'06/1/14:M·Suzuki.

## QUICK GUIDE to the QGD (Quantum Gravitational Dynamics as Standard Theory of General Guage Field)

None can succeed to establish quantum gravity theory in curvelinear coordinate.On the other hand, so called "Standard General Guage Field Theory of Point Particle Model" {U(1),SU(2),SU(3) ; SU(5), SO(10)} were successfully verfied in experiments.Now author shows simple but complete theory.

After all,essence of gravity is in the principle of equivalence, but not in general covariance.
❶Then the principle is expressed as **localized Lorentz transform invariance** (R.Utiyama,1956).And
❷also the invariance is proved to be **localized guage trandform one** in linear coordinates (1993).
❸ **Thus the gravity field is completely proved to be general guage field as supreme unified one.**
**Then,we can derive** $SO(11;1)\supset SO(11)\supset SO(10)\supset SU(5)\supset SU(3)\times SU(2)\times U(1)$.

"QGD". "BIG BANG PHASE TRANSITION". "STANDARD THEORY".

❹The sinario of creation universe from "$0^{*}$ #)" and matter evolution were derived as guage field phase transition dynamics in teperature decreasing universe field.

❺Mass of spinor patricle is due to mutual interaction energy between $\psi$ and frozen longitudinal gravitational field $A^a{}_0(\equiv\delta A^a{}_0+C^a)$ of $H_G=gch\psi\gamma^\mu A^a{}_\mu\ G_a\ \psi=\psi^* mc^2\psi$.
❻Macroscopic gravity is also derived as contracted $\delta A^a{}_0$ field of zero point vibration $\phi\propto C^a\delta A^a{}_0$

Such super string theory is mere a mathematical fantasy,confusional fraud,and not acutal physics. Supplementary to tell,quantum physics can be logically deduced from only two fundamental principles One is "canonical quantization" which constructs "quantum structure" with Schroedinger eqn, the other is "transform invariance" such as localized Lorentz transform one,which is due to space & time structure and is enabling "mutual interaction of fields".
Thus you can see that elementarary particle theory had been fundamentally completed.

## Introduction : As for Goedel's Completeness Theorem(≡CT)(1930) :

Any true proposition*) of theory K(≡axiom system) is provable.

(1)In the matter of course,the number of axioms of K are finite,and ordinary very few.Therefore a physcists should not introduce unreliable hypothesis(or model) with ease.
(2)After all,also QGD can become an axiom system with the principle of equivalence and guage theory. Therefore,it is not unusuall that elementary particle theory become completed.

*) : In the matter of course,a true proposition must be deterministic. Certainly there must be also indeterministic proposition X in incontradictional theory K due to Incompleteness Theorem(≡IT) Author proved that generally X is probabilitical phenomena caused from singularity part of K. So called "chaos" is mere a determistic sample processs of stochastic ensemble.Therefore any proposition must be either deterministic or statistical(≡The ultra completeness theorem).
#) : X in the natural number theory N is "the maximum number in N". That is infinity≡∞.Then real number zero≡ $0^*=1/\infty$. Therefore $0^*$ is also indeterministic!.

## ❶ Einstein's Principle of Equivalence on Gravity Field is expressed as Localized Lorentz Transform

1) : R.Utiyama,"Invariant Theoretical Interpretation of Interaction",Phys Rev **101** (1956),1597.
①Utiyama had established so called "general guage principle for interactions[1)]".
**infinitesimal guage transform for multi-component spinor field $\psi$ with infinitesimal $\{\varepsilon_a(x)\}$.**
$\delta\psi(x)\equiv i\varepsilon_a(x)\ G^a\ \psi(x)=\langle\exp[i\varepsilon_a(x)\ G^a\ ]-1\rangle\psi(x)$,where $G^aG^b-G^bG^a=if_a{}^c{}_b\ G^c$ .
② **Fundamental postulate on Localized Guage Transform(LGT) Invariance for $\psi$ Lagragian**$\equiv L(\psi;D_\mu\psi)$, where $D_\mu\equiv\partial_\mu-A^a{}_\mu\ G_a$ .Then the tranfrom for guage field must be $\delta A^a{}_\mu=\partial_\mu\varepsilon^a-\varepsilon^b f_b{}^a{}_c A^c{}_\mu$.
③Global Lorentz transform invariance is established in global field of nothing interaction. Einstein's principle of equivalence in gravity field is mathematically expressed as localized Lorentz transform(≡LLT) invariance.A gravity field is equivalent to local inertia cartesian systems.So in each local system,the LLT is to be established.
④LLT for coordinate : $dx_\mu'\equiv a_{\mu\nu}(x)dx_\nu\equiv[\delta_{\mu\nu}+\varepsilon_{\mu\nu}(x)]dx_\nu$. → $dx_\mu' dx_\mu'\equiv dx_\nu dx_\nu$.⟨norm invariance⟩.
⑤LLT for spinor field : $\psi'(x')\equiv T\ \psi(x)=[1+\frac{1}{4}\varepsilon_{\alpha\beta}(x)\gamma^\alpha\gamma^\beta]\psi(x)$. ← **SO(3;1) guage symmetry.**

## ❷ LLT Invariance simuletaneously becomes Comeplete LGT Invariance in Linear Coordinates :

Note that LGT is a tranform for only $\{\psi(x_\nu), A^a{}_\mu(x_\nu)\}$ fields, while LLT is simuletaneous tranfroms for $\{x_\nu; \psi(x_\nu), A^a{}_\mu(x_\nu)\}$ fields. Even though $A^a{}_\mu$'s tramform pattern become the same as ❶②.

