Infinite color energy in the SUSY

Imre Czövek

I examined three physical possibilities together: 1. infinite colour potential, 2. colour charge breaking, 3. supersymmetrical space-time quantum shift (with spin translations). The super-symmetrical Lagrangian allows me to introduce the followings:
1. the supersymmetry generator in the vertex (so the interactions contain spinor charges),
2. discrete space-time translation in the propagator (non continuous particle path in 4D),
3. dangerous color breaking.
So I declare that if a color charge disappears, the universe would become a colored QGP again, like in the Big Bang. The baryon and lepton number can remain invariant in the inverse electroweak phase transition and in the ordinary electroweak phase transition in my theory. The baryon genesis simulations can't give the baryon number breaking, with the possible Higgs mass, so the baryon genesis theory hasn't proved yet. The color charge breaking connects the serial worlds with Big Bangs and is in causal connection. IMHO only my idea can give the acceptable cause of the initial energy of the Big Bang. And this cause will be producible by CERN LHC experiment. The gluino mass (ca. 120 GeV) is crucial, and this energy will be reached in the collisions at the CERN. The particle energy at LHC will be unique since the BB, supposing that the supernova generated micro wave accelerators can't give above TeV nucleons.

1. Quark confinement

The color antiscreening forbids the escape of quarks and gluons from the hadrons, and forbids the existence of free quarks. Until the vacuum polarization screens the electrical charge, and antiscreens the color charge, the color charge develops to infinite in large distance, the proof is on [1]. The equal definitions of confinement: 1. the not color singlet states have got infinite energy, 2. in infinite distance the singlet quark- antiquark potential becomes infinite, 3. the gluon spectrum has mass-gap on low energy, 4. the color charge rises with the distance.

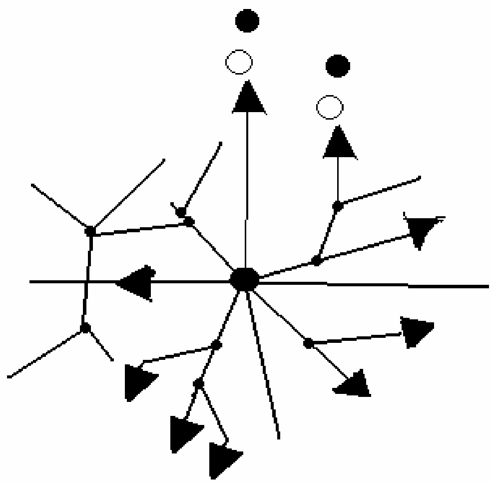


Fig. 1.
The extra color charge creates gluons and charges ● ○

1. The static quark potential at short distance likes to the electrical case:

$$V_{short}(r) = C\frac{\alpha_S}{r} + V_{r=\infty} \qquad (1)$$

where $C=Q_{1a}Q_{2a}$ depend on multiplet of quarks, V_∞ is the self interaction term at infinite distance. Out of the SU(3) color singlet (white) hadron $V_\infty = V(r=\infty)=0$.

2. *At large distance and at low energy the quark potential is linear:*

$$V\ (r) = -k(\alpha_S)r \qquad (2)$$

The "k" constant depends on the $\alpha_S(\Delta q)$ strong coupling constant, what depends on the impulse difference. This potential likes to the spring what bounds the quarks, and this potential orders the gluons in narrow flux tubes. The endless loop order Feynman graphs (Fig 1.) are vanished by renormalize only in SU(3) singlet cases. So the $V(r)=\infty$ bound energy exists in the non singlet SU(3) potential.

2. Break of confinement and the free quarks

If we create (or disappear) a lone quark color, the energy in (1) and (2) would be around infinity. The "spring" potential connects **all** quarks. This extra color charge polarizes all other hadrons (in $V_\infty \to \infty$), the attracts work until $k(\alpha_S(q^2)) \to 0$. The k=0 means the QGP state. So we get again a very dense, hot and charged QGP universe [2]. The arising energy is around infinity, real gluons and charges cause this effect (This is not an unsolved renormalization problem.) The infinite energy approach is the integral of the "k" number.

$$E=\sum_{i=1}^{N\to\infty}\int_0^{r_i\to\infty} dr(-k(\alpha_S(q^2{}_i)))\to-\infty \qquad (3)$$

Where N is the number of the quarks of the universe and r_i is their place. The range of gluons is ∞, because $m_{gluon}=0$.

The color charge rises with the distance. E.g.: I have an extra red quark color, it seems infinite red from large distance. This red attracts the blue and green quarks of any nucleon and repulses the red quark of the nucleons. But the color charge of a quark is random in the hadron, so this potential attracts with 2/3-1/3 force the hadrons. The white hadrons can't neutralize this extra red color. The red quark accelerate the hadrons until the difference of the impulse became Δp, where $k(\alpha_S(\Delta p))=0$. The final thermal QGP has at least T=137 MeV temperature.

