Corrections to *Weak Scale Supersymmetry*

(Paper Back Edition, 2012)

Howard Baer and Xerxes Tata, Cambridge University Press

Chapter 8

page 163, unnumbered equation at the top of the page: The $SU(3)$ coupling matrices in the round brackets are unfortunately denoted by the same symbol that we use to denote the $SU(3)$ gaugino λ_A in this equation. We apologise for any confusion caused by this terrible notation.

We thank Themis Athanassiadou for pointing this out. (November 10, 2007)

page 185, Eq. (8.127) should read,

$$\begin{aligned}\Delta V &\simeq \frac{3}{32\pi^2}\left[(m^2_{\tilde{t}_L}+f_t^2|h_u^0|^2)^2\left(\log\frac{m^2_{\tilde{t}_L}+f_t^2|h_u^0|^2}{Q^2}-\frac{3}{2}\right)\right.\\ &+ (m^2_{\tilde{t}_R}+f_t^2|h_u^0|^2)^2\left(\log\frac{m^2_{\tilde{t}_R}+f_t^2|h_u^0|^2}{Q^2}-\frac{3}{2}\right)\\ &- \left. 2f_t^4|h_u^0|^4\left(\log\frac{(f_t^2|h_u^0|^2)}{Q^2}-\frac{3}{2}\right)\right].\end{aligned}$$

(Dec. 3, 2011)

page 187, After Eq. (8.133) insert, "where $x = \frac{m^2_{\tilde{g}}}{m^2_{\tilde{q}}}$." (Nov. 30, 2011)

Chapter 9

page 226: The argument of the Bessel function K_1 on the right-hand-side of Eq. (9.34) should read $\frac{a}{x}$, not $\frac{a}{4}$. (July 11, 2014)

Chapter 10

page 252, The transformation of $\hat{f}$ in the exercise should read

$$\hat{f}(\hat{\mathcal{S}}) \rightarrow \exp\left(h(\hat{\mathcal{S}})\right)\hat{f}.$$

(Aug. 28, 2017).

We thank Dibyashee Sengupta for bringing this typo to our attention.

Chapter 16

page 470: On the second line of the paragraph beginning on top of the page, $\widetilde{Z}_1 \to cds + c\bar{d}\bar{s}$ should read $\widetilde{Z}_1 \to cds + \bar{c}\bar{d}\bar{s}$. (January 5, 2012)

Appendix A

page 487-88: A factor of factor of $\frac{1}{s}$ was inadvertently left out on the right-hand side of Eq. (A.25b). Eq. (A.25b) should read,

$$\frac{d\sigma}{dz}(e_L\bar{e}_R \to \tilde{\nu}_e\bar{\tilde{\nu}}_e) = \frac{p^3 E}{8\pi s}(1-z^2)\times$$

$$\left[\frac{4e^4(\alpha_\nu-\beta_\nu)^2(\alpha_e-\beta_e)^2}{(s-M_Z^2)^2+M_Z^2\Gamma_Z^2} + \frac{g^4\sin^4\gamma_R}{[2E(E-pz)+m_{\widetilde{W}_1}^2-m_{\tilde{\nu}_e}^2]^2}\right.$$

$$+\frac{g^4\cos^4\gamma_R}{[2E(E-pz)+m_{\widetilde{W}_2}^2-m_{\tilde{\nu}_e}^2]^2}$$

$$-\frac{4e^2g^2(\alpha_\nu-\beta_\nu)(\alpha_e-\beta_e)(s-M_Z^2)\sin^2\gamma_R}{[(s-M_Z^2)^2+M_Z^2\Gamma_Z^2][2E(E-pz)+m_{\widetilde{W}_1}^2-m_{\tilde{\nu}_e}^2]}$$
$$-\frac{4e^2g^2(\alpha_\nu-\beta_\nu)(\alpha_e-\beta_e)(s-M_Z^2)\cos^2\gamma_R}{[(s-M_Z^2)^2+M_Z^2\Gamma_Z^2][2E(E-pz)+m_{\widetilde{W}_2}^2-m_{\tilde{\nu}_e}^2]}$$
$$\left.+\frac{2g^4\sin^2\gamma_R\cos^2\gamma_R}{[2E(E-pz)+m_{\widetilde{W}_1}^2-m_{\tilde{\nu}_e}^2][2E(E-pz)+m_{\widetilde{W}_2}^2-m_{\tilde{\nu}_e}^2]}\right].$$