① : $\partial'_\mu = a^{-1}{}_{\nu\mu}\partial_\nu$.

② : $T \equiv [1 + \frac{1}{2}\varepsilon_{\alpha\beta}(x)\ G_{\alpha\beta}\ ] = [1 + \frac{1}{4}\varepsilon_{\alpha\beta}(x)\gamma^\alpha\gamma^\beta]$. $\Leftrightarrow$ $T^{-1}\gamma^\mu a^{-1}{}_{\nu\mu}T = \gamma^\nu$.

③ : $\frac{1}{2}T\gamma^\mu A'^{\alpha\beta}{}_\mu G_{\alpha\beta} = \frac{1}{2}T\gamma^\mu A^{\alpha\beta}{}_\mu G_{\alpha\beta}T^{-1} - T^{-1}\gamma^\nu\partial_\nu T$.

proof) $L'(x') \equiv -c\psi'(x')[\hbar\gamma^\mu(\partial_\mu' - \frac{1}{2}A'^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ ) + mc]\psi'(x')$

$= -c\psi T^{-1}[\hbar\gamma^\mu a^{-1}{}_{\nu\mu}\partial_\nu - \frac{1}{2}A'^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ ) + mc]T\psi$

$= -c\psi[\hbar T^{-1}\gamma^\mu a^{-1}{}_{\nu\mu}\partial_\nu - \frac{1}{2}\hbar T^{-1}\gamma^\mu A'^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ ) + mcT^{-1}]T\psi$

$= -c\psi[\hbar T^{-1}\gamma^\mu a^{-1}{}_{\nu\mu}\partial_\nu - \frac{1}{2}\hbar T^{-1}\gamma^\mu A'^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ ) + mcT^{-1}]T\psi$

$= -c\psi[\hbar T^{-1}\gamma^\mu a^{-1}{}_{\nu\mu}T\partial_\nu - \frac{1}{2}\hbar\gamma^\mu A^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ + mc]\psi$

$- c\hbar\psi[T^{-1}\gamma^\mu a^{-1}{}_{\nu\mu}\partial_\nu T + \frac{1}{2}\gamma^\mu A^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ - \frac{1}{2}T^{-1}\gamma^\mu A'^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ T]\psi$

$= L(x) - c\hbar\psi[(T^{-1}\gamma^\mu a^{-1}{}_{\nu\mu}T)T^{-1}\partial_\nu T + \frac{1}{2}\gamma^\mu A^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ - \frac{1}{2}T^{-1}\gamma^\mu A'^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ T]\psi$

$= L(x) - c\hbar\psi[\gamma^\nu T^{-1}\partial_\nu T + \frac{1}{2}\gamma^\mu A^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ - \frac{1}{2}T^{-1}\gamma^\mu A'^{\alpha\beta}{}_\mu\ G_{\alpha\beta}\ T]\psi$.

☞ : Generally, Greek $\mu,\nu = 0,1,2,3,\cdots,N$, while Latain $k,l = 1,2,\cdots,N$. However, Latain suffix happen to be $0,1,2,\cdots,N$ in this paper.

④ : $\delta A^{pq}{}_\mu = \partial_\mu\varepsilon_{pq} + \frac{1}{4}f_{rs}{}^{pq}{}_{tu}\varepsilon^{rs}A^{tu}{}_\mu$. 〈☞ : caution on the negative sign of $\varepsilon^{rs}$ in T〉.

$\partial_\mu\varepsilon^{rs} = A^{rs}{}_\mu$ ; $T \equiv [1 - \frac{1}{2}\varepsilon^{rs}G_{rs}]$ ; $T^{-1} \equiv [1 + \frac{1}{2}\varepsilon^{rs}G_{rs}]$.

proof) $\frac{1}{2}\gamma^\mu\delta A^{\alpha\beta}{}_\mu G_{\alpha\beta} \equiv \frac{1}{2}T\gamma^\mu(A'^{\alpha\beta}{}_\mu - A^{\alpha\beta}{}_\mu)G_{\alpha\beta} = \frac{1}{2}T\gamma^\mu A^{pq}{}_\mu G_{pq}T^{-1} - T^{-1}\gamma^\mu\partial_\mu T - \frac{1}{2}\gamma^\mu A^{pq}{}_\mu G_{pq}$

$= \frac{1}{2}[1 - \frac{1}{2}\varepsilon^{rs}G_{rs}]\gamma^\mu A^{pq}{}_\mu G_{pq}[1 - \frac{1}{2}\varepsilon^{tu}G_{tu}] - [1 - \frac{1}{2}\varepsilon^{rs}G_{rs}]\gamma^\mu\cdot\frac{1}{2}\partial_\mu\varepsilon^{rs}G_{rs} - \frac{1}{2}\gamma^\mu A^{pq}{}_\mu G_{pq}$

$= -\frac{1}{4}\varepsilon^{rs}A^{pq}{}_\mu G_{rs}\gamma^\mu G_{pq} + \frac{1}{4}\varepsilon^{tu}A^{pq}{}_\mu\gamma^\mu G_{pq}G_{tu} - \frac{1}{2}\partial_\mu\varepsilon^{rs}\gamma^\mu G_{rs} + \frac{1}{4}\varepsilon^{rs}A^{pq}{}_\mu G_{rs}\gamma^\mu G_{pq}$

