

$$\overline{bcb} = \overline{bcb} - \overline{bcb} - \overline{bcb}$$

$$\overline{bcb} + \overline{bcb} + \overline{bcb} = 0$$

$$\text{LHS} = \overline{bcb} - \overline{bcb} - \overline{bcb}$$

$$+ \overline{bcb} - \overline{bcb} - \overline{bcb} + \overline{bcb} - \overline{bcb} - \overline{bcb}$$

$$= \overline{bcb} + \overline{bcb} + \overline{bcb} - \overline{bcb} - \overline{bcb} - \overline{bcb}$$

$$= \overline{bcb} + \overline{bcb} + \overline{bcb} = 0$$

$$\overline{bcb} \times b + b \times \overline{bcb} = 0$$

$$\text{LHS} = \overline{bcb} \times b - \overline{bcb} \times b - \overline{bcb} \times b$$

$$+ b \times \overline{bcb} - b \times \overline{bcb} - b \times \overline{bcb}$$

$$= -\overline{bcb} \times b - b \times \overline{bcb} + \overline{bcb} \times b + b \times \overline{bcb} + \overline{bcb} \times b + b \times \overline{bcb}$$

$$- \overline{bcb} \times b - b \times \overline{bcb} + \overline{bcb} \times b + b \times \overline{bcb}$$

$$= \overline{bcb} \times b - b \times \overline{bcb} + \overline{bcb} \times b = 0$$

$$\overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} = \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b}$$

$$\begin{aligned} 2 \text{ LHS} &= \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} + \overline{b} \star \overline{b \overline{b} \overline{a} \overline{a}} = -\overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} - \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} \\ &= \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} + \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} + \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} + \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} \\ &= -\overline{b} \star \overline{b \overline{b} \overline{a} \overline{a}} - \overline{b} \star \overline{b \overline{b} \overline{a} \overline{a}} - \overline{b} \star \overline{b \overline{b} \overline{a} \overline{a}} - \overline{b} \star \overline{b \overline{b} \overline{a} \overline{a}} \\ &= \overline{b} \star \overline{b \overline{b} \overline{a} \overline{a}} + \overline{b} \star \overline{b \overline{b} \overline{a} \overline{a}} = \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} - \overline{b \overline{b} \overline{a} \overline{a}} \star \overline{b} = 2 \text{ RHS} \end{aligned}$$

$$\mathcal{E}(\pm f) = \mathcal{E}(g) + \mathcal{E}_g(\varphi) = \mathcal{E}(g) + \mathcal{E}_\varphi(g)$$

$$0 = \frac{\partial \mathcal{E}}{\partial g}(\pm f) = \underline{\mathcal{E}}(g) + \underline{\mathcal{E}}_\varphi(g)$$

$$\Rightarrow \underline{\mathcal{E}}(g) = -\underline{\mathcal{E}}_\varphi(g) = T \text{ stress energy tensor}$$

$$0 = \frac{\partial \mathcal{E}}{\partial \varphi}(\pm f) = \underline{\mathcal{E}}_g(\varphi)$$

Yang-Mills

$$\mathcal{Y}(\mathbb{A}f) = \mathcal{Y}(A) + \mathcal{Y}_A(\varphi) = \mathcal{Y}(A) + \mathcal{Y}_\varphi(A)$$

$$0 = \frac{\partial \mathcal{Y}}{\partial A}(\mathbb{A}f) = \underline{\mathcal{Y}}(A) + \underline{\mathcal{Y}}_\varphi(A)$$

$$\Rightarrow \underline{\mathcal{Y}}(A) = -\underline{\mathcal{Y}}_\varphi(A) = T \text{ stress energy tensor}$$

$$0 = \frac{\partial \mathcal{Y}}{\partial \varphi}(\pm f) = \underline{\mathcal{Y}}_A(\varphi)$$