Corrections for "A Supersymmetry Primer", version 6

The following is a list of known corrections to `hep-ph/9709356 v6`, September, 2011. If you have the more recent v7, you can find the corresponding list of corrections at:
`http://www.niu.edu/spmartin/primer`
I no longer maintain lists of corrections for earlier versions, including the World Scientific book versions. Please send any further corrections or suggestions to `spmartin@niu.edu`.

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• The attentive reader may question the signs found in the definitions of the differential operators $\hat{Q}$ and $\hat{Q}^\dagger$ in eqs. (4.2.1)-(4.2.2), and D and $D^\dagger$ in eqs. (4.3.2)-(4.3.3). It may seem that, with the signs chosen in these definitions, if $\hat{Q}^\dagger$ is the Hermitian conjugate of $\hat{Q}$, then $D^\dagger$ cannot be the conjugate of D, or vice versa. Actually, the symbol † means something different in the two cases, and that is the reason for the choice of signs [which follow the example of Sohnius, Phys. Rept. **128**, 39, (1985)]. For a more detailed explanation, please see the discussion in the paragraph containing eqs. (4.3.9)-(4.3.12) in version 7 of the Primer, where I have adopted a different notation, replacing $D^\dagger$ in version 6 with $\overline{D}$ in version 7.
(Thanks to Hajime Fukuda for pointing out this important issue.)

• In the second relation of eq. (4.9.1), Ω^a should be Ω^{a*}.
(Thanks to Fei Li.)

• Equation (4.9.16): the minus sign on the third term on the right side should be a plus sign. So it should read:

$$(\mathcal{W}^a_\alpha)_{\text{WZ gauge}} \;=\; \lambda^a_\alpha + \theta_\alpha D^a + \frac{i}{2}(\sigma^\mu\overline{\sigma}^\nu\theta)_\alpha F^a_{\mu\nu} + i\theta\theta(\sigma^\mu\nabla_\mu\lambda^{\dagger a})_\alpha$$

(Thanks to Peter Graf and Frank Steffen.)

• Section 6.1, in the middle of the third full paragraph after the paragraph containing eq. (6.1.3), the expression for the squark-quark-gluino coupling is missing an asterisk on the squark field $\tilde{q}$.
(Thanks to Fei Li.)

• The list of proton decay final states in the last full sentence before eq. (6.2.3) is somewhat misleading. Using the s-channel squark-exchange Feynman diagram in Figure 6.5, only the final states $e^+\pi^0$ and $\mu^+\pi^0$ and $\bar{\nu}\pi^+$ and $\bar{\nu}K^+$ can be obtained at tree-level. However, the other final states e^+K^0 and μ^+K^0 and $\nu\pi^+$ and νK^+ can be obtained by tree-level t-channel squark-exchange diagrams involving the λ' and λ'' couplings. (Note that I also sloppily did not distinguish between neutrinos and antineutrinos in the original text. The cases with neutrinos in the final state rely on left-right squark mixing.)
(Thanks to Herbi Dreiner.)

• Equation (6.5.11): the second term should have a^{mnp} replaced by a^{mnk}.
(Thanks to Matt Reece.)

• The parenthetical sentence at the end of the paragraph containing eq. (8.1.2) should not include "b," and "$\langle H_d\rangle$" should read "$\langle H_d^0\rangle$". So the sentence should read:

"(CP-violating phases in other couplings can induce loop-suppressed CP violation in the Higgs sector, but do not change the fact that $\langle H_u^0 \rangle$ and $\langle H_d^0 \rangle$ can always be chosen real and positive.)"

• Full paragraph between equations (8.2.5) and (8.2.6): it is incorrectly stated that one can always choose a convention such that M_1 and M_2 are both real and positive. That paragraph should be changed to read:

"In general, the parameters M_1, M_2, and μ in the equations above can have arbitrary complex phases. The phase of μ is physical and cannot be rotated away, because we have already used up the freedom to redefine the phases of the Higgs fields, since we have picked $\langle H_u^0 \rangle$ and $\langle H_d^0 \rangle$ to be real and positive; this guarantees that the off-diagonal entries proportional to m_Z in eq. (8.2.3) are real. A redefinition of the phases of the gaugino fields always allows us to choose a convention in which one of the gaugino masses, say M_2, is real and positive. Within that convention, the phases of the other two gaugino masses M_1 and M_3 are physical and cannot be rotated away, because any further phase rotation of the gaugino fields would modify the relative phases of the fermion-sfermion-gaugino couplings. However, if the phases are arbitrary, then there can be potentially disastrous CP-violating effects in low-energy physics, including electric dipole moments for both the electron and the neutron. Therefore, it is common (although not strictly mandatory, because of the possibility of nontrivial cancellations in the combinations appearing in physical observables) to assume that μ, M_1, and M_3 are real in the same set of phase conventions that make M_2, b, and the tree-level VEVs $\langle H_u^0 \rangle$ and $\langle H_d^0 \rangle$ real and positive. Note that even if the supersymmetry breaking mechanism imposes a gaugino mass unification condition like eq. (7.6.13) or eq. (7.7.17), so that M_1, M_2, and M_3 can all be chosen real and positive, the phase of μ is still undetermined by this constraint, and even if μ is assumed to be real, its sign is undetermined."

(Thanks to Andrew Fowlie.)

• First sentence of second paragraph of section 9.5: "charged lepton" should be "charged slepton".

(Thanks to Prudhvi Bhattiprolu.)

• Full sentence between equations (11.3.2) and (11.3.3): the Peccei-Quinn charge of S, according to the convention of Table 11.1, is -1, not -2.
(Thanks to Paddy Fox.)

• End of sentence containing equation (11.3.7): the Peccei-Quinn charge of S', according to the convention of Table 11.1, is $+1$, not $+2$.
(Thanks to Paddy Fox and Howie Baer.)