$= \frac{1}{4}\varepsilon^{tu}A^{pq}{}_\mu\gamma^\mu G_{pq}G_{tu} - \frac{1}{2}\partial_\mu\varepsilon^{rs}\gamma^\mu G_{rs} = -\frac{1}{4}A^{tu}{}_\mu\varepsilon^{pq}\gamma^\mu G_{pq}G_{tu} - \frac{1}{2}\partial_\mu\varepsilon^{rs}\gamma^\mu G_{rs}$ $\langle A^{tu}{}_\mu\varepsilon^{pq} = -\varepsilon^{tu}A^{pq}{}_\mu\rangle$

$= -\frac{1}{2}\gamma^\mu\{\partial_\mu\varepsilon^{rs}G_{rs} + \frac{1}{4}\varepsilon^{pq}A^{tu}{}_\mu[G_{pq}G_{tu} - G_{tu}G_{pq}]\} = -\frac{1}{2}\gamma^\mu\{\partial_\mu\varepsilon^{rs} + \frac{1}{4}\varepsilon^{pq}A^{tu}{}_\mu f_{pq}{}^{rs}{}_{tu}\}G_{rs}$.

$\Rightarrow +\frac{1}{2}\gamma^\mu\delta A^{rs}{}_\mu G_{rs} = -\frac{1}{2}\gamma^\mu\{\partial_\mu\varepsilon^{rs} + \frac{1}{4}\varepsilon^{pq}A^{tu}{}_\mu f_{pq}{}^{rs}{}_{tu}\}G_{rs}$. $\Rightarrow$ $\underline{\delta A^{rs} = \partial_\mu\varepsilon^{rs} + \frac{1}{4}\varepsilon^{pq}A^{tu}{}_\mu f_{pq}{}^{rs}{}_{tu}}$.

## ❸ Quantization on General Guage Fieldnized Gravity Field in Multi-Dimension Space.

Thus once guage field feature of gravity field has been proved. Then it can be directly generalized to (1+N) dimensional space and also applicable of "established qunatization method of general guage field by Faddeev·Popov, etal[2,3,4,5]. However there are also exceptional features as follows.

(1): time+space dimension must be taken (1+11) for realizing SO(11;1) unified field guage symmetry including partial Lie algebra {SO(10)⊃SU(5)⊃SU(3)×SU(2)×U(1)}. SO(11;1) also agrees with the being of 12 pieces elementary particles of leptons and quarks.

(2): time+space coordinate must be taken old fasion as $x_\mu \equiv (x_0 \equiv ict, x_1, x_2, \cdots\cdots, x_{11})$. Especially time must be imaginary $x_0 \equiv ict$. Note that $dx_\mu' = [\delta_{\mu\nu} + \varepsilon_{\mu\nu}(x)]dx_\nu$ and that $A^{\alpha\beta}{}_\mu = \partial_\mu\varepsilon^{\alpha\beta}$. Then $A^{0k}$ become imginary(anti hermite) guage field, which shall realize serious role of excess negative energy fluctuation of unstable transversal guage field in SO(11;1) → SO(11) phase transition of BIG BANG. Once SO(11) has realized, then such $A^{0k}$ had been self-anihilated. If the initial energy fluctuaion is positive, then BIG BANG(?) becomes stable to abort.

(3): Generally physics of SO(11;1) may can not be observed by experiment due to nonobservable multi-dimensional feature. Even though, we can make 0=+E−E(quasi big·ban) reaction in normal space[6] After all, quantization on SO(11;1) field does not yield quantum number physics, but clasical number interpretation shall yield necessary and sufficient informations on SO(11;1) world.


2) R.Utiyama: Prog Theo.Phys.Suppl 9 (1959) 19-44.
3) L.D.Faddeev & V.N.Popov: Phys Lett. 25 B (1967) 29.
4) G.'t Hooft: Nucl Phys. B33 (1971) 173.
5) T.Kugo & I.Ojima: Prog Theo.Phys.Supplement 66 (1979) 1.
6) M·Suzuki, "Creating Electrical Power by Longitudinal B Wave", private collected papers, 1995~2006.


**① Field Variables in QGD :** 〈☞ : $x_\mu \equiv (x_0 \equiv ict, x_1, x_2, \cdots, x_N)$ ; $A^a{}_\mu \equiv (A_0 \equiv i\phi^a/c, A^a{}_1, A^a{}_2, \cdots, A^a{}_N)$〉.

(1) LGT≡pararell shifting : $\psi_A(x+\Delta x)_{//} \equiv \psi_A(x) + \varepsilon_a(x)G^a{}_{AB}\psi_B(x) = \psi_A(x_\mu) + \Delta x_\mu A^a{}_\mu(x)G^a{}_{AB}\psi_B(x)$. LGT results invariant physics, so it is interpreted as pararell shifting. $\varepsilon_a(x)$ is infinitesimal function so as to be $\Delta x_\mu A^a{}_\mu(x)$.

(2) $D_\mu\psi_A \equiv \lim_{\Delta x_\mu \to 0}\Delta x_\mu{}^{-1}[\psi_A(x_\mu + \Delta x_\mu) - \psi_A(x_\mu + \Delta x_\mu)_{//}] = \partial_\mu\psi_A(x) - A^a{}_\mu(x)G^a{}_{AB}\psi_B(x)$. → (3) $A^a{}_\mu = \partial_\mu\varepsilon_a$.

(4) $dx'_\alpha = [\delta_{\alpha\beta} + \varepsilon_{\alpha\beta}(x)]dx_\beta$. → (5) $A^{\alpha\beta}{}_\mu = \partial_\mu\varepsilon_{\alpha\beta}(x) = \{\partial_\mu\varepsilon_{0k} \equiv iG^{0k}{}_\mu(\text{anti hermite})\ ;\ \partial_\mu\varepsilon_{kl} \equiv R^{kl}{}_\mu(\text{hermite})\}$.

