

# SCHWARTZ ERRATA

## PART III<sup>1</sup>

- p391–393, 398, 400, 402, 422, 436, nine instances of ‘non-analytic’ should be ‘non-polynomial’
- p389, below (21.20), should say two more factors of  $k$ , not  $k^2$
- p387, below (21.14), divergent graphs are those with  $D \geq 0$
- p385, in (21.12) there should be a factor  $(2\pi)^8$  instead of  $(2\pi)^4$
- p377, paragraph 2, should have  $Q^2 > 0$
- p359, in (20.21) there is a missing factor of  $1/4$  on the RHS
- p359, in (20.23) there is a missing  $\text{Re}$  on the LHS
- p353, in (19.87) there is an overall factor of  $-1$  missing
- p321, in (17.33) there should be a dagger after the two covariant derivatives
- p321, in (17.33) there should be Dirac adjoints on the electron and muon fields
- p402, in (22.19) the  $\pi^-$  should be a  $\pi^+$
- p408, missing factor of  $i$  on RHS of (22.44)
- p409, equation (22.51) is based on (22.45) not (22.46)
- p409, factors of  $1/20$ ,  $1/10$ ,  $1/20$  in equations (22.50,51,52) should be  $1/10$ ,  $1/5$ ,  $1/10$  respectively
- p410, superficial,  $m_p$  at end of 22.6.1 should be  $m_P$
- p422, in (23.17) and (23.18) the  $p^2$  in the logarithm should be  $-p^2$
- p427, in (23.40) there should be a factor  $-4$  and the labels  $\nu_e$  and  $e$  should be swapped
- p434, in (23.78) I have a strong feeling  $\gamma_{\mathcal{O}}$  should be  $-\gamma_{\mathcal{O}}$
- p437, in (23.96) I would have thought the corrections should be order  $\lambda_R^2$
- p440, in the penultimate paragraph,  $d < 3$  should be  $d < 4$
- p446, I think  $b$  and  $c$  should be interchanged throughout (23.120)–(23.127)
- p450, we should rescale  $C_n \rightarrow C_n \mu^{4-d_n}$
- p457, I think the ‘retarded propagator’ should be called the ‘advanced propagator’
- p463, in the second paragraph should have  $\Gamma \sim \text{Im}(\Sigma) \sim g^2$
- p464, in the first line,  $\text{Im}(\mathcal{M}) \leq |\mathcal{M}|^2$  does *not* imply  $\mathcal{M} \leq 1$
- p467, beneath (24.65), should have  $\langle X|\phi(x)|\Omega\rangle = e^{ipx}\langle X|\phi(0)|\Omega\rangle$
- p467, equation (24.66) only holds if  $\phi(0)$  is Hermitian
- p476, the prefactors in equations (24.108), (24.109) should be  $\lambda^2/4$

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<sup>1</sup>NB I only started recording errors in this file from chapter 21.

