. My preferred form for this equation is

$$\begin{aligned}\Delta E &= -i\sum_N\sum_{\mathbf{k}}\frac{4\pi}{2kc}[(\bar{j}^*_{1,\mathbf{k}})_{MN}(\bar{j}_{1,\mathbf{k}})_{NM}+(\bar{j}^*_{2,\mathbf{k}})_{MN}(\bar{j}_{2,\mathbf{k}})_{NM}]\int_0^\infty e^{(i/\hbar)(E_M-E_N-\hbar kc)\tau}\,d\tau \\ &= \sum_N\int\frac{4\pi\hbar}{2kc}[|(j_{1,\mathbf{k}})_{NM}|^2+|(j_{2,\mathbf{k}})_{NM}|^2]\frac{1}{E_M-E_N-\hbar kc+i\epsilon}\frac{d^3\mathbf{k}}{(2\pi)^3}.\end{aligned}$$

Page 253, one line above equation (9-69): Rutherford should be Retherford.

Page 253, two lines below equation (9-70): E_m should be E_M, and γ should be $\hbar\gamma$.

Page 253, fifth line of section 9-5: The expression $\mathbf{j} = \mathrm{e}\dot{\mathbf{R}}\exp(i\mathbf{k}\cdot\mathbf{R}/\hbar)$ should be $\mathbf{j_k} = \mathrm{e}\dot{\mathbf{R}}e^{-i\mathbf{k}\cdot\mathbf{R}}$.

Page 253, sixth line of section 9-5: The expression $\mathbf{j}$ should be $\mathbf{j_k}$.

Page 254, problem 9-10: Twice, $\mathbf{k}\cdot\mathbf{R}/\hbar$ should be $\mathbf{k}\cdot\mathbf{R}$.

Page 254, four lines above "Short-wavelength Difficulties": $\mathbf{k}\cdot\mathbf{R}/\hbar$ should be $\mathbf{k}\cdot\mathbf{R}$.

Page 254, three lines above "Short-wavelength Difficulties": $-\mathbf{k}$ should be $-\hbar\mathbf{k}$.

Page 254, second line of "Short-wavelength Difficulties": $\rho_k\rho_k/2k^2$ should be $4\pi\rho_{\mathbf{k}}\rho_{-\mathbf{k}}/k^2$.

Page 254, fifth line of "Short-wavelength Difficulties": $\rho_k = \mathrm{e}\exp(i\mathbf{k}\cdot\mathbf{q})$ should be $\rho_{\mathbf{k}} = \mathrm{e}e^{-i\mathbf{k}\cdot\mathbf{q}}$.

Page 254, sixth line of "Short-wavelength Difficulties": $\frac{1}{2}|\rho_k|^2/k^2 = 4\pi\mathrm{e}^2/2k^2$ should be $4\pi|\rho_{\mathbf{k}}|^2/k^2 = 4\pi\mathrm{e}^2/k^2$.

Page 254, sixth line of "Short-wavelength Difficulties": $4\pi\mathrm{e}^2\int(\frac{1}{2}k^2)d^3k/(2\pi)^3$ should be $\delta E_c = 4\pi\mathrm{e}^2\int(1/k^2)d^3\mathbf{k}/(2\pi)^3$.

Page 255, fifth line: $\mathrm{e}^2(k_{\max})^2/2\pi m_\pi c$ should be $\hbar\mathrm{e}^2(k_{\max})^2/2\pi m_\pi c$.

Page 255, two lines below display equation: $\Delta E = 0.034m_\pi$ should be $\Delta E = 0.034m_\pi c^2$.

Page 255, seven lines above bottom: 782.71 ± 0.40 kev should be 782.61 ± 0.40 kev.

Page 256, fourth line of section 9-6: Rutherford should be Retherford.

Pages 256–257, equations (9-74), (9-75), (9-76), and (9-77): d^3k should be $d^3\mathbf{k}$.

Page 257, one line below (9-78): The expression $\delta E'''$ should be $\delta E''$.

Page 257, one line below (9-78): The expression $-(p^2/2m_0)\delta m$ should be $-(p^2/2m_0)(\delta m/m_0)$.