② **QCD Lagrangean :**

(1)W suffix singlenization : $a\equiv(1=01, 2=02, \cdots\cdots, a=kl, \cdots\cdots, 66=1011)$, where $0\leq k<l\leq 11$.
(2)Gamma matrix : $\gamma^k\gamma^l+\gamma^l\gamma^k=2\delta^{kl}$. (3) : SO(11;1)'s generator : $G_a\equiv Q_{kl}=\frac{1}{4}[\gamma^k,\gamma^l]$.

| (4) **Partial Lie Algebra Sequence and the Evidence of Supreme Unified Field Feature of SO(11;1) :** |
|---|
| $SO(11;1)\supset SO(11)\supset SO(10)\supset SU(5)\supset SU(3)\times SU(2)\times U(1)$. |

(5)SO(11;1) Lie algebra : $[Q_{kl}, Q_{mn}]=f_{kl}{}^{kn}{}_{mn}Q_{kn}$ . → (6)$f_b{}^a{}_c\equiv f_{kl}{}^{kn}{}_{mn}=\delta^{lm}$. otherwise= 0.
(7)covariant derivative : $D_\mu C^a=\partial_\mu C^a+gf_b{}^a{}_c A^b{}_\mu C^c$.

$$L_{QCD}=-1/2\eta(\partial_\mu A^a{}_\nu-\partial_\nu A^a{}_\mu+gf_b{}^a{}_cA^b{}_\mu A^c{}_\nu)^2+icB^a\partial_\mu A^a{}_\mu+\tfrac{1}{2}\alpha^a B^a B^a+\chi C^a\partial_\mu D_\mu C^a-c\bar\psi[\hbar\gamma^\mu(\partial_\mu+gA^a{}_\mu G_a)]\psi \quad\cdots\cdots(8)$$

③ **Canonical Conjugate Variables :** 〈☞ : $L_0$ is that of free field term of $L_{QCD}$〉
(1)$\Pi_{\psi a}\equiv\partial L_0/\partial(\partial_t\psi_a)=i\hbar\psi_a{}^*$ ; (2)$\Pi_{Aa0}\equiv\partial L_0/\partial(\partial_t A^a{}_0)=B^a$ ; (3)$\Pi_{Aak}\equiv\partial L_0/\partial(\partial_t A^a{}_k)=(i/c\eta)(\partial_0 A^a{}_k-\partial_k A^a{}_0)$.
(4)$\Pi_{Ca}\equiv\partial L_0/\partial(\partial_t C^a)=(i\chi/c)\partial_0 C^a$. 〈☞ : 「$\Pi_{Ca}\equiv\partial L_0/\partial(\partial_t C^a)=(i\chi/c)\partial_0 C^a$」 must be not taken〉.

④ **QCD Hamiltonian :** 〈☞ : $\{B^a;C^a,C^a\}$ have dipole dimension and are called non·observable ghost 〉.

$H_{QCD}\equiv\Sigma_\phi\Pi_\phi\partial_t\phi-L_{QCD}=H_0$ |fields product of 2nd order ≡energy observables.| $+H_I$ |3rd and 4th order ≡field reactions|.

$=+c\hbar\bar\psi\gamma^k\partial_k\psi$ (1)
$+\langle(1/4\eta)(\partial_\mu A^a{}_\nu-\partial_\nu A^a{}_\mu)^2-\eta^{-1}(\partial_0 A^a{}_k-\partial_k A^a{}_0)\partial_0 A^a{}_k\rangle$ (2)
$-\langle icB^a\partial_k A^a{}_k+\tfrac{1}{2}\alpha^a B^a B^a\rangle+\chi\partial_k C^a\partial_k C^a$ (3)
$-gc\hbar\bar\psi\gamma^\mu A^a{}_\mu G_a\psi$ ·· **minimal guage interaction** on $\psi$ & $A^a{}_\mu$. (4)
$+(g/2\eta)f_b{}^a{}_c(\partial_\mu A^a{}_\nu-\partial_\nu A^a{}_\mu)A^b{}_\mu A^c{}_\nu+(g^2/4\eta)(f_b{}^a{}_cA^b{}_\mu A^c{}_\nu)^2$ ···2nd and 3rd order self reaction of $A^a{}_\mu$. (5)
$+g\chi f_b{}^a{}_c\partial_k C^a A^b{}_k C^c$. ···FP ghost and $A^a{}_\mu$ reaction, which acts in nucleon dipole forming reaction. (6)

⑤ **The Method of Guage Field Euler Equation as Non Quantum Number Physics(=Clasical Number one) :**
Generally speaking, multidimensional world such as QCD is quantum·physically nonobservable, because perturbation integral can converge only in ordinary (1+3) dimension world. So $H_I$ is of no use. Hence we employ "clasical number interpretation for QCD" instead of quantum number one. Then field Euler equation method acts unique and significant role especially in phase transition of guage field. As is in the below, the equation is multidimensional simuletaneous and nonlinear one, so it is almost impossible to derive analytical solution. Even though above mentioned method is useful.