(June 3, 2014)

Corrections to *Weak Scale Supersymmetry*

(Hard Back Edition, 2006)

Howard Baer and Xerxes Tata, Cambridge University Press

Unnumbered Description Page preceding Title Page

On the last line, "Americal" should be "American". (April 18, 2006)

Preface

page xvii, para 2, line 2: remove the comma between "and" and "encouragement". (April 7, 2006)

page xvii, The URL to the website of the "Corrections to this book" should read www.cambridge.org/9780521857864/ (the 0 at the end needs to be deleted). (Nov. 5, 2010)

Chapter 1

page 10, line below (1.20) should read, $\lambda_{f_i} = \frac{g m_{f_i}}{\sqrt{2} M_W}$. (April 7, 2006)

Chapter 3

page 30, line 3 of the exercise should read, "the properties $\mathrm{Tr}\Gamma^i = 0$ (for $\Gamma^i \neq \mathbf{1}$) and $\mathrm{Tr}\Gamma^i\Gamma_j = 4\delta^i_j$." (September 6, 2006)

Chapter 6

page 102, In Eq. (6.47), the sign of the Fayet-Illiopoulos term should be flipped and the Hermitean conjugate on the second line should also conjugate $d^2\theta_L$, so that this equation should read,

$$S = -\frac{1}{4}\int d^4x d^4\theta \left[\hat{\mathcal{S}}^\dagger e^{-2gt_A\hat{\Phi}_A}\hat{\mathcal{S}} + 2\xi_p\hat{\Phi}_p\right]$$
$$-\frac{1}{2}\left[\int d^4x d^2\theta_L \hat{f}(\hat{\mathcal{S}}) + \text{h.c}\right] - \frac{1}{4}\int d^4x d^2\theta_L \overline{\hat{W}^c_A}\hat{W}_A \ .$$

We thank Scott Willenbrock for bringing the typo on the second line to our attention. (October 12, 2007)

Chapter 7

page 116, in the last unnumbered equation, the derivative should be evaluated with the superfield set equal to the corresponding scalar field, so that this reads,

$$\left.\frac{\partial f_{AB}}{\partial \hat{\mathcal{S}}_{Li}}\right|_{\hat{\mathcal{S}}=\mathcal{S}} \bar{\lambda}_A \lambda_B .$$

(October 2, 2006)

page 118, eq. (7.29): the derivative on the first term on the right hand side should be evaluated with the superfield equal to the corresponding scalar component, so that this equation reads,

$$V(\mathcal{S},\mathcal{S}^*) = \sum_i \left|\frac{\partial \hat{f}}{\partial \hat{\mathcal{S}}_i}\right|^2_{\hat{\mathcal{S}}=\mathcal{S}} + \frac{1}{2}\sum_A \left(\sum_i \mathcal{S}_i^\dagger g t_A \mathcal{S}_i + \xi_A\right)^2 , \qquad (7.29)$$

(October 2, 2006)

page 119, eq. (7.30): the second derivatives in the first term on the right hand side should be taken with respect to the corresponding superfields, and should be evaluated with the superfields set equal to their scalar components, so that this equation reads,

$$\begin{aligned} STr\mathcal{M}^2_{\text{scalars}} = \;& 2 \sum_{i,j} \left(\frac{\partial^2 \hat{f}}{\partial \hat{\mathcal{S}}_i \partial \hat{\mathcal{S}}_j}\right)_{\hat{\mathcal{S}}=\mathcal{S}} \left(\frac{\partial^2 \hat{f}}{\partial \hat{\mathcal{S}}_i \partial \hat{\mathcal{S}}_j}\right)^*_{\hat{\mathcal{S}}=\mathcal{S}} \\ &+ 2\sum_A \mathcal{D}_A Tr(g t_A) + 2\sum_{i,A} g^2 \mathcal{S}_i^\dagger t_A t_A \mathcal{S}_i , \qquad (7.30) \end{aligned}$$