Page 257, equation (9-80): The

$$\sum_M \quad \text{should be} \quad \sum_N .$$

Page 257, first line of footnote: $\int d^3k/k^2$ should be $\int (1/k^2) d^3\mathbf{k}/(2\pi)^3$.

Page 258, one line above (9-81): Change "First note that..." to "First note that, in view of Eq. (5-17),...".

Page 258, equation (9-83): In three places, j should be $\mathbf{j}$. And the expression $e^{-(\mathbf{k}\cdot\mathbf{R}-\omega t)}$ should be $e^{-i(\mathbf{k}\cdot\mathbf{R}-\omega t)}$.

Page 259, one line above equation (9-86): Should be "the Coulomb portion of the action, Eq. (9-29), is".

Page 259, equation (9-86): Numerous errors. Should be

$$S_c = -2\pi \int\int \frac{|\rho(\mathbf{k},\omega)|^2}{k^2} \frac{d^3\mathbf{k}}{(2\pi)^3} \frac{d\omega}{2\pi} = -2\pi \int\int \frac{(\omega|\rho|/k)^2 - |\rho|^2 c^2}{\omega^2 - k^2c^2} \frac{d^3\mathbf{k}}{(2\pi)^3} \frac{d\omega}{2\pi}.$$

Page 259, equation (9-88): $\rho(k,\omega)$ should be $\rho(\mathbf{k},\omega)$.

Page 260, equation (9-90): On left-most side, omit either factor of $(2\pi)^4$

Page 260, one line below equation (9-90): The function $\delta_+(x)$ should be defined as $-i/[\pi(x-i\epsilon)]$.

Page 260, third line of section 9-7: The reference to equation (9-90) should be to (9-60).

Page 261, line above (9-92): S should be X.

Page 261, equation (9-92): The factor of π/k in front should not be there, and the differential should be

$$\prod_{\mathbf{k}} \mathcal{D}a_{1,\mathbf{k}}\, \mathcal{D}a_{1,\mathbf{k}}.$$

(It's amusing to think about how these twin errors came to be.)

Page 261, equation (9-93): In two places k should be L, $\sqrt{4\pi}$ should be $\sqrt{\pi}$, two factors of 1/2 are missing, and nine overbars are missing. The equation should be

$$X'_{1,\mathbf{L}} = \int \exp\left\{\frac{i}{\hbar}\int \left[\sqrt{\pi}(\bar{j}^*_{1,\mathbf{L}}\bar{a}_{1,\mathbf{L}} + \bar{j}_{1,\mathbf{L}}\bar{a}^*_{1,\mathbf{L}}) + \tfrac{1}{2}\dot{\bar{a}}^*_{1,\mathbf{L}}\dot{\bar{a}}_{1,\mathbf{L}} + \tfrac{1}{2}L^2c^2\bar{a}^*_{1,\mathbf{L}}\bar{a}_{1,\mathbf{L}} - \tfrac{1}{2}\hbar Lc\right] dt\right\} \mathcal{D}\bar{a}_{1,\mathbf{L}}.$$

Pages 261–262: In equations (9-94), (9-95), (9-96), and the display equation below (9-94), the factor should be

$$i\sqrt{\frac{2\pi}{\hbar Lc}}\int \bar{j}_{1,\mathbf{L}} e^{iLct}\, dt.$$

Page 261, bottom line: "The expression which we previously evaluated was equivalent" should be "The expression which we previously evaluated, Eq. (9-50), was equivalent".

Page 263, equation (9-99): $\mathbf{A}(\mathbf{R},t)$ should be $\mathbf{A}(\mathbf{R},t)/c$.

Page 263, equation (9-100): $\mathbf{A}$ should be $\mathbf{A}/c$.

Page 263, equation (9-101): i should be $(1/2c)$.

Page 265, display equation: On the right-hand side, $2\hbar$ should be $-i\hbar c\,\delta_{i,j}$.

Summary: More than 207 errors.

Chapter 10: Statistical Mechanics

Page 268, last sentence of second paragraph: The currently accepted value of Boltzmann's constant is $k = 1.380\,650\,3 \times 10^{-16}$ erg/K or 1 eV per 11 604.51 K. (Note: Today we use eV instead of ev, but both terms were in use in 1965.)