$$\Box A^a{}_\mu-g^2(f_a{}^c{}_bA^b{}_\nu)^2A^a{}_\mu=gf_a{}^c{}_b\partial_\nu(A^b{}_\mu A^c{}_\nu)+g^2f_a{}^c{}_bA^b{}_\nu(\partial_\mu A^c{}_\nu-\partial_\nu A^c{}_\mu)+g^2f_a{}^c{}_bA^b{}_\nu(f_{d\neq a}{}^c{}_eA^d{}_\mu A^e{}_\nu)+j^a{}_\mu$$
$$\equiv s^a{}_\mu+j^a{}_\mu\equiv J^a{}_\mu. \quad\cdots\cdots ●⑤\text{-}(1)$$
$$j^a{}_\mu\equiv\eta gc\hbar\bar\psi\gamma^\mu G_a\psi+(ic\eta-\alpha/ic)\partial_\mu B^a+\eta\chi f_a{}^c{}_bC^b\partial_\mu C^c. \quad\cdots\cdots ●⑤\text{-}(2)$$

⑥ **Stability Criterion Method on General Klein·Gordon Equation $[\Box-M(x)]\phi(x)=j(x)$ :**

$L_\phi=-\tfrac{1}{2}(\partial_\mu\phi)^2-\tfrac{1}{2}M\phi^2-j\phi\equiv T$(kinetic energy)$-V$(potential one).
$V=\tfrac{1}{2}M\phi^2+j\phi=\tfrac{1}{2}M(\phi+j/M)^2-\tfrac{1}{2}j^2/M$. ⇔ 「$M>0$ → real # $\phi$ is stable at $\phi=-j/M$」.

| If $M>0$, $\phi$ has stable ∪ type potential with the bottom value $\phi=-j/M$. If $M<0$, $\phi$ has unstable ∩ type potential. | ⇔ 「$M=0$ → $\phi$ is critical 」. ⇔ 「$M<0$ → $\phi$ is unstable at $\phi=-j/M$」. ☞ : $M^a{}_\mu\equiv g^2(f_a{}^c{}_bA^b{}_\nu)^2\equiv g^2\Sigma_{\nu\neq\mu,\,c}(\Sigma_b f_a{}^c{}_bA^b{}_\nu)^2$. |
|---|---|

⑦ **Calculation on Stability Criterion of SO(N;1) Guage Field $M^a{}_\mu=g^2(f_a{}^c{}_bA^b{}_\nu)^2$ :**
〈☞ : $f_{kl}{}^{kn}{}_{mn}=\delta^{lm}$, otherwise=0, then note the double suffix symmetry features〉.
(1) $\{1=f_{kl}{}^{kn}{}_{ln}\equiv f_a{}^c{}_b\}$ → $a\equiv(kl)$ is fixed, only "n" is variable. If b is assigned, c becomes unique.
⇒ $M^a{}_\mu=g^2\Sigma_{\nu\neq\mu,\,n\neq k,\,l}{}^N\{(A^{n<l}{}_\nu)^2+(A^{l<n}{}_\nu)^2+(A^{n<k}{}_\nu)^2+(A^{k<n}{}_\nu)^2\}$.
(2)Note that $A^{kl}{}_\mu=\{iG^{0<k}{}_0=\text{real} ; R^{0<k<l}{}_0=\text{imaginary} ; iG^{0<k}{}_{\mu>0}=\text{imaginary} ; R^{0<k<l}{}_{\mu>0}=\text{real}\}$.

(3)$M^{0k}{}_\mu=g^2\Sigma_{n\neq k,\,0}[(f_{0k}{}^{0n}{}_{kn}A^{kn}{}_\nu)^2+(-f_{0k}{}^{kn}{}_{0n}A^{0n\neq k}{}_\nu)^2]=g^2\{\Sigma_{r(a)}{}^{N-1}(R^r{}_\nu)^2-\Sigma_{g\neq a}{}^{N-1}(G^g{}_\nu)^2\}$.
☞ : $a\equiv(0k)$ ⇒ $b\equiv(nk)=\{1k, 2k, \cdots, k\text{-}1\cdot k, k\cdot k\text{+}1, \cdots, kN\}\equiv r(a)$. (N-1) pieces of $R^r{}_\nu$.
☞ : $a\equiv(0k)$ ⇒ $b\equiv(0n)=\{01, 02, \cdots, 0k\text{-}1, 0k\text{+}1, \cdots\cdots, 0N\}\equiv g(a)$. (N-1) pieces of $G^g{}_\nu$

(4)$M^{a=kl}{}_\mu=g^2\Sigma_{n\neq k,\,l}[(f_{kl}{}^{k0}{}_{l0}A^{0l}{}_\nu)^2+(f_{kl}{}^{kn}{}_{ln}A^{ln\neq k}{}_\nu)^2]=g^2\{\Sigma_{r\neq r1,\,r2}{}^{2N-4}(R^r{}_\nu)^2-\Sigma_{j=1}{}^2(G^{g(aj)}{}_\nu)^2\}$.
☞ : $a\equiv(kl)$ ⇒ $b\equiv$\{two of(0k,0l)\}≡only $\{g(a_1), g(a_2)\}$of $(iG^g{}_\nu)$ are taken in sum.
☞ : $a\equiv(kl)$ ⇒ $b\equiv$\{two (kl)≡$\{r(a_1), r(a_2)\}$not taken in sum of (k-) & (l-) of 2(N-2) pieces of $R^r{}_\nu$\}