So I image a "re-Big Bang". The main idea is to make QGP from all materials; therefore this theory needs an extra color charge. In this potential the physical compulsion is k:=0, where k=0 means the asymptotic freedom. The running coupling constant is always positive $\alpha>0$, and $\alpha(q,E)$ run until the $\alpha_{SU(5)}$ of Grand Unification. So in $k=\alpha M_{gluon}^2=0$ the mass-gap become zero.

The reappear of the missing anti red charge dissolve the k=0 compulsion and the potential became zero $V_\infty = V(r=\infty)=0$. The already globally white QGP can cool, expand, and the strong connection (the gluon spring) disappear.

The physicists don't break the Energy and charge, but the infinite E is in the QCD, and if SUSY would be today, it should break the SU(3) charge "T_{ij}" immediately, because the spinor and color charge don't commutate with each other (Eq. 14.1).

The following Feynman graphs are a possible SUSY particle creating method at LHC, complement with SUSY transformations and with QGP.

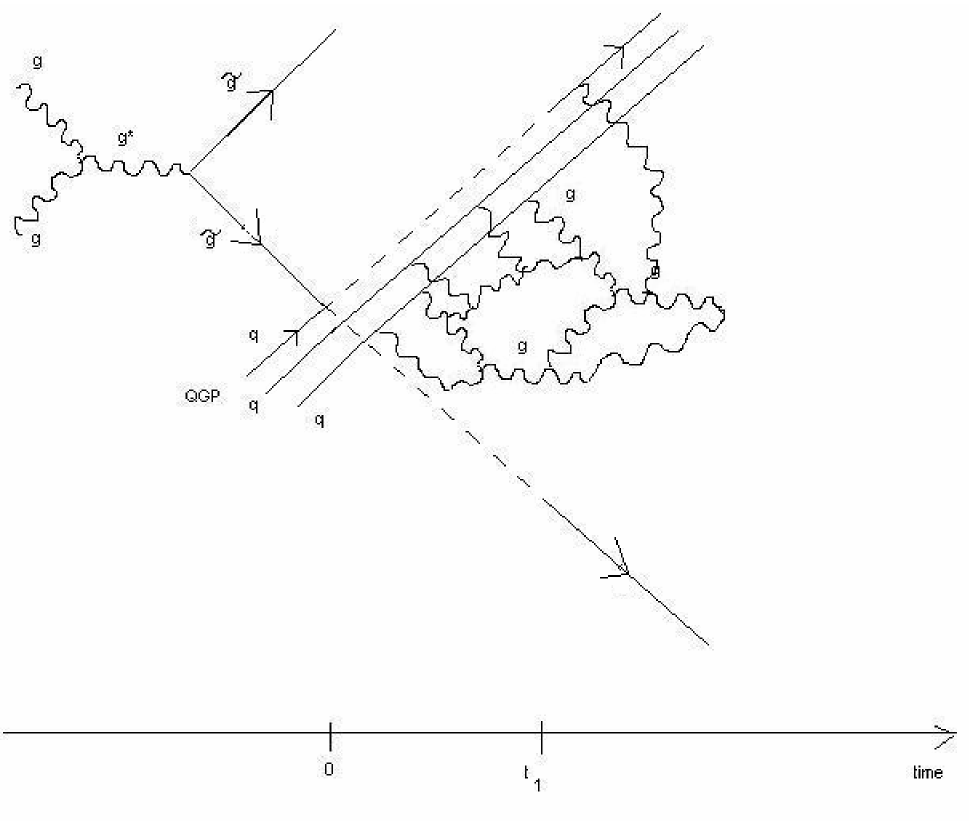


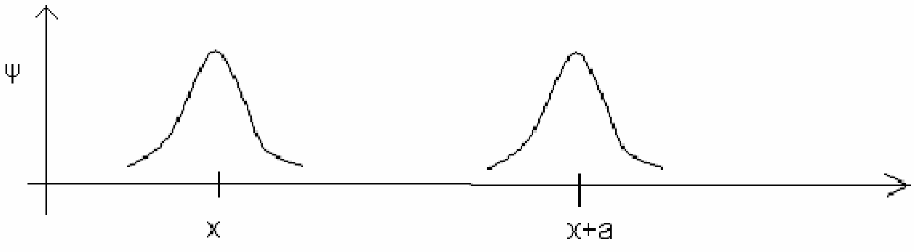
Fig. 2.
A free quark and a gluino disappear in the *first* interaction after the pair production

The collided hadrons (and gluons) create a gluino pair, the gluino interacts with a quark of QGP, what was created by this collision. One free quark disappears for t_1 time on this graph. The remaining color attracts the hadrons with the more and more gluons. The t_1 time gives $r=ct_1$ gluon ball; instead of the waited small gluon flux tubes. In general an interaction exchanges the energy and the impulse momentum of particles in the Poincare group. But SUSY particles exchange SUSY generators, super charges (Q) too. In the super Poincare group the E, p, Q generators are changing, and the gluon spin change to gluino spin. **Quantum shift**[7] is the name of the space shift: any fluctuation of the Grassmann space generates a space shift for the particles. Instead of fluctuations; I use the discrete Grassmann (spin) shifts, because the new SUSY vertex, what I introduced, allows that for me.