(October 2, 2006)

page 120, eq. (7.33): in the (2,2) entry of the matrix the derivatives should be with respect to superfields, and should be evaluated with the superfield set equal to the corresponding scalar field. This equation should read,

$$\mathcal{L} \ni -\frac{1}{2}\begin{pmatrix} \bar{\lambda}_A & \bar{\psi}_i \end{pmatrix} \begin{pmatrix} 0 & \sqrt{2}g(\mathcal{S}^\dagger t_A)_j \\ \sqrt{2}g(\mathcal{S}^\dagger t_B)_i & \left(\frac{\partial^2 \hat{f}}{\partial \hat{\mathcal{S}}_i \partial \hat{\mathcal{S}}_j}\right)_{\hat{\mathcal{S}}=\mathcal{S}} \end{pmatrix} \frac{1-\gamma_5}{2} \begin{pmatrix} \lambda_B \\ \psi_j \end{pmatrix} + \text{h.c.} \quad (7.33)$$

(October 2, 2006)

page 120, eq. (7.34): in the second term in the square brackets, the derivatives should be with respect to superfields, and be evaluated with the superfields set equal to the corresponding scalar components, so that this equation reads,

$$STr\mathcal{M}^2_{\rm fermions} = (-1)\times 2\times\left[\sum_{i,A} 4g^2(\mathcal{S}^\dagger t_A)_i (t_A\mathcal{S})_i + \sum_{i,j}\left(\frac{\partial^2\hat{f}}{\partial\hat{\mathcal{S}}_i\partial\hat{\mathcal{S}}_j}\right)_{\hat{\mathcal{S}}=\mathcal{S}}\left(\frac{\partial^2\hat{f}}{\partial\hat{\mathcal{S}}_i\partial\hat{\mathcal{S}}_j}\right)^*_{\hat{\mathcal{S}}=\mathcal{S}}\right]. \quad (7.34)$$

(October 2, 2006)

Chapter 8

page 147, line 8: remove the comma after "The mixing matrix". (August 8, 2006)

page 156, second line of unnumbered equation just above (8.63a): The sum over A should be removed.

We thank Scott Willenbrock for pointing this out. (November 10, 2007)

page 159, 3 lines above (8.69a): the tilda's should be properly aligned over "$\tilde{f}_L$" and "$\tilde{f}_R$". (August 8, 2006)

page 163, unnumbered equation at the top of the page: The $SU(3)$ coupling matrices in the round brackets are unfortunately denoted by the same symbol that we use to denote the $SU(3)$ gaugino λ_A in this equation. We apologise for any confusion caused by this terrible notation.

We thank Themis Athanassiadou for pointing this out. (November 10, 2007)

page 164, Eq. (8.77) should read,

$$\mathcal{L}_{4\tilde{q}} = -\frac{g_s^2}{8}\sum_A\left(\sum_i \tilde{q}^\dagger_{Li}\lambda_A\tilde{q}_{Li} - \sum_i \tilde{q}^\dagger_{Ri}\lambda_A\tilde{q}_{Ri}\right)^2 ,$$

where i denotes the flavor of the squark. (Sept. 3, 2007)

page 180, Equation (8.123): The $\frac{g'^2}{4}$ just before the large open square bracket on the third last line should be g'^2.

We thank Andrew Box for bringing this typo to our attention. (March 16, 2007)

page 180, Eq. (8.123): The term on the last line of Eq. (8.123) should read,

$$-\frac{g_s^2}{8}\sum_A\left(\sum_i \tilde{q}^\dagger_{Li}\lambda_A\tilde{q}_{Li} - \sum_i \tilde{q}^\dagger_{Ri}\lambda_A\tilde{q}_{Ri}\right)^2 .$$

(Sept. 3, 2007)

page 185, Eq. (8.127) should read,

$$\Delta V \simeq \frac{3}{32\pi^2}\left[(m^2_{\tilde{t}_L} + f_t^2|h_u^0|^2)^2\left(\log\frac{m^2_{\tilde{t}_L} + f_t^2|h_u^0|^2}{Q^2} - \frac{3}{2}\right)\right.$$

$$+ \quad (m^2_{\tilde{t}_R} + f_t^2|h_u^0|^2)^2 \left(\log\frac{m^2_{\tilde{t}_R} + f_t^2|h_u^0|^2}{Q^2} - \frac{3}{2}\right)$$
$$- \quad 2f_t^4|h_u^0|^4 \left(\log\frac{(f_t^2|h_u^0|^2)}{Q^2} - \frac{3}{2}\right)\Bigg] .$$