**❹ Creation Mechanism of Universe as Guage Field Phase Transition SO(N;1)→SO(N) :**

**① SO(N;1) Guage Field Euler Equation of $\{iG^g{}_\mu ; R^r{}_\mu\}$ :**

(1) $\Box G^g{}_\mu - g^2\{\Sigma_{r(g)}{}^N (R^r{}_\nu)^2 - \Sigma_{h\neq g}{}^{N-1}(G^h{}_\nu)^2\}G^g{}_\mu = J^g{}_\mu / i.$ 〈☞ : $iG^g{}_\mu$ is {SO(N;1)−SO(N)} guage field〉

(2) $\Box R^r{}_\mu - g^2\{\Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_\nu)^2 - \Sigma_{j=1}{}^2 (G^{g(rj)}{}_\nu)^2\}R^r{}_\mu = K^r{}_\mu.$ 〈☞ : $R^r{}_\mu$ is SO(N) guage field〉

**② Stability Criterion on $\{G \equiv iG^g{}_\mu ; R \equiv R^r{}_\mu\}$ :**

| |
|---|
| (1) $M^g{}_0 = g^2\{\Sigma_{r(g)}{}^{N-1}(R^r{}_k)^2 - \Sigma_{h\neq g}{}^{N-1}(G^h{}_k/i)^2\}.$ |
| (2) $M^r{}_0 = g^2\{\Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_k)^2 - \Sigma_{j=1}{}^2(G^{g(rj)}{}_k/i)^2\}.$ |
| (3) $M^g{}_k = g^2\{\Sigma_{r(g)}{}^{N-1}(R^r{}_{l\neq k})^2 - \Sigma_{h\neq g}{}^{N-1}(G^h{}_{l\neq k}/i)^2 + \Sigma_{h\neq g}{}^{N-1}(iG^h{}_0)^2 - \Sigma_{r(g)}{}^{N-1}(R^r{}_0/i)^2\}.$ |
| (4) $M^r{}_k = g^2\{\Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_{l\neq k})^2 - \Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_0/i)^2 + \Sigma_{j=1}{}^2(iG^{g(rj)}{}_0)^2 - \Sigma_{j=1}{}^2(G^{g(rj)}{}_{l\neq k}/i)^2\}.$ |

**③ Self Decay of Imaginary Field $\{iG^g{}_\mu\}$ and Realizing SO(N) Field(=BIG BANG) :**

☞ : $\{iG^g{}_\mu ; R^r{}_\mu\}$'s amplitude uniformity is assumed.→$\{M^g{}_\mu | M^{01}{}_\mu = M^{02}{}_\mu = \cdots = M^{0N}{}_\mu ; M^r{}_\mu | M^{12}{}_\mu = \cdots = M^M{}_\mu\}$

**SO(N;1)→SO(N) Transition Initiated by Fluctuation $\Delta E = \hbar/\Delta t$ :** $\langle iE_k = \partial_k A^a{}_0 - \partial_0 A^a{}_k ; H^a{}_j = \partial_k A^a{}_l - \partial_l A^a{}_k \rangle$.

(1) SO(N;1) initial field eneregy U is uniformly distributed due to "complete information lack".
$-\infty \leqq U = 1/2\eta[(E^r{}_k)^2 + (H^r{}_l)^2 - (E^g{}_k)^2 - (H^g{}_l)^2] < \infty$
U=0 is Energy Conservation Low(≡ECL).Negative energy comes from $\{iG^g{}_\mu\}$,positive comes from $\{R^r{}_\mu\}$
In the beginning of $\Delta t = 0$ is singular point of $\infty = \Delta E = \hbar/\Delta t$ in statistical ensemble meaning.Then
(2) If $U(t=0) \gg 0$.→(R > G)→universe is stable to abort by mismatching for ECL.
(3) If $U(t=0) \ll 0$.→(R < G)→universe is temperature T increasing and unstable system driving $\{iG^g{}_\mu\}$ selfdecay and explosive growth of $\{R^r{}_\mu\}$ so as to $\Delta E = +E - E \to 0$ in $\Delta t = \hbar/\Delta E$. ( **=BIG BANG** ).

(4) $M^{G,R}{}_0 < 0 ; M^{G,R}{}_k < 0$ : all $\{iG^g{}_\mu ; R^r{}_\mu\}$ is unstable.G→0, R→grow.Decay or growth depned on T.
(5) $M^{G,R}{}_0 < 0 ; M^{G,R}{}_k > 0$ : $\{G_k > R_k ; G_k < R_k\}$⇒contradiction,$\{M^G{}_\mu > 0 ; M^R{}_\mu < 0\}$⇒contradiction
(6) $M^{G,R}{}_0 > 0 ; M^{G,R}{}_k < 0$ : $\{iG^g{}_k ; R^r{}_k\} \to 0$, $\{iG^g{}_0 ; R^r{}_0\}$ → critically alive ⇒ (8)(T→0) state.
(7) $M^{G,R}{}_0 > 0 ; M^{G,R}{}_k > 0$: **R sperior** : all $\{iG^g{}_\mu ; R^r{}_\mu\}$ is stable.→no evolution→ E>0 contradict ECL.
☞ : In this case,negative $\{iG^g{}_\mu\}$ never grow so as to cancell +E for +E−E→0.