## PART IV<sup>2</sup>

- p490, the surface integral in 25.51 probably shouldn't have a factor  $1/2$
- p493, in (25.73) there should be an additional  $-A^3/3$  term
- p502, beneath (25.120) we should have  $r_\mu \Pi^{\mu\nu ab} = 0$
- p505, (25.135) should read  $C(x) \equiv \langle \Omega | \mathcal{O}(0) \mathcal{O}(x) | \Omega \rangle$
- p515, on the last line, should have  $T_{ik}^a T_{ki}^a$
- p523, in diagram (26.65) I think the indices  $i$  and  $j$  should be swapped
- p524, in diagram (26.72) the lower line should have momentum  $q_1 - k$
- p524, in (26.74) all instances of  $q_1$  should be replaced with  $-q_1$  as a result
- p532, the references to (26.108) and (26.109) should be to (26.111) and (26.112)
- p544, penultimate paragraph should say that *adjoint* of  $U(N)$  is equivalent to  $N \times \bar{N}$
- p550, in (27.86) I think  $\widetilde{\mathcal{M}}_t$  should acquire a minus sign in the second line (see (27.62))
- p564, in (28.9)  $\omega_p$  should be  $\omega_q$  and  $e^{i\mathbf{q}\cdot\mathbf{y}}$  should be  $e^{-i\mathbf{q}\cdot\mathbf{y}}$
- p564, above (28.9), we should integrate with  $e^{-i\mathbf{p}\cdot\mathbf{y}}$ , not  $e^{i\mathbf{p}\cdot\mathbf{y}}$
- p564, beneath (28.9),  $\delta^3(\mathbf{p} - \mathbf{k})$  should be  $\delta^3(\mathbf{p} - \mathbf{q})$
- p566, in (28.16) the right hand side should have a minus sign (similarly for (28.30))
- p569, in (28.24) the prefactor should be  $(v + \sigma)/2$
- p569, in (28.28) the second term should be  $(D_\mu \pi^+)(D^\mu \pi^-)$
- p570, below (28.29), should have  $L_1 = (\nu_e, e)$
- p571, in (28.32) the second term should have  $(1 - \gamma^5)$
- p571, I think (28.33) is correct up to factors of  $i$
- p581, on the left of (28.62), we should shift  $\pi^a$  to  $\pi^a + m_A \alpha^a$
- p581, on the right of (28.62),  $m_A$  should be  $-m_A^2$  in both cases
- p581, in (28.63) and (28.64),  $\xi m_A^2 c^a$  should be  $-\xi m_A^2 c^a$
- p582, in the final paragraph we should have  $E \gg m_A$
- p586, the definition of  $W_\mu^\pm$  should have no superscript 2
- p590, in the first paragraph,  $a_0$  should be negative
- p596, the hypercharge interactions are *flavour* diagonal, not just generation diagonal
- p597, in (29.58) the phase in the top right of the middle matrix should be  $e^{-i\delta}$
- p597, in (29.59) the  $\lambda^2$  on the bottom row should be  $-\lambda^2$
- p600, above (29.64) it might be better to define  $\psi_R = (-i\sigma_2 \nu_R^*, \nu_R)$
- p600, in (29.64) there should be a + h.c.
- p601, in (29.65) should have  $(\tilde{H}^\dagger L^c)(\tilde{H}^\dagger L)$  (consider hypercharge neutrality)
- p601, in (29.66) and (29.67) the  $\tilde{W}$  should be  $\tilde{W}^-$  and there should be no overall sign

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<sup>2</sup>NB I only started recording errors from 25.2. The section on Lie groups and algebras is rife with small errors.