(Dec. 3, 2011)

page 185, Eq. (8.128): On the left hand side, $m_{h,H}$ should be $m^2_{h,H}$. We thank Csaba Balázs for pointing this out. (Aug. 7, 2008)

page 187, After Eq. (8.133) insert, "where $x = \frac{m^2_{\tilde{g}}}{m^2_{\tilde{q}}}$." (Nov. 30, 2011)

Chapter 9

page 198: In the expression for ζ^2 just below the equation for mass eigenvalues, $\phi_{\widetilde{W}}$ should be ϕ_μ. (February 7, 2007)

page 225: In Eq. (9.33), $M_{\rm Pl}$ should be in the denominator instead of the numerator, *i.e.* this equation should read,

$$\rho_{\widetilde{Z}_1}(T_0) \simeq \frac{1.66}{M_{\rm Pl}}\left(\frac{T_0}{T_\gamma}\right)^3 T_\gamma^3\sqrt{g_*}\frac{1}{\int_0^{x_F}\langle\sigma v_{\rm rel}\rangle dx}.$$

We thank Daniel Feldman for bringing this typo to our attention. (February 5, 2007)

page 226: The argument of the Bessel function K_1 on the right-hand-side of Eq. (9.34) should read $\frac{a}{x}$, not $\frac{a}{4}$. (July 11, 2014)

vspace5mm

Chapter 10

page 239, 2 lines below (10.9): Replace the sentence, "We will see later....on the spacetime manifold." with,

"The torsion tensor, usually taken to be zero in GR, does not vanish in supergravity theories when gravitinos (see below) are present.". (October 1, 2006)

page 240, lines 3-4 of the exercise should read, "...the equation of motion for a spinless particle is...." (insert "spinless"). (October 1, 2006)

page 241, in the lines following eq. (10.16): Replace the text starting with,

"This tensor vanishes..." to the end of the page, *i.e.* until "...and in particular in GR", by,

"The part of this tensor *symmetric* under $\mu \leftrightarrow \lambda$" vanishes in the frame where the metric is locally Minkowskian, and hence must vanish in all frames. We thus obtain,

$$\Gamma^\tau_{\mu\lambda} = \frac{1}{2}g^{\nu\tau}\left(\partial_\mu g_{\nu\lambda} + \partial_\lambda g_{\mu\nu} - \partial_\nu g_{\lambda\mu}\right), \qquad (10.17) \qquad (1)$$

for the components of the connection that are *symmetric* under $\mu \leftrightarrow \lambda$. The corresponding antisymmetric components of the connection are *not* determined by the metric, but depend on the torsion tensor introduced above."

We are grateful to Probir Roy for bringing the independence of the torsion tensor to our attention. (October 1, 2006)

page 250, Insert a comma after (10.50c) and also after (10.50d). (May 24, 2006)

page 251, The second term on the RHS of (10.51) should read,

$$-\frac{1}{2}\left[\int d^2\theta_L \hat{f}(\hat{\mathcal{S}}) + \text{h.c}\right].$$

(Dec. 6, 2006)

We thank Scott Willenbrock for pointing this out.

page 252, The transformation of $\hat{f}$ in the exercise should read

$$\hat{f}(\hat{\mathcal{S}}) \to \exp\Big(h(\hat{\mathcal{S}})\Big)\,\hat{f}.$$

(Aug. 28, 2017)

We thank Dibyashee Sengupta for bringing this typo to our attention.

page 255, The field ψ_L on the RHS of (10.59a) should have an index i. Also, there should be an index i on $(\not{D}\mathcal{S})$ in (10.59b). (Dec. 6, 2007)

page 257, line 5: delete the comma between "Remember" and "that". (April 20, 2006)

Chapter 11

page 264, Eq. (11.1): The subscript capital M in the last term of (11.1) should be a small m. (Nov. 30, 2007)

We thank Scott Willenbrock for bringing this to our attention.