2.1 The superparticles disappear for t_1 time in the double SUSY transformation

Only the product of two conjugated super transformations is measurable. Just the $\{Q_\alpha, \overline{Q}_\beta\}_+ \sim 2\sigma_{\alpha\beta}{}^\mu p_\mu$ anticommutator is always Hermitian, so this two Q operators act at once in time. I inserted these measurable $\{Q, \overline{Q}\}_+$ spinor charges in SUSY vertices as coupling constants (charges) are in SM vertices. E.g. SU(3) multiplet ->g_{strong} in the vertex, but the super vertex can extend -> $g_{susy} e^{i\varepsilon_1 \overline{Q}} e^{i\overline{\varepsilon_2} Q}$ (spinor charges appear in the vertex), see this later in eq. 10. Measurable super charges (Q-s) and discrete spinor parameters (ε-s) are available in the interaction Lagrange.

After the two SUSY transformations the quark reappears in a new position $x^\mu + a^\mu$ in flat-space [5]**:**



Wave function translation

Fig. 3.

After the two infinitesimal SUSY transformation, we get the power series of $\exp(ip_m a^m)\,\Psi$.

$$[\delta_1,\delta_2]\Psi = \left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right]_-\Psi = a^\mu\partial_\mu\Psi = \delta_a\Psi \tag{6}$$

$$\Psi_{new} = \Psi_{old} + a^\mu\partial_\mu\Psi_{old} = (1+\left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right])\Psi_{old} \tag{6.a}$$

In spontaneous broken SUSY theory the left side of eq. 6 isn't continuous. The space-time translation of the fermions and bosons is the same:

$$a^\mu = \bar{\varepsilon}_2 2i\sigma^\mu\varepsilon_1 \tag{7.a}$$

On the supersymmetric coordinates ($\mathbf{x}^{0,1,,2,3}$, $\Theta^{1,2},\overline{\Theta_{1,2}}$) the supersymmetric action gives the same translation:

$$\left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right]_- : (x,\Theta,\overline{\Theta}) = (x+\bar{\varepsilon}2i\sigma\varepsilon,\Theta+\varepsilon_1,\overline{\Theta}+\bar{\varepsilon}_2) \tag{7.b}$$

Where ε is a finite constant, it isn't a continuous translation, is not dissolvable to the sum of infinitesimal parts. If $\varepsilon = \sum_{i=1}^{\infty}\varepsilon_i$ the anticommutator of these sums is different from the sum of anticommutators. The series isn't measurable, until the discrete SUSY is measurable.

$$\left[\sum_{i=1}^{\infty}\varepsilon_i\overline{Q},\sum_{j=1}^{\infty}\overline{\varepsilon}_j Q\right]_- = \sum_{i,j=1}^{\infty}\left[\varepsilon_i\overline{Q},\overline{\varepsilon}_j Q\right]_- \neq \sum_{i=1}^{\infty}\left[\varepsilon_i\overline{Q},\overline{\varepsilon}_i Q\right]_- = \left[\varepsilon\overline{Q},\overline{\varepsilon}Q\right] \tag{7.c}$$

So the non linear transformation is not dissolvable, or the parts of the sum are not measurable.

SSB:

As SUSY and SU(2) $_{weak}$ *spontaneous sym. breaking theorem we can choose the* ε *spinor parameter to the goldstone fermion field* $\boldsymbol{\varepsilon=\lambda}$. Then a^μ is a large non dissolvable, constant amount of time (and space). *[3] So the epsilon is fixed to the Goldstino field value at the moment, when the interaction was.*

(The Schrödinger equation is the $\delta_{a^\mu}\Psi$ infinitesimal space-time evolution of wave functions. With large epsilons eq. 6. couldn't be the Schrödinger time evolution, because a^μ *is non infinitesimal and non continuous,* and the discrete time translation depends only on the Goldstino. a^μ is discrete, constant and determined by the Goldstone fermion field. *In this discrete case we should use eq. 12. instead of eq. 6.*)

I show that the fields and SUSY propagators contain a^{μ} translation, because the Wess Zumino Lagrange is invariant under $1+\left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right]$ SUSY transformation.

$$L=(\frac{1}{2}\phi T\phi-\frac{m}{2}\phi\phi-\frac{g}{3}\phi\phi\phi)_F=(\frac{1}{2}\phi' T\phi'-\frac{m}{2}\phi'\phi'-\frac{g}{3}\phi'\phi'\phi_2)_F$$
$$\phi'=(1+\left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right])\phi \qquad (8)$$