Page 269, equation (10-5): The symbol dV represents the differential volume element in $3N$-dimensional configuration space, not in 3-space. That is, dV means $d^3\mathbf{r}_1 \cdots d^3\mathbf{r}_N$.

Page 270, third line: E_i should be ϕ_i.

Page 270, equation (10-10): Same point as raised concerning equation (10-5).

Page 271, lines 9–10: The phrase "this corresponds to" should be "this is the negative of".

Page 271, equation (10-19): Sign error. Should be $dQ = -T \cdots$.

Page 271, equation (10-20): The left-hand side dQ should be dQ/dV.

Page 272, equation (10-25): Sign error. Should be $U = F + T$S.

Page 273, four lines below (10-28): The expression $A\rho(x'x)$ should be $A\rho(x', x)$.

Page 275, equation (10-41): Place a factor of $1/a$ in front of the entire right-hand side to make it read

$$k(x_2, u_2; x_1, u_1) = \frac{1}{a} \int \Big(\cdots\Big) \prod_{i=1}^{N-1} \frac{dx_i}{a}.$$

Page 276, equation (10-43): The upper limit of integration, printed as βh, should be $\beta\hbar$.

Page 276, ten lines above equation (10-44): Eq. (10-42) should be (10-43), and $1/\beta$ should be $1/k\beta$.

Page 276, equation (10-44): In the denominator of the exponent, expression $(\sinh \omega\beta\hbar)^2$ should be $\sinh \omega\beta\hbar$.

Page 280, equation (10-52): The right-hand side should end with "$+\cdots$".

Page 280, equation (10-53): The expression $[x(u) - \bar{x}]^2$ should be $\frac{1}{2}[x(u) - \bar{x}]^2$.

Page 280, display equation two lines above bottom of page: To avoid a dimensional error at equation (10-55), this equation is better written with a prefactor $1/\beta\hbar$ (compare equation (10-50)) to read

$$\frac{1}{\beta\hbar}\int_0^{\beta\hbar}(x-\bar{x})\,du = 0.$$

Page 281, display equation two lines below top of page: As in the previous correction, this equation is better written

$$\frac{1}{\beta\hbar}\int_0^{\beta\hbar} y\,du = 0.$$

Page 281, two lines below (10-54): Sign error. The equation should be $\omega^2 = V''(0)/m$.

Page 281, five lines below (10-54): As in the two previous corrections, this delta function is better written with a prefactor $1/\beta\hbar$ to read

$$\delta\left(\frac{1}{\beta\hbar}\int_0^{\beta\hbar} y\,du\right).$$

Page 281, equation (10-55): The term $+iky$ is dimensionally incorrect. In light of the three previous corrections, it should be $-iky/\beta$.

Page 281, equation (10-56): The exact value of this path integral is

$$\sqrt{\frac{mkT}{2\pi\hbar^2}}\frac{\beta\hbar\omega/2}{\sinh(\beta\hbar\omega/2)}.$$

Page 282, problem 10-4: The expression $\beta^3\hbar^3$ should be $\beta^3\hbar^4$.

Page 283, equation (10-59): Sign error. The expression m should be $-m$.

Pages 283–285: The derivation of the effective potential equation (10-68) is flawed. The book claims, below equation (10-59), that "we can look upon the path integral in this expression as representing the average over paths". This is not an average because it is not normalized. To get the correct answer, Feynman and Hibbs throw in a few factors *ex post facto* at equation (10-65). A better scheme would be to normalize the average at equation (10-62).

Page 283, equation (10-62): $x(t)$ should be $x(u)$, dt should be du, and

$$\frac{1}{\hbar} \quad \text{should be} \quad -\frac{1}{\hbar}.$$

Page 283, below equation (10-63): Change "where the paths..." to "where t is some particular value of u with $0 \le t \le \beta\hbar$, and where the paths...".

Page 283, equation (10-64): The expression

$$\int_0^{\beta\hbar} y(u)\,du \quad \text{should be} \quad \frac{1}{\beta\hbar}\int_0^{\beta\hbar} y(u)\,du.$$

Page 284: In text and captions and figures, every occurrence of t should be u, however the occurrences of t_1 are correct. (A total of 15 errors.)

Page 284, line 2: The word "families" should be "family".

Page 284, figure 10-2: The lower appearance of $y(t\ )$ should be $y(t_1)$,

Page 285, line 1: $y_i(t)$ should be $y_i(u)$.