Chapter 12

page 299, third last line: remove the arrows over $\mathbf{p}_a$ and $\mathbf{p}_b$. (April 7, 2006)

page 311, first line: "Z amplitude" should be "W amplitude". (July 5, 2006)

Chapter 13

page 348, footnote 4: remove the comma after "See". (August 8, 2006)

page 365, footnote 16: remove the comma before "J. F. Gunion,". (August 8, 2006)

Chapter 14

page 376: Item 2) in Fig. 14.1: “Intial” should be “Initial”. (July 29, 2008) We thank Eugene Golowich for pointing this out.

page 381: In the penultimate line of the caption to Fig. 14.3, there should be periods after “*Phys*” and after “*Rev*”. (April 7, 2006)

Chapter 15

page 418: In the last line of the caption to Fig. 15.6, JHEP should be italicised and 06 should be bold-faced. (April 7, 2006)

page 418: The $\infty > 0$ on top of Fig. 15.6 should read $\mu > 0$. (June 8, 2007)

page 419: In the caption to Fig. 15.7, “Krupornickas” should read “Krupovnickas”. (September 15, 2009)

page 420: The $\infty > 0$ in the frame of Fig. 15.8 should read $\mu > 0$. (June 8, 2007)

page 447: In footnote 32, the first reference should be to *Phys. Lett.* **B565**, 42 (2003). (July 3, 2006)

Chapter 16

page 470: On the second line of the paragraph beginning on top of the page, $\widetilde{Z}_1 \to cds + c\bar{d}\bar{s}$ should read $\widetilde{Z}_1 \to cds + \bar{c}\bar{d}\bar{s}$. (January 5, 2012)

Appendix A

page 481: In (A.7i), $m_{\tilde{g}}$ should be $m_{\tilde{g}}^2$ in the second term of the curly braces. (April 7, 2006)

page 482: $\frac{d\sigma}{dt}$ on the LHS of both Eq. (A.14) and Eq. (A.15a) should be $\frac{d\sigma}{d\hat{t}}$. (Sept. 21, 2007)

page 487-88: A factor of factor of $\frac{1}{s}$ was inadvertently left out on the right-hand side of Eq. (A.25b). Eq. (A.25b) should read,

$$\frac{d\sigma}{dz}(e_L\bar{e}_R \to \tilde{\nu}_e\bar{\tilde{\nu}}_e) = \frac{p^3E}{8\pi s}(1-z^2)\times$$

$$\left[\frac{4e^4(\alpha_\nu-\beta_\nu)^2(\alpha_e-\beta_e)^2}{(s-M_Z^2)^2+M_Z^2\Gamma_Z^2} + \frac{g^4\sin^4\gamma_R}{[2E(E-pz)+m_{\widetilde{W}_1}^2-m_{\tilde{\nu}_e}^2]^2}\right.$$

$$+\frac{g^4\cos^4\gamma_R}{[2E(E-pz)+m_{\widetilde{W}_2}^2-m_{\tilde{\nu}_e}^2]^2}$$

$$
-\frac{4e^2g^2(\alpha_\nu-\beta_\nu)(\alpha_e-\beta_e)(s-M_Z^2)\sin^2\gamma_R}{[(s-M_Z^2)^2+M_Z^2\Gamma_Z^2][2E(E-pz)+m_{\widetilde{W}_1}^2-m_{\widetilde{\nu}_e}^2]}
$$

$$
-\frac{4e^2g^2(\alpha_\nu-\beta_\nu)(\alpha_e-\beta_e)(s-M_Z^2)\cos^2\gamma_R}{[(s-M_Z^2)^2+M_Z^2\Gamma_Z^2][2E(E-pz)+m_{\widetilde{W}_2}^2-m_{\widetilde{\nu}_e}^2]}
$$

$$
\left.+\frac{2g^4\sin^2\gamma_R\cos^2\gamma_R}{[2E(E-pz)+m_{\widetilde{W}_1}^2-m_{\widetilde{\nu}_e}^2][2E(E-pz)+m_{\widetilde{W}_2}^2-m_{\widetilde{\nu}_e}^2]}\right].
$$

(June 3, 2014)

Appendix B

page 514: The denominator on the right-hand-side of (B.77b) should be $2m_{\widetilde{Z}_i}^2$, not $2m_{\widetilde{Z}_j}^2$. (July 31, 2009)

We thank Srikanth Hundi for pointing this out.