The components contain kinetic, mass and jA-like interaction terms. The SUSY transformation shifts the SM Lagrange terms of eq.8;
Before and after the SUSY transformation the energy of the particles is equal; and we get back the Ψ_{old} state, like to the teleportation. For example: an electron accelerate between x and x+a. so $\delta H>0$. But if I increase and then decrease the spin in the x point, then the spin forward and backwards translation give a δ_a space translation, with $\delta H=0$, because the energy is always invariant in the SUSY. It is possible only if:

$$\begin{aligned}&\psi(x+b)=\psi(x)\_\_\_\_\_\_ 0<b<a\\&1+\left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right]:\psi(x)\to\psi(x+a)\\&1+\left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right]:\overline{\psi}\psi(x)\to\overline{\psi}\psi(x+a)\\&1+\left[\varepsilon_1\overline{Q},\overline{\varepsilon_2 Q}\right]:j(x)\to j(x+a)\end{aligned} \qquad (9)$$

During the discrete translation, there isn't mass and interaction, because the wave function is constant. We get constant, not interacting, not propagate state in SM. The extended *space-time isn't continuous* in 7.b, and so the conversation laws break. ***ε=λ=const.***

These all are coming from the vertex. I have written the general and an example gluon-gluino vertex.

$$\Gamma_{super}=\frac{\partial^3(g\phi'\phi'\phi)}{\partial\phi\partial\phi\partial\phi}\Big|_{components}$$
$$\Gamma_{g,gino}=g_s f^{abc}\gamma_\mu\to g_{susy}f^{abc}\gamma_\mu e^{i\varepsilon_1\overline{Q}}e^{i\overline{\varepsilon_2 Q}} \qquad (10)$$

Before the arrow stands then "text book" vertex and on the right side stands my vertex, what come from (8). The $e^{i\varepsilon_1\overline{Q}}e^{i\overline{\varepsilon_2 Q}}$ phase of SUSY space-time shift appears in the propagator and vertex, because I can put this phase in the supersymmetric Lagrange density and $\delta_\varepsilon L=0$ stay invariant. The vertex was obtained from L_{int} and the propagator was obtained from L_0.

Now the SUSY generators and chiral fields:

$$Q_a = i\frac{\partial}{\partial\theta^a}-(\sigma^\mu\bar{\theta})_a\partial_\mu$$
$$\bar{Q}_{\dot{a}} = -i\frac{\partial}{\partial\bar{\theta}^{\dot{a}}}+(\theta\sigma^\mu)_{\dot{a}}\partial_\mu \qquad (10.1)$$

$$\bar{D}_{\dot{\alpha}}\phi = 0$$

$$\phi(x,\theta,\bar{\theta}) = \exp\left(-i\theta\not{\partial}\bar{\theta}\right)\phi(x,\theta); \quad \bar{\phi}(x,\theta,\bar{\theta}) = \exp\left(i\theta\not{\partial}\bar{\theta}\right)\bar{\phi}(x,\bar{\theta})$$

The correlation functions were written by Wess. The $\Phi\Phi$ two point function contains a negligible exp(i0)=1 phase if $\Theta = \Theta'$ [3]:

$$\langle 0|T\{\Phi(x,\Theta,\overline{\Theta})\Phi(x',\Theta',\overline{\Theta}')\}|0\rangle = -im\delta(\Theta-\Theta')\exp[i(\Theta\sigma^m\overline{\Theta}-\Theta'\sigma^m\overline{\Theta}')\partial_m]\frac{1}{\partial_\mu\partial^\mu - m^2} \quad (10.2)$$

But the $\Phi\Phi^+$ (true) superfield propagator allows $\Theta \neq \Theta'$ and allows translations, small distances where the SUSY particle doesn't "propagate" classically. Discrete space-time translation contains the propagator:

$$\langle 0|T\{\Phi(x_1,\Theta_1,\overline{\Theta_1})\Phi^+(x_2,\Theta_2,\overline{\Theta_2})\}|0\rangle = -i\exp[i(\Theta_1\sigma^m\overline{\Theta}_1 + \Theta_2\sigma^m\overline{\Theta}_2 - 2\Theta_1\sigma^m\overline{\Theta_2})\partial_m]\Delta_F(x_1-x_2)$$

(10.3)

Eg.: between $(x,\Theta,\overline{\Theta})$ and ($x+\bar{\varepsilon}2i\sigma\varepsilon$, $\Theta+\varepsilon,\overline{\Theta}+\bar{\varepsilon}$) the 10.3 propagator contains a space-time evolution phase:

$eg.$:

$$\langle 0|T\{(1+[\varepsilon_1\overline{Q},\overline{\varepsilon_2}Q])\Phi(x,\Theta,\overline{\Theta})\Phi^+(x,\Theta,\overline{\Theta})\}|0\rangle = -i\exp[i(\varepsilon\sigma^m\bar{\varepsilon} + \Theta\sigma^m\bar{\varepsilon} - \varepsilon\sigma^m\overline{\Theta})\partial_m]\Delta_F(\bar{\varepsilon}2i\sigma\varepsilon) =$$

$$=> -i\exp[ia^m\partial_m]\Delta_F(x,x+a)$$

We could choose the thetas to zero, than we get similar discrete space-time translation, as in the definition of SUSY in eq. 6. is. It's another proof of the discrete space translation among spin transformations. The equation of motion is the invert propagator, eg. the Klein-Gordon:

$$-i\exp[-ia^m\partial_m](k^2+m^2)\Psi(x) = (k^2+m^2)\Psi(x) = 0 \qquad (10.3)$$

The n-point function is:

$$\langle 0|T\{\Phi(x_1,\Theta_1,\overline{\Theta_1})...\Phi^+(x,\Theta_{n+1},\overline{\Theta_{n+1}})\int L_{\text{int}}(x'_1)dx'^4_1...\int L_{\text{int}}(x'_n)dx'^4_n\}|0\rangle =$$

$$= \langle 0|T\{\Phi...\Phi^+...\int \tfrac{1}{3}[g\Phi^3(x'_1,\Theta_1,\overline{\Theta_1})\delta(\overline{\Theta_1}) + g^*\Phi^{+3}(x'_1,\Theta_1,\overline{\Theta_1})\delta(\Theta_1)]dx'^4_1\, d^2\Theta_1 d^2\overline{\Theta}_1...|0\rangle$$

The discrete version of SUSY transformation (eg non infinitesimal case):

$$\Phi(x,\varepsilon,\bar{\varepsilon}) = \exp i(xP + \bar{\varepsilon}Q + \varepsilon\overline{Q})\Phi(0,0,0)\exp[-i(xP+\bar{\varepsilon}Q+\varepsilon\overline{Q})] \qquad (11)$$

The coordinate (Lorentz) transformation:

$$\exp(\frac{1}{2}i\lambda M)\Phi(0,0,0)\exp(-\frac{1}{2}i\lambda M) = \exp(i\lambda\Sigma)\Phi(0,0,0) \qquad (12.a)$$

where $M_{\mu\nu} = i(x_\mu\partial_\nu - x_\nu\partial_\mu) + \frac{1}{2}\Theta\sigma_{\mu\nu}\frac{\partial}{\partial\Theta} - \frac{1}{2}\overline{\Theta\sigma_{\mu\nu}}\frac{\partial}{\partial\overline{\Theta}} + \Sigma_{\mu\nu}$ (12.b)

$M_{\mu\nu}$ is the superspace representation of the angular momentum generator.

(The $\{Q,\overline{Q}\}_+ \sim p$ anticommutator is measurable in flat (zero mass) geometry $[x_1,x_2] = 0$. More and more particles could disappear in a chain reaction, if the fireball mass become zero through $SU(2)_{\text{weak}}$ restoration.)

2.1.2 Quantum shift

The chiral coordinates contain the SUSY generator caused translations:

$$y^{\mu} = x^{\mu} + i\Theta o^{\mu}\overline{\Theta} \qquad \overline{y}^{\mu} = x^{\mu} - i\Theta o^{\mu}\overline{\Theta} \qquad (13.)$$

The $y^{\mu} y_{\mu}$ square is an invariant scalar. And here we use the curved space time and the curved Grassmann space:

$$[x^{\mu}, x^{\nu}] = ig^{\mu\nu} \qquad \{\Theta^{\alpha}, \Theta^{\beta}\} = C^{\alpha\beta} \qquad [y^{\mu}, y^{\nu}] = 4\Theta\overline{\Theta}C^{\mu\nu} \qquad (13.1)$$

The Grassmann space fluctuation gives the quantum shift:

$$\Theta^{\wedge\alpha} = \Theta^{\alpha} + \vartheta^{\wedge\alpha} \qquad \phi(y, \Theta^{\wedge\alpha}) = e^{\vartheta^{\wedge} Q}\phi(y, \Theta^{\alpha}) \qquad (13.2)$$

The phase factor is the unitary operator of the Hilbert space. This ϑ^{α} Grassmann shift can be caused by the SUSY vertex.

In y chiral coordinate representation the single SUSY acting ($\Theta^{\wedge\alpha} \longrightarrow \Theta^{\alpha} + \vartheta^{\wedge\alpha}$) makes the following phase for the antichiral superfield:

$$\overline{\phi}(\overline{y}, \overline{\Theta}^{\wedge\alpha}) = e^{-2i\vartheta^{\wedge}\sigma^{\mu}\overline{\Theta}\partial_{\mu}}\,\overline{\phi}(\overline{y}, \overline{\Theta}^{\alpha}) \qquad (13.3)$$

This antichiral quantum shift likes to the space shift.
Earlier I used measurable double Grassmann space shift:

$$\Theta, \overline{\Theta} \longrightarrow \Theta + \varepsilon, \overline{\Theta} + \overline{\varepsilon} \quad \text{and this give} \quad x \longrightarrow x + \overline{\varepsilon}2i\sigma\varepsilon \qquad (13.3.1)$$

The product of chiral and antichiral fields describes the behavior of the Lagrange. In general the products describe the n-point functions, the scatters and the currents. Here we can use the Baker-Campbell-Hausdorff's formula of the product of the exponents.