Page 285, display equation three lines below top of page: The expression y^2 should be $\dot{y}^2$. Also, the upper limit of integration $\beta\mathrm{\hbar}$ (roman typeface) should be $\beta\hbar$ (italic typeface).

Page 285, equation (10-65): At the far right, the expression

$$\frac{\langle f\rangle}{\beta} \quad \text{should be} \quad -\frac{\langle f\rangle}{\beta}.$$

Page 285, equation (10-66): The upper limit of integration $\beta\mathrm{\hbar}$ (roman typeface) should be $\beta\hbar$ (italic typeface).

Page 285, three lines above bottom: The expression "mean-square spread" should be "root-mean-square spread".

Page 286, one line above equation (10-70): "approximate potential" should be "effective potential".

Page 286, equation (10-70): The expression $\hbar$ should be $\hbar^2$.

Page 287, equation (10-73): The expression $\dot{\mathbf{R}}i$ should be $\dot{\mathbf{R}}_i$.

Page 287, equation (10-74): The expression

$$\int_0^{\beta\hbar} |\dot{\mathbf{R}}(t)|^2\,dt \quad \text{should be} \quad \sum_i \int_0^{\beta\hbar} |\dot{\mathbf{R}}_i(u)|^2\,du.$$

Also, the variable t should be u at all six occurrences.

Page 287, two lines below equation (10-74): The expression $\mathcal{D}\mathbf{R}_1\,\mathcal{D}\mathbf{R}_2\,\mathcal{D}\mathbf{R}_3\cdots\mathcal{D}\mathbf{R}_N$ should be $\mathcal{D}^3\mathbf{R}_1\,\mathcal{D}^3\mathbf{R}_2\,\mathcal{D}^3\mathbf{R}_3\cdots\mathcal{D}^3\mathbf{R}_N$.

Page 287, four lines below equation (10-74): At two places, $\mathbf{R}_i(\beta)$ should be $\mathbf{R}_i(\beta\hbar)$.

Page 288, third line of second full paragraph: The expression $x(\beta)$ should be $x(\beta\hbar)$.

Page 288, equation (10-75): In the expression $Px_3 = x_3\cdots Px_N = x_N\cdots$, the first ellipsis is correct, but the last should be removed.

Page 288, equation (10-76): The expression $x_j(\beta)$ should be $x_j(\beta\hbar)$.

Page 289, equation (10-77): The expression

$$\sum_P{}' \, d^N\mathbf{R}(0) \quad \text{should be} \quad \sum_P{}' \int d^N\mathbf{R}(0).$$

Also, the variable t should be u at all five occurrences.

Page 289, one line above equation (10-79): The scalar expression r_c, r_d should be the vector expression $\mathbf{r}_c, \mathbf{r}_d$.

Page 290, second line: The phrase "energy eigenvalues" should be "energy eigenstates".

Page 290, one line above equation (10-82): The expression "N atom" should be "N atoms".

Page 290, equation (10-83): In the second line, $\phi_n(x)$ should be $\phi_N^*(x)$. Also, bad typeface: the expression

$$\sum_n^{sym} \quad \text{should be} \quad \sum_n^{\text{sym}}.$$

Page 291, equation (10-84): Same typeface problem as equation (10-83).

Page 291, last word: "perturbation" should be "permutation".

Page 294, equation (10-85): The expression

$$\sinh \frac{\hbar\omega_i}{kT} \quad \text{should be} \quad \sinh \frac{\hbar\omega_i}{2kT}.$$

Page 295, first line: The word "energy" should be "energy density".

Page 295, equation (10-89): The expression $\hbar\omega$ should be $\hbar\omega^3\, d\omega$.

Page 295, equation (10-90) and the following 13 lines: To avoid confusion between wave vector and Boltzmann's constant, and for consistency with page 294, each occurrence of $\mathbf{k}$ or k on this page should be replaced with $\mathbf{K}$ or K (12 times).

Page 295, two lines below equation (10-90): The expression $3p\omega$ should be $3p$.

Page 296, line 15: The reference to equation (10-1) should be to (10-2).

Page 298, line 6: $t > T$ should be $t < T$ and vice versa.

Summary: 99 errors.

