# Supersymmetry and String Theory: Beyond the Standard Model. Michael Dine

# Errata

# Some ancient wisdom on the subject of teachers and error:

If there are two teachers available for hire– one who has studied extensively but is not meticulous about mistakes, and another who is meticulous but has not studied as much, we hire the one who has studied extensively but is not as meticulous because mistakes have a way of working themselves out.

# But a related text:

We hire the one who is meticulous about mistakes, because once a mistake enters the students' minds, it stays there.

In any case, thanks to those who have noted errors: Alex Morisse, Zheng Sun, Yevegny Kats, Gil Paz, Ari Pakman, Josep Maria Pons, and others. I am sure that this list will continue to grow. Chapter 2

1. The last term in Eqn. 2.24 should read:

 $-\lambda |\phi|^4$ .

(no factor of 1/2).

- 2. Eqn. 2.37 should end with dots (...); i.e. only certain terms are indicated.
- 3. Eqn. 2.67, covariant derivative should include an i in front of g'.
- 4. Eqn. 2.81 should end with dots (...); i.e. only certain terms are indicated.

#### Chapter 3

- 1. below eqn. 3.10, should read "Because the  $\bar{d}$  quarks..."
- 2. below eqn. 3.12, "where we have introduced three angles,  $\theta_{12}, \theta_{13}, \theta_{23}$ , and  $s_{12} = \sin(\theta_{12})$ , etc."
- 3. Eqn. 3.18, first term on right hand side, argument of  $g^2$  should be M, not  $\Lambda$ .
- 4. p. 39, above eqn. 3.41, "So if we choose  $R = \Lambda^{-1},...$ "
- 5. eqn. 3.74, r.h.s. should have  $U(x_1(s), x_2)$ .
- 6. eqn. 3.78 should read

$$U(x) \approx e^{ia^2 F_{\mu\nu}(x)}.$$

- 7. p.51, end of first paragraph in section 3.8, should read "Finally, we discuss processes involving hadrons only."
- 8. 3.86 should read

$$T = ca^{-2}e^{-\int \frac{dg'}{\beta(g')}}.$$

#### Chapter 4

- 1. p. 65, below eqn. 4.5, should read "In the limit  $M_W \to \infty$ .
- 2. p. 67, above eqn. 4.10, should remain "mainly mixing of  $\nu_{\mu}$  and  $\nu_{e}$ ."
- 3. p. 68. End of section 4.1.1, sentence should read "the scale can be much smaller".
- 4. p. 68 Eqn. 4.14, operator should be  $F_{\mu\nu}\bar{\mu}\sigma^{\mu\nu}e$ .

#### Chapter 5

1. eqn. 5.20 should read

$$j_5^{\mu} = \bar{q}(x+\epsilon)e^{i\int_x^{x+\epsilon} dx^{\mu}A_{\mu}}q(x)$$

- 2. p. 87, above 31<br/>n. 5.58, should read  $x_1^2 + x_2^2 + x_3^2 = 1.$
- 3. above eqn. 5.66,  $X_0$  should read  $x_0$ .
- 4. eqn. 5.73,  $\mathcal{M}$  should read  $\langle \mathcal{M} \rangle$

# Chapter 6

1. Eqn. 6.19 should read:

$$V = -\frac{1}{2}m^{2}v^{2} + \frac{1}{4}(\frac{7}{30}\lambda + \lambda')v^{4}$$

# Chapter 7

- 1. Eqns. 7.1, 7.2: left hand sides should be vectors,  $\vec{A}_N$  and  $\vec{A}_S$ , respectively.
- 2. Eqn. 7.8, the quartic coupling should be  $\frac{\lambda}{4}$ .

#### Chapter 9

- 1. Eqn. 9.1, p. 140: Right hand side should contain  $P_{\mu}$  (no extra subscript).
- 2. p. 152 near the bottom, should read "there is an R symmetry under which  $\Phi$  has R charge 1 and, if we reintroduce  $\lambda$  as a perturbation,  $\lambda$  has R charge -1.

#### Chapter 10

- 1. P. 160, near the top, sentence should read "First, however, we turn to the issue of the goldstino theorem and explicit supersymmetry breaking."
- 2. p. 166, third line should read "non-renormalization theorem."

#### Chapter 11

1. \*\*\*

# Chapter 12

- 1. P. 194, second line from bottom, SU(N) should read  $SU(N_f)$ . Similarly page 195, above eqn. 13.13.
- 2. Below eqn. 13.22, "similar" should be "simpler".
- 3. P. 198, near bottom of page, sentence should read "But in this case,  $\Phi = 0$  in the flat direction.

4. P. 202, eqn. 13.47, in second line,  $\sigma^{ij}$  should be  $\tilde{\sigma}^{ij}$ . Immediately below, should say: " $\sigma^{ij}$  and  $\tilde{\sigma}^{ij}$  generate the two SU(2)'s."

## Chapter 16

1. Equation 16.2 should read:

$$b_1 = 6N^2 - 2NN_F - 4N_F \frac{(N^2 - 1)}{2N}$$

### Chapter 17

1. Eqn. 17.97 (exercise 6) should read:

$$ds^2 \approx -\frac{\eta^2}{4r_h^2}dt^2 + d\eta^2 + r_h^2 dt^2.$$

Immediately below the equation, the substitution should be  $t \rightarrow 2i\phi/r_h$ .

#### Chapter 19

1. Last paragraph of section 21.1, middle of paragraph, "tensor product of vector representations" should read "tensor product of fundamental and anti-fundamental representations."

## Chapter 21

- 1. Eqn. 21.10 should read  $H = \frac{1}{p^+}p^-$ .
- 2. Eqn. 21.101 should have  $\delta_{ij}$  in numerator on right hand side.

#### Chapter 22

- 1. Eqns. 22.9 and 22.10 should have  $\psi_{-}^{I} = \dots \quad \psi_{+}^{I} = \dots$
- 2. Eqn. 22.62 should have  $\partial$  rather than  $\overline{\partial}$  in first parenthesis.

# Chapter 23

# 1. \*\*\* Repair eqn. 23.6 \*\*\*

#### Chapter 24

1. First paragraph of section 24.0.2,  $C_{11\mu\nu}$  should be  $C_{10\mu\nu}$ .

#### Chapter 25

1. \*\*\*

#### Chapter 26

- 1. P. 411 at bottom, should read "as in four dimensions, operators  $D_{\alpha}$  and  $\bar{D}_{\alpha}$ , and left and right moving chiral fields, annihilated by the  $\bar{D}'s$ .
- 2. p. 413, near bottom of page, instead of " $R^2$  scales out of the Lagrangian," should read " $R^2$  appears in front of the Lagrangian".

Chapter 28

- 1. p. 445, second paragraph, near beginning, "with 3 complex scalars transforming in the adjoint representation of the group."
- 2. p. 445, near bottom, "The same is true for the other set of supercharges" should read "The other set of supercharges are linearly realized (i.e. they are manifest symmetries)".

Appendix A

1. Eqn. A10, second matrix should be  $\bar{\sigma}^{\mu} = \bar{\sigma}^{\mu\dot{\beta}\beta}$