- p601, below (29.67) the equation for  $\nu_{Le}$  doesn't account for the rotation of the charged electrons
- p604, in (29.79) I think there should be a factor of  $2\cos^2\theta_W$  in front of the  $(J_\mu^Z)^2$  term
- p605, there should be factors of  $-1/2$  in (29.81) (not properly corrected in his errata)
- p608, second paragraph, should have  $K^+ \rightarrow \pi^+\pi^0$ , which involves  $\bar{s} \rightarrow \bar{d}uu$
- p610, in (29.99), under  $C$  the correct transformation is in fact  $A \rightarrow -A^T$
- p618, in (30.9) the  $xy$  term should have a positive sign
- p627, in fourth paragraph, two instances of  $q_\alpha^1$  should be  $q_\mu^1$
- p627, in (30.53) there should be an additional term  $(Q_R^3 + Q_L^3)M_V^{\alpha\mu\nu}/2$
- p629, in (30.64) should have  $e^{-\mathbb{W}^2/\Lambda^2}$
- p630, in (30.66) there should be an overall minus sign
- p632, in (30.79) the RHS should read  $A(R)d^{abc}/2$
- p635, major omission in section 30.5: the anomalies  $U(1)_Y^2 U(1)_B$  and  $U(1)_Y^2 U(1)_L$  are also non-zero
- p635, (30.88) should consequently have an extra term  $-n_g(g'^2/32\pi^2)\epsilon^{\mu\nu\alpha\beta}B_{\mu\nu}B_{\alpha\beta}$
- p635, sphalerons are not locally gauge-equivalent to zero (they have mass!) or topologically stable
- p636,  $CPT$  invariance does not guarantee equal rates for matter to antimatter and vice versa
- p637, in (30.93) there are missing  $a$  superscripts
- p647, in (31.30) there should be a factor of  $-1$  on the second line
- p649, in (31.44) the momenta in the loop should be  $k$  and  $k+p$
- p650, above (31.51),  $Z$  couples to  $T^3 - s^2 Q$  with strength  $+e/sc$
- p651, in (31.61) I think  $4m_W^2$  should be  $2m_W^2$
- p653, below (31.66) the  $W$  mass should be given in GeV
- p654, in (31.74) the final term should be  $(J_\mu^3 - s^2 J_\mu^{\text{EM}})^2$
- p659, the RHS of (31.87) should be  $i\mathcal{M}$
- p661, in (31.99) the  $d_L^i$  should be  $b_L^i$
- p663, in (31.110) both terms should have the prefactor  $\alpha_s/\pi$
- p678, in (32.32) and directly beneath,  $4z/Q^2$  should be  $4z^2/Q^2$
- p682, my derivation of (32.58) has an extra factor  $8(1-z)$
- p683, in (32.61) there should no factor of  $Q^2$  — this is cancelled by the change in measure
- p684, in (32.64) the  $\delta$  at the end of the line should be  $\delta t$
- p684, in (32.64) and (32.65), the minus signs should be plus signs (assuming  $\delta t < 0$  and  $t < t_0$ )
- p689, in third paragraph, should have  $(P \pm q)^2 = Q^2(-1 \pm \omega)$
- p691, in (32.90) there is an extra factor of  $i$  in the second term
- p693, above (32.101),  $f_1(x)$  should be  $f_q(x)$
- p697, in the first line of (32.114), there should be no subscript  $i$  on the integration measure

An incomplete list of errata for chapter 33 follows:

- p716, in (33.76) the coefficient of  $\sigma_{\mu\nu}F^{\mu\nu}$  should be  $-ies/2$  in both lines
- p716, in (33.76)  $\cosh(esX)$  should be  $\cos(esX)$
- p723, in (33.107) there should be no  $\phi$
- p724, in (33.109) there should be a factor  $s^2$  in the denominator
- p724, in (33.109), (33.110) and (33.111) the coefficient of  $\sigma_{\mu\nu}F^{\mu\nu}$  should be  $-ies/2$
- p724, in (33.109), (33.110) and (33.111)  $\cosh(esX)$  should be  $\cos(esX)$  (and next to  $\text{Im}$ )
- p724, in (33.110) there is an overall minus sign missing
- p724, in (33.110) there should be no factor  $s^2$  in the numerator
- p724, in (33.111) there should be a plus sign on the right
- p724, in (33.112) there should be no factor of  $i$  on the left, and a minus sign on the right
- p724, in (33.113) the final term should have a minus sign
- p729, in (33.A.148) there should be no minus signs on either line
- p730, in (33.A.150) there should be no minus sign on the left
- p730, in (33.A.151) the coefficient of  $\text{tr}(\sigma\mathbf{F})$  should be  $+ies/2$
- p731, in (33.A.157) the coefficient of  $\text{tr}(\sigma\mathbf{F})$  should be  $+ies/2$
- p731, in (33.A.158) there should be a plus sign in front of the factor of  $1/32\pi^2$
- p731, in (33.A.158) there should be no  $s$  in the denominator of the argument of the logarithm
- p731, in (33.A.161) the right hand side should read  $-\mathbf{E} \cdot \mathbf{B}$
- p731, in (33.A.164)  $\mathcal{F} + i\mathcal{G}$  should be  $\mathcal{F} - i\mathcal{G}$
- p732, in (33.A.167) the left hand side should be the argument of an exponential