Chapter 11: The Variational Method

Pages 300–310: All occurrences of variable t should be u, except for the occurrence one line below equation (11-35) — a total of 65 times!

Page 300, two lines above equation (11-3): The word "small" should be "large".

Page 301, figure 11-1: The horizontal axis should be labeled x.

Page 302, fifth line: $e^{S-S'}$ should be $e^{\langle S-S' \rangle}$.

Page 302, equation (11-9): In two places, the subscript 0 shouldn't be there.

Page 302, two lines below equation (11-11): The expression F_0' should be F'.

Page 302, six lines below equation (11-11): The word "derivation" should be "deviation".

Page 303, six lines below equation (11-14): The density matrix $\beta(x', x)$ should be $\rho(x', x)$.

Page 304, one line above equation (11-20): The reference to equation (11-14) should be to (11-11).

Page 305, equation (11-22): There should be a $-$ sign in front of the right-hand side.

Page 306, two lines below equation (11-24): The reference to equation (11-13) should be to (11-10).

Pages 306 and 307, equations (11-25), (11-26), (11-28), (11-30), and (11-32): On the left-hand sides of these five equations, the expression E_0' should be F'.

Page 306, last line: The reference to equation (11-13) should be to (11-10).

Page 307, one line above equation (11-32): $V(\bar{x})$ should be $\overline{V(\bar{x})}$.

Page 307, one line below equation (11-32): The reference to equation (11-24) should be to (11-23).

Page 307, equation (11-34): The summation variables n are misplaced (twice).

Page 307, four and five lines below equation (11-34): Twice, the reference to equation (11-13) should be to (11-14).

Page 308, seven lines below equation (11-35): The reference to equation (11-13) should be to (11-14).

Page 308, equation (11-36): Sign error; the $+$ should be a $-$.

Page 308, equation (11-37): The first integral should be preceded by a $-$ sign.

Page 308, equation (11-40): The expression "$= \langle V - V' \rangle$" should be "$= -\langle V - V' \rangle$".

Page 308, one line below equation (11-40): The reference to chapter 2 should be to chapter 10.

Page 309, equation (11-41): First sum over n should be a double sum over n, m. In the first line, E_m' should be E_n', E_n' should be E_m', and $\phi'_m(x_1)$ should be $\phi'^*_m(x_1)$. In the second line, $\phi'^*_n(x_2)\phi'_n(x_1)$ should be $\phi'_n(x_2)\phi'^*_n(x_1)$.

Page 310, lines eight and ten: Twice, the reference to equation (11-13) should be to (11-14).

Page 310, footnote: Frohlich should be Fröhlich.

Page 311, equation (11-52): This equation should be

$$\rho = -\nabla \cdot \mathbf{P} = -ika_k e^{i\mathbf{k}\cdot\mathbf{r}}.$$

Page 311, equation (11-53): This equation should be

$$\nabla^2 V = -4\pi\rho.$$

Page 311, two lines above bottom: The expression $e^{i\mathbf{k}\cdot\mathbf{x}}$ should be $e^{i\mathbf{k}\cdot\mathbf{r}}$.

Page 312, one line below equation (11-56): The reference to chapter 8 should be to section 8-9.

Page 312, equation (11-58): αi should be α.

Page 313, equation (11-60): Sign error. The $\frac{1}{2}$ should be $-\frac{1}{2}$.

Page 313, seven lines below equation (11-60): The expression E' should be E'_0.

Page 314, two lines above (11-62): The reference to chapter 2 should be to section 3-5.

Page 314, equation (11-62): In two places, ds should be $dt\,ds$. α should be α/β, and C should be C/β.

Page 314, equation (11-63): Curly bracket } should come immediately after the square bracket] to read

$$\frac{1}{|\mathbf{r}(t)-\mathbf{r}(s)|} = \int \frac{4\pi}{k^2} \exp\{i\mathbf{k}\cdot[\mathbf{r}(t)-\mathbf{r}(s)]\} \frac{d^3\mathbf{k}}{(2\pi)^3}$$

Page 314, equation (11-64): In the denominator, omit the square brackets and the power -1.

Page 315, five lines below (11-66): The reference to chapter 2 should be to section 3-5.

Page 315, one line above equation (11-67): T should be β.

