ERRATA

SUPERFIELD APPROACH TO A NOVEL SYMMETRY FOR NON-ABELIAN GAUGE THEORY

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The last sentence above Eq. (4.2) (p. 192) up to the line above Eq. (4.7) (p. 193) should read:

The Hodge duality $\star$ operation on the super differentials (dZ^M) and their wedge products ($dZ^M \wedge dZ^N$), ($dZ^M \wedge dZ^N \wedge dZ^P$) etc., defined on this supermanifold, is

$$\begin{aligned}
 \star(dx^\mu) &= \varepsilon^{\mu\nu}(dx_\nu \wedge d\theta \wedge d\bar{\theta}), & \star(d\theta) &= \frac{1}{2!}\varepsilon^{\mu\nu}(dx_\mu \wedge dx_\nu \wedge d\bar{\theta}), \\
 \star(d\bar{\theta}) &= \frac{1}{2!}\varepsilon^{\mu\nu}(dx_\mu \wedge dx_\nu \wedge d\theta), & \star(dx^\mu \wedge dx^\nu) &= \varepsilon^{\mu\nu}(d\theta \wedge d\bar{\theta}), \\
 \star(dx^\mu \wedge d\theta) &= \varepsilon^{\mu\nu}(dx_\nu \wedge d\bar{\theta}), & \star(dx^\mu \wedge d\bar{\theta}) &= \varepsilon^{\mu\nu}(dx_\nu \wedge d\theta), \\
 \star(d\theta \wedge d\theta) &= \frac{1}{2!}s^{\theta\theta}\varepsilon^{\mu\nu}(dx_\mu \wedge dx_\nu), & \star(d\theta \wedge d\bar{\theta}) &= \frac{1}{2!}s^{\theta\bar{\theta}}\varepsilon^{\mu\nu}(dx_\mu \wedge dx_\nu), \\
 \star(d\bar{\theta} \wedge d\bar{\theta}) &= \frac{1}{2!}s^{\bar{\theta}\bar{\theta}}\varepsilon^{\mu\nu}(dx_\mu \wedge dx_\nu), & \star(dx_\mu \wedge d\theta \wedge d\bar{\theta}) &= \varepsilon_{\mu\nu}(dx^\nu), \\
 \star(dx_\mu \wedge dx_\nu \wedge d\theta \wedge d\bar{\theta}) &= \varepsilon_{\mu\nu}, & \star(dx_\mu \wedge dx_\nu \wedge d\theta) &= \varepsilon_{\mu\nu}(d\bar{\theta}), \\
 \star(dx_\mu \wedge dx_\nu \wedge d\bar{\theta}) &= \varepsilon_{\mu\nu}(d\theta), & \star(dx_\mu \wedge dx_\nu \wedge d\theta \wedge d\bar{\theta}) &= \varepsilon_{\mu\nu}s^{\theta\theta},
 \end{aligned} \tag{4.2}$$

where s 's are symmetric (e.g., $s^{\theta\bar{\theta}} = s^{\bar{\theta}\theta}$ etc.). In the above we have collected only a few of the $\star$ operations. The other $\star$ operations can be computed in an analogous

manner. With these as the backdrop, we obtain the expression for the superscalar superfield $\tilde{\delta}\tilde{A} = -\star\tilde{d}\star\tilde{A}$ as

$$\tilde{\delta}\tilde{A} = (\partial_\mu B^\mu) + s^{\theta\theta}(\partial_\theta\Phi) + s^{\bar{\theta}\bar{\theta}}(\partial_{\bar{\theta}}\bar{\Phi}) + s^{\theta\bar{\theta}}(\partial_\theta\bar{\Phi} + \partial_{\bar{\theta}}\Phi). \quad (4.3)$$

It will be noted that we have dropped all the terms in the computation of $(\tilde{d}\star\tilde{A})$ which contain (i) more than two differentials in spacetime, and (ii) more than two differentials in Grassmannian variables. Only after this, we have applied another $\star$ operation on it. Now we exploit the analogue of the horizontality condition w.r.t. $\tilde{\delta}$ (i.e. $\tilde{\delta}\tilde{A} = \delta A$) which is nothing but equating the R.H.S. of Eqs. (4.1) and (4.3). In other words, we set the coefficients of $s^{\theta\theta}$, $s^{\bar{\theta}\bar{\theta}}$, $s^{\theta\bar{\theta}}$ equal to zero. The ensuing restrictions on the superfields are

$$\partial_\theta\bar{\Phi} + \partial_{\bar{\theta}}\Phi = 0, \quad \partial_\theta\Phi = 0, \quad \partial_{\bar{\theta}}\bar{\Phi} = 0. \quad (4.4)$$

Exploiting the expansions (3.2), it can be checked that the above restrictions lead to

$$s^a(x) = 0, \quad \bar{s}^a(x) = 0, \quad \mathcal{B}^a(x) + \bar{\mathcal{B}}^a(x) = 0, \quad B^a(x) = \bar{B}^a(x) = 0, \quad (4.5)$$

and the following conditions on the component fields of $B_\mu(x, \theta, \bar{\theta})$

$$\partial \cdot \bar{R} = 0, \quad \partial \cdot R = 0, \quad \partial \cdot S = 0. \quad (4.6)$$

In terms of solutions (4.5) and $R_\mu^a = -\varepsilon_{\mu\nu}\partial^\nu\bar{C}^a$, $\bar{R}_\mu^a = -\varepsilon_{\mu\nu}\partial^\nu C^a$, $S_\mu^a = -\varepsilon_{\mu\nu}\partial^\nu\mathcal{B}^a$, the superfield expansion (3.2) can be re-expressed as