The S action is the space-time integral of the Lagrange density, and the Lagrange density contains Grassmann integration. And all these integrals are invariant under the quantum shift. The quantum shift breaks the super Poincare invariance in non commutative, curved space. The Scatter matrix don't commutate with the $M_{\mu\nu}$ 4D-Lorentz generator:

$$[S_{NC}, M_{\mu\nu}] = \mathrm{M}_{\mu\nu}{}^{\vartheta} S_{\vartheta} \qquad (13.4)$$

On the right side the $\mathsf{M}_{\mu\nu}{}^{\vartheta}$ matrix is the superspace representation of the angular momentum generator. And this $\mathsf{M}_{\mu\nu}{}^{\vartheta}$ matrix is in relation with the $C_{\mu\nu}$ "non-commutating matrix", 13.1. In flat space C=0, and the Lorentz transformation commutates with the scatter matrix. .

2.2 Addendum: one SUSY transformation [1]

Q isn't Hermitian in general, but with supersymmetry breaking Q could be Hermitian operator, so *maybe* it could be a measurable action in our world, but it is generated by SUSY fields. So if this Q operator is Hermetian in spontaneous SUSY breaking, Q would mix the original and super particle states. Q: disappears a fermion => creates a boson. This breaks R parity, too.
With Hermitian Q the charge breaking is too easy. The spinor charge and the color charge are not commutate, are not invariant. We get different eigen charges if we first measure T then Q, or first Q then T:

$$[Q_{ai}, T_j] = (b_j)_i^k Q_{ak}; \quad [\bar{Q}_{\dot{a}i}, T_j] = -(b_j)_i^k \bar{Q}_{\dot{a}k}$$
(14.1)

where $1 \leq j \leq 8$, and i,k depend on SUSY group. In SM the hyper and color charge commutate, in SUSY Q and T don't commutate. The second SUSY transformation and the space-time translation leave the colour generator invariant

$$\left[\{Q,\overline{Q}\},T\right]_{-} = -b[Q,\overline{Q}] = 0. \quad (14.2)$$

Another example: Q is Hermitian on the goldstino Hilbert space, $\delta_\varepsilon \lambda \approx \partial_m \lambda$

where $p_m = \frac{\hbar}{i}\partial_m$ is Hermitian operator:

$$\delta_\varepsilon \lambda = \varepsilon / \kappa + i\kappa(\varepsilon\sigma^m \overline{\lambda} - \lambda\sigma^m \overline{\varepsilon})\partial_m \lambda$$
$$\delta_\varepsilon \delta_\varepsilon \lambda = 1/2[\varepsilon\overline{Q}, \overline{\varepsilon}Q]\lambda = a^m \partial_m \lambda \quad (16.)$$

In eq. 16. the Goldstino isn't mixing with sgoldstino or with goldstone boson.
Q would break the charge of the goldstino, if it has any charge.

In this case the super vectorfield is the mixing of a fermion, a boson and a non propagating auxiliary field:

$$y_\mu = x_\mu + \overline{\Psi_\mu}\Theta + \Psi_\mu \overline{\Theta} + B_\mu \Theta\overline{\Theta} \quad (16.2)$$

Q mixes the original state with their super partner state.

$$\Psi_\mu \xrightarrow{\varepsilon Q} \Psi_\mu + \overline{\varepsilon} i \sigma^\alpha \partial_\alpha X_\mu \quad (16.3)$$

When we measure this mixed state, we get Ψ_μ^i eigenstate with p_1 likelihood or $i\overline{\varepsilon}\sigma^\alpha\partial_\alpha X_\mu$ with p_2 likelihood. $i\overline{\varepsilon}\sigma^\alpha\partial_\alpha X_\mu$ is virtual, so we measure the minimal state with zero energy, so $p_2=1$, $p_1=0$. In the low energy case Q can't make a heavy squark from a quark, so squark become virtual. Instead of this Q mixes the original state with the vacuum. If in SUSY breaking $Q\left|\Psi_\mu\right\rangle \longrightarrow \left|0\right\rangle$, then $\left\langle \Psi \| Q\Psi \right\rangle = \left\langle Q^*\Psi \| \Psi \right\rangle = 0$ and Q=Q*, Q Hermitian. But this is a speculation only.

The Hermitian Q generators can act in different points. The time difference between the two action $Q_1(t_1)$ and $\overline{Q}_2$ (t_2) is $\Delta t = t_2 - t_1$ but

$$\Delta t_{SUSY} = a^0 = \overline{\varepsilon}_2 2i\sigma^0 \varepsilon_1 \quad (16.4)$$

The lost time of the particle: $\Delta t - \Delta t_{SUSY}$.. The particle reappear at t_2 but its "time evolution" is only Δt_{SUSY}, it loses time.