Page 315, equation (11-67): $e^{-w|-st|}$ should be $e^{-w|t-s|}$.

Page 315, two and three lines below equation (11-67): $X'(T) = 0$ should be $X'(\beta) = 0$. Change "if the time interval is 0 to T" to "if the 'time' interval is 0 to β", or omit it completely.

Page 316, one line above equation (11-73): The reference to equation (11-68) should be to (11-66).

Page 316, equation (11-73): In top equation, right-hand side, vectors should be scalars, and X should be X'.

Page 316, equations (11-75) and (11-77): These two equations hold in the limit $\beta \to \infty$.

Page 316, equation (11-75): Two extra ws. Should be

$$A = \frac{\alpha v}{\pi^{1/2}} \int_0^\infty \left[w^2\tau + \frac{v^2-w^2}{v}(1-e^{-v\tau}) \right]^{-1/2} e^{-\tau}\, d\tau$$

(See R.P. Feynman, "Slow electrons in a polar crystal," *Phys. Rev.* **97** (1955) 660–665, equation (31).)

Page 316, equation (11-76): $e^{-\tau-\sigma}$ should be $e^{-v|\tau-\sigma|}$. (See R.P. Feynman, "Slow electrons in a polar crystal," *Phys. Rev.* **97** (1955) 660–665, equation (31.5).)

Page 316, one line below equation (11-77): E' should be E'_0.

Page 316, two lines below equation (11-77): The reference to equation (11-6) should be to (11-13). (But actually even that one's not perfectly right.)

Page 316, equation (11-80): "$E =$" should be "$E_0 \le$".

Pages 317–319: All occurrences of E should be E_0 (9 times).

Page 317, two lines below equation (11-81): The reference to equation (11-37) should be to (11-61).

Page 317, three lines below equation (11-81): In expression for A, omit ω.

Page 317, one line below equation (11-82): Frohlich should be Fröhlich.

Page 317, one line above equation (11-83): The reference to equation (11-80) should be to (11-75).

Page 317, equation (11-83): $e^{w\tau}$ should be $e^{-w\tau}$, $2\pi^{1/2}$ should be $w\pi^{1/2}$.

Page 318, five lines above equation (11-89): The reference to equation (11-76) should be to (11-75).

Page 318, one line above equation (11-90): $41n^2$ should be $4\ln 2$.

Page 318, equation (11-90): α should be α^2.

Page 319, table 11-1: The symbol E_{1p} should be E_{lp}.

Page 319, table 11-1: This table is missing a line from the table in T.D. Schultz's paper (a line that is discussed in the text, line 9). Between E_f and E_{lp} there should be a line for E_{llp} as follows:

α	3	5	7	9	11
E_{llp}	-3.0000	-5.0000	-7.0000	-9.000	

Page 319, line 9: The symbol E_{11p} should be E_{llp}, the symbol E_{1p} should be E_{lp}.

Page 319, line 11: "α, e, and w" should be "α, v, and w".

Page 319, footnote 6: S.I. Bogolubov should be N.N. Bogolubov.

Summary: 155 errors.

Chapter 12: Other Problems in Probability

Page 325, first line: The reference to Chap. 7 should be to Sec. 11-1.

Page 325, equation (12-9): dk should be $dk/2\pi$.

Page 327, fifth line: Add the qualifier (used implicitly in the following, particularly at equation (12-20)), that the time interval T lasts for much longer than the pulse length.

Page 327, seventh line: $\sum_{j=1}^{n} g(t-t_j)$ should be $f(t) = \sum_{j=1}^{n} g(t-t_j)$.

Page 327, equation (12-17):

$$\int_0^T \quad \text{should be} \quad \int_0^T \cdots \int_0^T \int_0^T .$$

Page 329, two lines above equation (12-25): "second term" should be "second factor".

Page 329, equation (12-26): $(1/2\sigma)$ was surely intended to be $(1/2\sigma^2)$.

Page 331, equation (12-39): The expression σ should be σ^2.

Page 333, one line above equation (12-45): In $\int B(t-s)A(s)\,ds$, swap B and A.

Page 334, equation (12-48): Rightmost dt should be dt'.

Page 335, equation (12-54): Right-hand side should be within angle brackets, not absolute value signs.

