Points

1) A_0^a - usually interpreted as "abelian gauge field" is seen a fluctuation of quantum space-time.
Through previous eqn. it determines $\theta^{ab}(y)$ and therefore a metric $G^{ab}(y) = -\theta^{ac}(y)\,\theta^{bd}(y)\,g_{cd}$

2) $A_\alpha^a(y)\,\tau_\alpha$ describe SU(n) gauge field.

3) The well known fact that the U(1) and SU(n) parts of the gauge field cannot be decoupled implies the coupling between SU(n) gauge theory and gravity.

4) The U(1) SU(n) splitting is important for the recognition of gravitation in these theories. Why?
Consider gauge invariant actions

- $S_{YM} = -\mathrm{Tr}\left([X^a, X^b][X^{a'}, X^{b'}]\,g_{aa'}g_{bb'}\right)$
- $S_\Phi = -\mathrm{Tr}\left([X^a, \Phi][X^{a'}, \Phi]\,g_{aa'}\right)$

The kinetic term always involves the induced metric $\overset{\uparrow}{G}^{ab} \Rightarrow$ **Universal coupling** - a feature of gravity.

Why? → In matrix models all field must be in the adjoint to acquire a kinetic term. But other types of matter and low energy gauge fields can arise after SSB