We live in compact 11D dimension (in compact Grassmann space), so Q compactificate the dimensions and fields, also they disappear. The compactification operator of the N=1 space-time supersymmetry:

$$Q_{-1/2;\alpha}(z) = e^{-i\phi/2} S_\alpha \Sigma(z)$$
$$\overline{Q}_{1/2;\overline{\alpha}}(z) = e^{-i\phi/2} S_{\overline{\alpha}} \Sigma^+(z)$$
$$S_\alpha = e^{i\alpha H}$$

2.3 Fluctuations and low energy observations

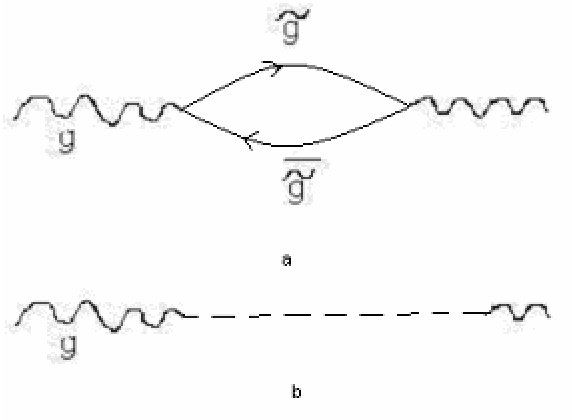


Fig. 4.

The a. graph could be, but the vertices contain $g_{susy}e^{i\varepsilon_1\bar{Q}}e^{i\bar{\varepsilon_2}Q}$ so we see b. The long disappearance of a gluon changes the hadron colour and causes a disaster.
But the virtual SUSY particles lifetime is too short to observe them:

$$r_{disappear} \approx \frac{h}{m_{SUSY}c} << r_{strong} \approx \frac{h}{m_\pi c}.$$

On low energies we should not take Fig. 3. into consideration, because virtual SUSY particles don't change the energy momentum, because the SUSY vertex $\left[\varepsilon_1\bar{Q}, \bar{\varepsilon_2}Q\right]_-$ commutate with the Hamilton, and it's very short disappearing. In Fig 4. the incoming gluon annihilated, so it disappear forever, the gluinos live for short time.
With real goldstone fermion ε=λ we get measurable, discrete, constant time shifts. If I good know, the Higgs condensate is everywhere and give mass; Goldstino as LSP and SUSY breaking could be everywhere as an invisible current, and fix a^μ when a SUSY particle interacts. The one-loop correction on high energies is added to the (5.b) $\Phi\Phi^+$ first order superfield propagator [3]:

$$\int d^4x d^4x' d^2\Theta d^2\bar{\Theta}\Delta^2{}_F(x-x')\Phi(x,\Theta,0)\exp[-2i\Theta\sigma^m\bar{\Theta}\partial_m]\Phi^+(x,0,\bar{\Theta}) \qquad (16.5)$$

The phase of the correction contains $-2i\Theta\sigma^m\bar{\Theta}$ spatial shifts.

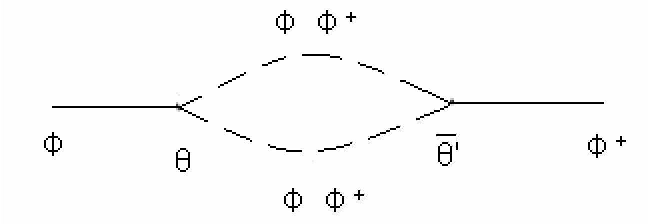


Fig. 5. high energy graph like to Fig. 4.a low energy graph

So SUSY isn't observable until the energy of heavy ion collisions is below the super partner masses. And after this energy the particles will disappear…

3. Lack of observations

- Bounded quarks and gluons (like to the proton) disappear and reappear together. The SUSY generator acts at once on every quark, as the impulse acts on the whole proton. The proton is one mixed wave function, EPR state.

- SUSY particles disappear forever in any $g_{susy} e^{i\varepsilon_1 \overline{Q}} e^{i\overline{\varepsilon_2} Q}$ interaction in flat-space.
LSP will vanish forever, because by self interactions we can add infinite amount of time shifts $\Psi(t + \sum a_0)$. So LSP (as dark matter) has zero cross-section and zero mass.
- The only observable Feynman graph is the first interaction between the superparticle and a SM particle.
- Virtual (small) shift is favourable to quantum vagueness.
- In the nature there is not supersymmetric QGP:
In the near of the black holes of the astrophysics $[x_1, x_2] \neq 0$ and the two SUSY transformations become:

$$(\delta_\eta \delta_\varepsilon - \delta_\varepsilon \delta_\eta) V^A = V^D \varepsilon^C \eta^B R^A_{BCD} - \varepsilon^C \eta^B T^D_{BC} D_D V^A \qquad (17)$$