Page 335, six lines below equation (12-54): The reference to equation (12-25) should be to (12-39).

Page 335, equation (12-55): The exponent $-i\omega t$ should be $+i\omega t$.

Page 335, equations (12-56) and (12-57): The double integral signs $\int\int \cdots d\omega$ should be a single integral sign $\int \cdots d\omega$.

Page 335, one line above (12-57): The reference to equation (12-26) should be to (12-56).

Page 335, equation (12-58): $\mathrm{K}(\omega)$ should be $\mathrm{K}^*(\omega)$.

Page 335, equation (12-59): $\mathrm{K}(\omega)$ should be $\mathrm{K}^*(\omega)$.

Page 335, two lines below equation (12-59): Δ should be $2\pi\Delta$.

Page 336, equation (12-60): In right-most exponent, $i\Delta\mathrm{K}(\omega)\phi(\omega)$ should be $-i\Delta\mathrm{K}^*(\omega)\phi(\omega)$.

Page 336, equation (12-61): $\Phi(\omega)$ should be $\mathcal{P}(\omega)$.

Page 337, five lines above equation (12-65): μ should be $\mu\,dt$.

Page 338, line above (12-68): $G(w)$ should be $W[\omega]$.

Page 340, last sentence of first paragraph of section 12-7: $e^{-E/kt}$ should be $e^{-E/kT}$.

Page 342, two lines above equation (12-87): The phrase "characteristic function" should be "correlation function".

Page 342, line above equation (12-87): The reference to equation (12-46) should be to (12-40).

Page 343, four and two lines above bottom: In two places, S_i should be S_{int}.

Page 346, equation (12-96): $\mathcal{D}Q_f$ should be dQ_f.

Page 346, one line above equation (12-97): $\phi^*(Q_i)$ should be $\phi^*(Q_i')$.

Page 347, two lines above bottom: $q(t)V(t)$ should be $-q(t)V(t)$.

Page 349, one line above equation (12-105): The reference to chapter 4 should be to chapter 7.

Page 349, one line below equation (12-105): $e^{iS[q']}$ should be $e^{-iS[q']}$.

Page 349, equation (12-107): $-i$ should be $+i$.

Page 349, equation (12-108): $2\,$R.P. should be $2|q_{mn}|^2\,$R.P. .

Page 350, equation (12-109): $e^{-\nu\tau}$ should be $e^{-i\nu\tau}$.

Page 350, two lines above (12-112): The reference to equation (12-32) should be to (12-50).

Page 350, one line below equation (12-113): $P(\omega)$ should be $\mathcal{P}(\omega)$.

Page 351, equations (12-116) and (12-117): In three places, $+\omega^2$ should be $-\omega^2$.

Page 352, equation (12-119): $\sum_n$ should be $\sum_m$. In two places, G'_{00} should be G'^{*}_{00}.

Page 352, equation (12-122): $i\omega_t$ should be $i\omega t$.

Page 353, equations (12-124) and (12-126):

$$e^{-n\hbar\omega/kT}(1 - e^{-\hbar\omega/kT}) \quad \text{should be} \quad e^{-n\hbar\omega/kT}/(1 - e^{-\hbar\omega/kT})$$

Page 353, equation (12-127): G'_{00} should be G'^{*}_{00}.

Page 353, two lines below equation (12-128): $\omega < 0$ should be $\nu < 0$.

Summary: 49 errors.

Appendix: Some Useful Definite Integrals

Page 357:

The first expression holds true when $\Re e\{a\} \leq 0$.

The second expression holds true when $\Re e\{a + b\} \leq 0$.

The third expression is best written in three forms, each of which holds true when a and b are positive real numbers:

$$\begin{aligned}
\int_0^\infty \exp\left\{-\frac{a}{x^2} - bx^2\right\} dx &= \sqrt{\frac{\pi}{4b}} \exp\{-2\sqrt{ab}\} \\
\int_0^\infty \exp\left\{-\frac{ia}{x^2} - ibx^2\right\} dx &= \sqrt{\frac{\pi}{i4b}} \exp\{-i2\sqrt{ab}\} \\
\int_0^\infty \exp\left\{\frac{ia}{x^2} + ibx^2\right\} dx &= \sqrt{\frac{i\pi}{4b}} \exp\{i2\sqrt{ab}\}
\end{aligned}$$