(8) $\{|G^g{}_k| > |R^r{}_k|\}$ ⇒ $M^{G,R}{}_\mu < 0$ : **Negative Energy of Transversal $G^g{}_k$ Field Sperior :**
**「Sperior {antihermite $iG^g{}_\mu$} tends to self-decay! and promote {hermite $R^r{}_\mu$}'s explosive growth!」**
**T↑ system:** Unstability acts $G_k$ field self-decay and R's explosive growth so as to cancell +E−E → 0 realization until $\Delta t = \hbar/\Delta E$. ⇔ **BIG·BANG Universe Creation from "Nothing"≡0*=+E−E.**
→finally R sperior⇒ **{SO(N;1)→SO(N)transition}** ,$0 > M^g{}_0(t=0) \to M^g{}_0(t \gg 0) \geqq 0$ as {G>R}→{G<R}
Exceptionaly hermite $\{iG^g{}_0\}$ shall revive to be −E energy.⇒ **universal attraction field of −E energy**

**❺ Frozen Longitudinal Field $iG^g{}_0(=A^a{}_0)$ in T→0 and Mass Generating Mechanism :**

Spinor particle mass can be derived in **closed axiom system of QCD** as observable interaction energy between $\psi$ and $A^a{}_0$ in $H_I = gc\hbar\psi\gamma^\mu A^a{}_\mu$ $G_a$ $\psi \Rightarrow \psi^* mc^2 \psi$.Then $A^a{}_0 = iW^a/c + \delta A^a{}_0$ called frozen longitudinal guage field in T→0,where $W^a$ is macro scale constant determiend by $\psi$ distribution in universe and $\delta A^a{}_0$ is zero point vibration.This fact is entirely analogous of electron charge e in longitudinal electrical potential $A_0$ of $H_{QED} = gc\hbar\psi\gamma^\mu A_\mu \psi = ce\psi^*\psi A_0 (e = g\hbar)$.So called Higgs model is entirely of no use.Thus famous SSC project in USA was aborted in 1993,before when author had discoverd ❶ ❷ and probabilitical phenomena of incompleteness theorem of Goedel.

**① Potential $V(A^a{}_\mu)$ is 2nd order function of $A^a{}_\mu$ with mini·maximum point :**

(1) $L_{GF} = -\frac{1}{4}(F^a{}_\mu)^2 = T - V = -\frac{1}{2}(\partial_\nu A^a{}_\mu)^2 - V$
$= -\frac{1}{2}(\partial_\nu A^a{}_\mu)^2 - \frac{1}{2}g(f_a{}^c{}_b A^b{}_\nu)^2 \underline{(A^a{}_\mu)^2} - \{gf_a{}^c{}_b A^b{}_\nu(\partial_\mu A^c{}_\nu - \partial_\nu A^c{}_\mu) + g^2 f_a{}^c{}_b A^b{}_\nu (f_{d\neq a}{}^c{}_e A^d{}_\mu A^e{}_\nu)\}\underline{A^a{}_\mu}$
(2) $V(A^a{}_\mu) = \frac{1}{2}M^a{}_\mu \underline{(A^a{}_\mu)^2} + N^a{}_\mu \underline{A^a{}_\mu} = \frac{1}{2}M^a{}_\mu (A^a{}_\mu + N^a{}_\mu / M^a{}_\mu)^2 - \frac{1}{2}(N^a{}_\mu)^2 / M^a{}_\mu.$
(3) $V^*(A^a{}_\mu = -N^a{}_\mu / M^a{}_\mu) = -\frac{1}{2}(N^a{}_\mu)^2 / M^a{}_\mu.$

☞ : $iG^g{}_0 = i^2\phi^g/c$=real, $(G^h{}_k)^2 = 0$, $R^r{}_k$=real and also $M^a{}_\mu = M^g{}_0 \geqq 0$.Thus $V_{mini}$ is negative.
This fact entirely desireable for $iG^g{}_0$'s being negative energy=−E so as +E−E=0 in universe.
☞ : $R^r{}_0 = i\phi^r/c$= imaginary and is ordinary stable due to $M^r{}_0 \geqq 0$.Then $V_{MAX} = -\frac{1}{2}(N^a{}_\mu)^2 / M^a{}_\mu > 0$.
$V(R^r{}_0 = i\phi^r/c)$ has ∩ type potential,whereas $V(iG^g{}_0 = i^2\phi^g/c)$ has ∪ type potential.

**② Absolute Stable Feature of Longitudinal Guage Field $iG^g{}_0$ due to $(G^h{}_k)^2=0$ after BIG·BANG.**

$M^g{}_0=g^2\{\Sigma_{r(g)}{}^{N-1}(R^r{}_k)^2-\Sigma_{h\neq g}{}^{N-1}(G^h{}_k/i)^2\}=g^2\{\Sigma_{r(g)}{}^{N-1}(R^r{}_k)^2\geqq 0.$ ·····❹②(1)

☞ : Thus $\{iG^g{}_0\}$ shall revive as constantnized field with 0 point vibration at stable point.

**③ Transversal Field $R^r{}_k$ shall be anihilated as $T\rightarrow 0$.**

$$M^r{}_k=g^2\{\Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_{l\neq k})^2-\Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_0/i)^2+\Sigma_{j=1}{}^2(G^{g(rj)}{}_0)^2-\Sigma_{j=1}{}^2(G^{g(rj)}{}_{l\neq k})^2\}.$$
$$=g^2\{\Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_{l\neq k})^2-\Sigma_{s\neq r1,r2}{}^{2N-4}(R^s{}_0/i)^2+\Sigma_{j=1}{}^2(G^{g(rj)}{}_0)^2).$$

1st term is dominant term,2nd is survibal term,3rd is small survibal term,4th is 0 after BIG BANG.
「As you can seen in (4),if dominant term $(R^s{}_{l\neq k})$ are weakend, $M^r{}_k$ become negative and $R^r{}_k$ become more weakend to weaken fellow field$(R^s{}_{l\neq k})$.This process acts cyclic weaken process of $R^r{}_k$」.

