

(1)

日付: Aug. 1, 1973

研・日付

1965 IS 2988

56

~~para quark~~

Para fermi (order 3)

greenberg

湯川・荒川

Gell-mann

colored quarks
色荷

RWB

同好

$e^+e^- \rightarrow \gamma \rightarrow \text{hadrons}$ a

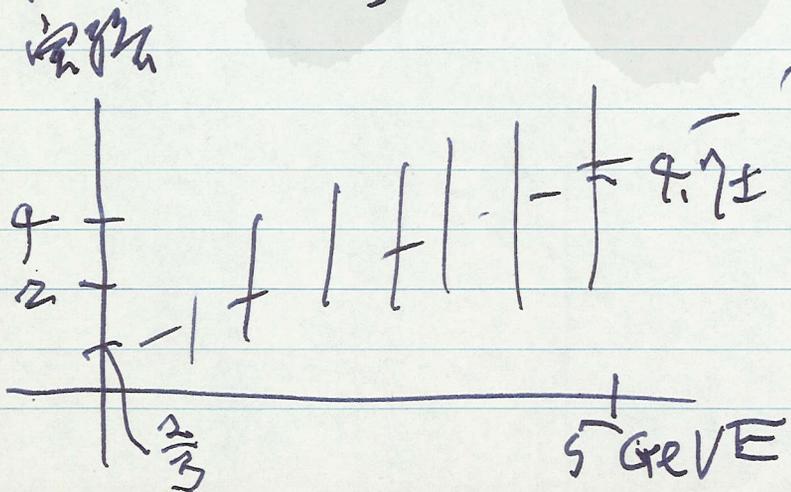


$e^+e^- \rightarrow \gamma \rightarrow \mu^+ + \mu^-$ b

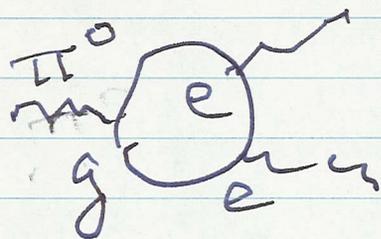
1) $R = \frac{a}{b} = \sum_i e_i^2$

quark
夸克

$= \left(\frac{2}{3}\right)^2 + \left(\frac{2}{3}\right)^2 + \left(-\frac{1}{3}\right)^2 = \frac{2}{3}$



2) $A(\pi^0 \rightarrow \gamma + \gamma) = S$



$S = \frac{1}{3} S_{\text{exp}}$

Green's decomposition:

$$\psi(x) = \sum_{\alpha=1}^p \psi_{\alpha}(x)$$

大数, 近似

a) $[\bar{\psi}(x), \psi(y)] = 0$ or observable ψ

b) $[\psi(x), \psi(y)] = 0, [\bar{\psi}(x), \bar{\psi}(y)] = 0$

a) $U(p)$

b) $O(p)$

$$\begin{cases} \psi_{\alpha}(0) = 0 \\ \sum_{\alpha} (\psi_{\alpha} \bar{\psi}_{\alpha})|_0 = p \end{cases}$$

Pauli-Ginney

2-component neutrino $\psi, \bar{\psi}$

$\nu_L, \nu_R, \bar{\nu}_L, \bar{\nu}_R$

$\bar{\psi} \gamma_{\mu} \partial_{\mu} \psi$

$\psi \rightarrow \alpha \psi + \beta \gamma_5 \psi^c$

$|\alpha|^2 + |\beta|^2 = 1$

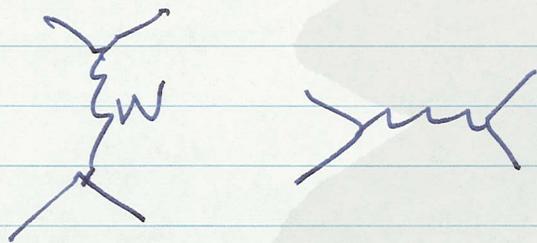
$T_{\mu} \sim \bar{\psi}^c \gamma_{\mu} \gamma_5 \psi$

(3)

$$\sum_i \bar{q}_i \gamma_\mu \partial_\nu q_i = \text{em } \bar{q}_i \gamma_\mu q_i \rightarrow U(3)_L \times U(3)_R \subset U(6)$$

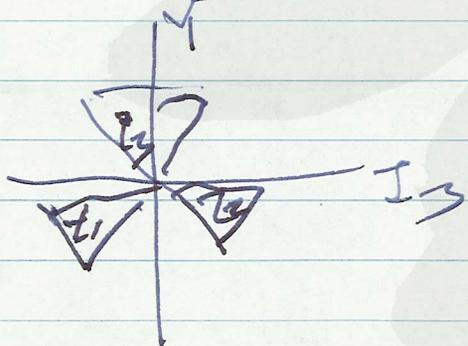
$$\rightarrow U(3) \subset O(6)$$

Tanikawa - Watanabe



3-triplet model

a) $q_L, q_R; \bar{q}_L; \text{Tanikahelidze}$



$$t^\alpha \rightarrow SU(3)'' \sim D(0,1)$$

$$t^i \rightarrow SU(3)' \sim D(1,0)$$

b) $\text{SU}(3)'' \rightarrow SO(3)$

$$Q = I_3' + \frac{1}{2} Y'$$

para (3, 2/3)

$$= I_3' + \frac{1}{2} Y' + I_3'' + \frac{1}{2} Y''$$

H-UV (2, 2/3)

$$= I_3' + \frac{1}{2} Y' + L_3$$

(Tati) (3, 2/3)

$$R = 2$$

$$4$$

$$8$$

superstrong interaction

$$g = 1$$

$$= 1$$

$$= 1$$

a) $U(1)$ vector \rightarrow neutral gluon field

$$q \bar{q} : 31 \text{ force}$$

$$qq : 14 \text{ N}$$

($\text{SU}(3) \text{ force?}$)

$$b) \text{SU}(3) \text{ } q^i \text{ } i=1,2,3$$

$$\sum_{n>m} g \sum_{i=1}^3 \lambda_i^{(n)} \lambda_i^{(m)} V(\vec{a}_n - \vec{a}_m)$$

$$E = N \mu_0 + \frac{1}{2} g^2 C_2(\lambda_1, \lambda_2)$$

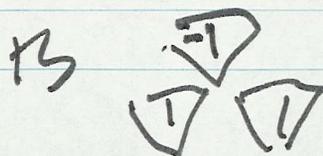
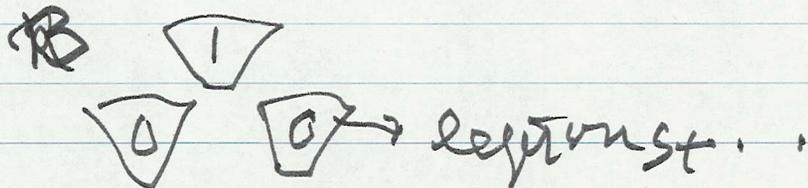
μ_0 : bare mass $\approx \frac{1}{3} \text{ GeV}$

$$g \cdot \text{mass } \mu = \mu_0 + \frac{1}{2} g^2 C_2(1, 0)$$

$$= \mu_0 + \frac{2}{3} g^2 \sim 2 \text{ GeV}$$

$$e^+ + e^- \rightarrow t + \bar{t} \quad 4 \text{ GeV}$$

$(t \bar{t})_g$: unbound



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$$t \rightarrow \pi + M$$