There is a misprint in the value of the fourth integral, which is again best written in three forms, each of which holds true when a and b are positive real numbers:

$$\begin{aligned}
\int_0^T \exp\left\{-\frac{a}{T-\tau} - \frac{b}{\tau}\right\} \frac{d\tau}{\sqrt{(T-\tau)\tau^3}} &= \sqrt{\frac{\pi}{bT}} \exp\left\{-\frac{1}{T}(\sqrt{a} + \sqrt{b})^2\right\} \\
\int_0^T \exp\left\{-\frac{ia}{T-\tau} - \frac{ib}{\tau}\right\} \frac{d\tau}{\sqrt{(T-\tau)\tau^3}} &= \sqrt{\frac{\pi}{ibT}} \exp\left\{-\frac{i}{T}(\sqrt{a} + \sqrt{b})^2\right\} \\
\int_0^T \exp\left\{\frac{ia}{T-\tau} + \frac{ib}{\tau}\right\} \frac{d\tau}{\sqrt{(T-\tau)\tau^3}} &= \sqrt{\frac{i\pi}{bT}} \exp\left\{\frac{i}{T}(\sqrt{a} + \sqrt{b})^2\right\}
\end{aligned}$$

The fifth integral can be found by taking the partial derivative of the fourth integral with respect to a. It is again best written in three forms, each of which holds true when a and b are positive real numbers:

$$\int_0^T \exp\left\{-\frac{a}{T-\tau}-\frac{b}{\tau}\right\}\frac{d\tau}{\left[\sqrt{(T-\tau)\tau}\right]^3} = \sqrt{\frac{\pi}{T^3}}\frac{\sqrt{a}+\sqrt{b}}{\sqrt{ab}}\exp\left\{-\frac{1}{T}(\sqrt{a}+\sqrt{b})^2\right\}$$

$$\int_0^T \exp\left\{-\frac{ia}{T-\tau}-\frac{ib}{\tau}\right\}\frac{d\tau}{\left[\sqrt{(T-\tau)\tau}\right]^3} = \sqrt{\frac{\pi}{iT^3}}\frac{\sqrt{a}+\sqrt{b}}{\sqrt{ab}}\exp\left\{-\frac{i}{T}(\sqrt{a}+\sqrt{b})^2\right\}$$

$$\int_0^T \exp\left\{\frac{ia}{T-\tau}+\frac{ib}{\tau}\right\}\frac{d\tau}{\left[\sqrt{(T-\tau)\tau}\right]^3} = \sqrt{\frac{i\pi}{T^3}}\frac{\sqrt{a}+\sqrt{b}}{\sqrt{ab}}\exp\left\{\frac{i}{T}(\sqrt{a}+\sqrt{b})^2\right\}$$

The sixth integral is missing a "dx". The result holds true when $\Re e\{a\} \geq 0$. (But in fact, this integral shouldn't be here at all, since it's just the first integral with $b = 0$.)

The seventh integral should have $e^{+q\sin x}$ rather than $e^{-q\sin x}$ in the integrand.

The tenth (and final) expression should have "m" rather than "n" in $\Gamma((k+1)/m)$. It holds true when $k > -1$, $\lambda > 0$, and $m > 0$.

On page 53, the integral

$$\int_{-\infty}^{+\infty} e^{iax}\,dx = 2\pi\delta(a)$$

is promised in the appendix, but it never appears. I suspect that the sixth integral was intended to be this one.

It would also be a good idea to add the integral (promised on page 354)

$$\int_0^\infty e^{i\omega t}\,dt = \lim_{\epsilon\to 0+}\frac{i}{\omega+i\epsilon} = \text{P.P.}\left(\frac{i}{\omega}\right)+\pi\delta(\omega)$$

and the expression

$$\int f(\mathbf{k})\frac{d^3\mathbf{k}}{(2\pi)^3} = \frac{1}{\text{Vol}}\sum_{\mathbf{k}} f(\mathbf{k}).$$

Erroneous index entries

"Jacobian, J." should be "Jacobian"

"Lamb, Sir Horace" should be "Lamb, W."

"Pekar, S.E." should be "Pekar, S.I."

"Rutherford, E." should be "Retherford, R.C."

Expanded index entries