**④ Field Temperature Decresing to Zero and Realization of Constant Field of $A^a{}_0$ :**

$U_{GF}=½\eta[(E^a{}_k)^2+(H^a{}_l)^2]\backsim T^4\rightarrow 0$ , $iE_k=(\partial_kA^a{}_0-\partial_0A^a{}_k)\rightarrow 0$ ; $H^a{}_j=(\partial_kA^a{}_l-\partial_lA^a{}_k)\rightarrow 0$.

「As is seen in (4),transversal field $A^a{}_l\rightarrow 0(T\rightarrow 0)$.Then we derive $\partial_kA^a{}_0\rightarrow 0$ for survibed $A^a{}_0$. This fact means $A^a{}_0$'s constatness in global space( **frozen longitudinal guage field** )」.

**⑤ $A^a{}_0=iG^g{}_0(T\rightarrow 0)\equiv i^2W^g/c+i\delta G^g{}_0$ (constant field)+(zero point vibration field) :**

In the field eqn.transversal field $A^a{}_k$ and gohst term are dropped,and we derive fact that $A^a{}_0$ is determined by spinor current distribution$\equiv\eta gc\hbar\psi^*\ G_a\ \psi$.

(1) $\square A^a{}_0-g^2(f_a{}^c{}_bA^b{}_k)^2A^a{}_0=gf_a{}^c{}_b\partial_k(A^b{}_0A^c{}_k)+g^2f_a{}^c{}_bA^b{}_k(\partial_0A^c{}_k-\partial_kA^c{}_0)+g^2f_a{}^c{}_bA^b{}_k(f_{d\neq a}{}^c{}_eA^d{}_0A^c{}_k)$
$+\eta gc\hbar\psi\gamma^0\ G_a\ \psi+(ic\eta-\alpha/ic)\partial_0B^a+\eta\chi f_a{}^c{}_bC^b\partial_0C^c.$

$\square A^a{}_0=\eta gc\hbar\psi\gamma^0\ G_a\ \psi=\eta gc\hbar\psi^*\ G_a\ \psi.$

| (2) $\square A^a{}_0=\eta gc\hbar\psi^*\ G_a\ \psi.(T\rightarrow 0).$ |
|---|

**⑥ Mass Generating Mechanism and Spinor Mass Matrix :**

As was mentioned before,$\psi$'s mass is mere an energy of minimal guage inteaction as follows. Then we take $A^a{}_0=iG^g{}_0(T\rightarrow 0)=i^2W^g/c$. (2) is "**spinor mass matrix**". $G_a$ is assumed to be 12×12 hermite matrix,so "spinor elementary particles has 12 kind of masses as the eigen values".

(1) $H_I=-gc\hbar\psi\gamma^\mu A^a{}_\mu\ G_a\ \psi=-gc\hbar\psi\gamma^0A^a{}_0\ G_a\ \psi=-gc\hbar\psi^*(i^2W^g/c)\ G_g\ \psi=\psi^*[g\hbar W^g\ G_g\ ]\psi\equiv\psi^*mc^2\psi$

| (2) $M\ \equiv[c^{-2}g\hbar W^g\ G_g\ ]$. 《 "**spinor particle mass matrix**" 》. |
|---|

**❻ Zero Point Vibration $\delta iG^g{}_0$ and Macro Gravity Field as Newton potential :**

In ❺⑤(2) of $T\rightarrow 0$,we take following contraction and derive Newton potential by using mass matrix.

$\square A^a{}_0\equiv\square iG^g{}_0=\eta gc\hbar\psi^*\ G_g\ \psi=\square(i^2W^g/c+i\delta G^g{}_0)=\square i\delta G^g{}_0.$

$\square(iW^g\delta G^g{}_0)\ =\psi^*[\eta gc\hbar W^g\ G_g\ ]\psi.$

$\square(i^2W^g\delta\phi^g/c^4\eta)=\psi^*[c^{-2}g\hbar W^g\ G_g\ ]\psi=\psi^*m\psi\equiv\rho.$ 〈mass density〉

$\square(K_GW^g\delta\phi^g/c^4\eta)=-K_G\psi^*m\psi\equiv\square\phi=-K_G\rho.$ 〈$K_G$≡universal gravity constant〉.

| (1) $\phi\equiv(K_G/c^4\eta)W^g\delta\phi^g.\rightarrow\ \square\phi=-K_G\rho.\rightarrow$ stationarity $\rightarrow\nabla^2\phi=-K_G\rho$.〈Newton Potential〉 |
|---|

**❼ Nothing Low Principle in the Origin:** 〈☞:A logical "true" means an realizaion in physics〉.

According to "logic",once contradiction($A\wedge\neg A=1$) has established,then everything become true. A matter world(quantum physically observable one) is non-contradictional due to non-simuletaneous realization of phenomena $A\wedge\neg A$,while a vaccume world can be strictly proved to be contraradictional due to vaccume polarization reaction which is evidently created from "nothing" without causality.Therefore the creator is contradictional where there is no impossibility.After all,the creation(BIG BANG) is also **logical phase transition** from contradictional world(origin vaccume) to non-contradictional world(matter one) with normal vaccume(contradictional=non-observable). Therefore also our duty may be to establish "an order as non-contradictionality".

**backface :** Conclusions are derived by axiomatical simple way without any doubtful models.Above all, they just agree with physical realities. In anyway,truthes should be disclosed earlier,because harmful oppresions on author's works becomes worse and worse now.(Motoji-SUZUKI,2006/1/17 in Japan)