Where V^A is a tensor zero-form, R is Ricci tensor, curvature, D_D is the covariant derive, D_D contain gravitational fields. These equations are more complicated because new gravitational fields appear in eq. 17.
By this means eq. 17 become non-Hermitian and not measurable.
If I write the eq. 17 fields in the interaction Lagrange, and I derivate it with V^A, then I get "curved" vertexes, which can't disappear. In the quantum shift theory the antisymmetrical curved matrix appear in the shift, what isn't selfadjoint, not measurable.
A vertex couldn't contain non measurable parts. So Black holes eat the reappeared LSP and raise the universe mass. Conclusion: the astrophysical accelerators, collisions and lepton accelerators aren't dangerous [6].
It was an interpretation, why are undetectable the Lightest SUSY Particle, the dark matter; and why was the Big Bang.
- I can't imagine TeV, PeV EeV nucleons and neutrinos in the cosmic rays; rather I can imagine clouds of dust with microgram masses and with TeV energy, because dust clouds give the same muon and electron shower in the air like the TeV particles.
- Before the Big Bang this theory needs flat geometry to disappear and to break charge. If this ε parameter is a free parameter, and a^μ is random; a^0 could be negative, and the particle could reappear in an earlier state (pre Big Bang) if $a^m = \overline{\varepsilon}_1 i \sigma^m \varepsilon_2 < 0$.
- Fermions and bosons have equal mass m=0 during the translation, this is the same mass multiplet of unbroken SUSY. Fermions and bosons have equal occupation of states because T=0, but before and after the disappearance this particles have high temperature.
- In UFO stories we have heard stories about 15 minutes time lost experiences = disappearances.
- The flat universe looks like to the flat shape of supernova explosion, where the matter existed, collapsed then expanded.

4. re-Big Bang:

I find very interesting that a little charge breaking can cause infinite universe contraction and explosion. The disappearance of a lot of particles was give a white noise color and can give a quasi stable state. (After the $SU(2)_{weak}$ restoration the masses became zero, and after the SUSY restoration the Goldstone fermion vanish. The discrete space-time shifts became a random parameter independently from Goldstino.) The border of SU(2) restored space contain SUSY particles with mass and discrete shifts, so the contraction continue.

Until $k_{source} > 0$ the hadrons move in the direction of the source. So the extra color potential rises far away from the source, where still confined hadrons in the far galaxies are. This takes for long time (billions of years) if we collect all baryons. It's not a long time for the forever existing super particles. The spring diagram contains identical springs, two attract and one repulse:

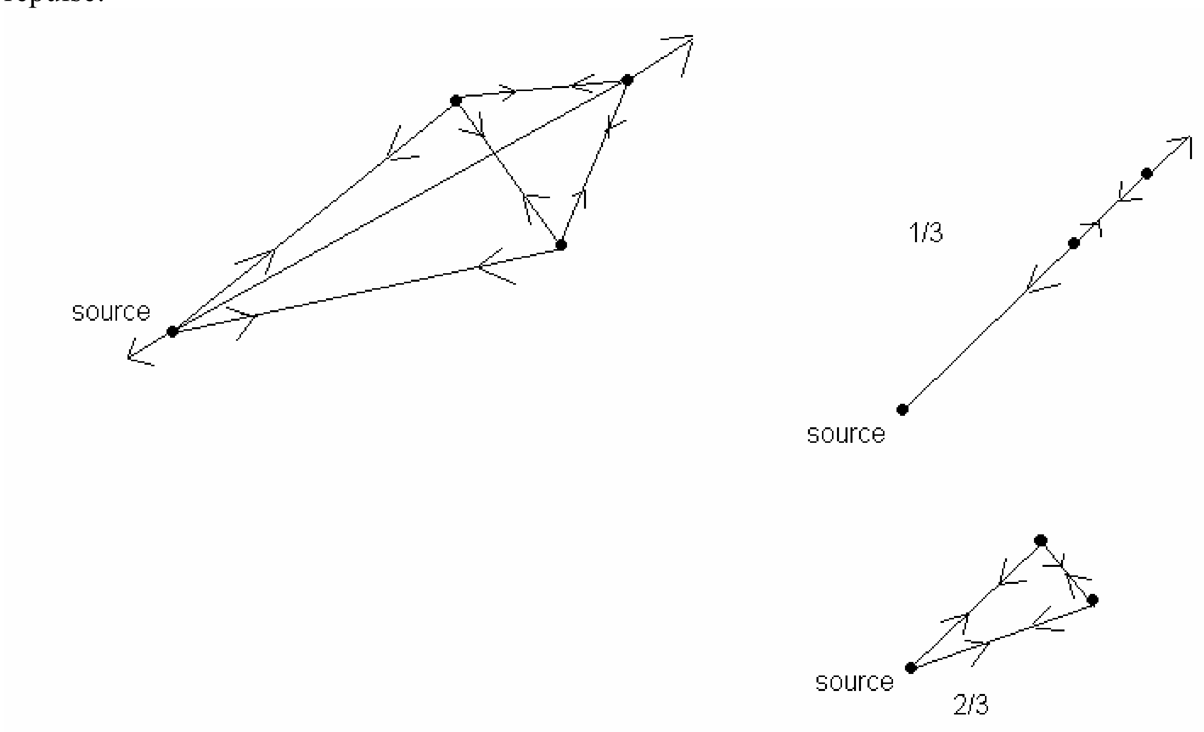


Fig 5.
The extra color source attracts the mesons and triplets with the strong force.

The first physical compulsion (or goal) in the extra color potential is $k_{source}=0$, because until $k>0$ the potential attracts strongly the hadrons.
The second physical compulsion is the creation of squarks and gluinos. With the disappearance of gluinos the extra color source develops to a random extra color, white noise source. This could be a stable state. It is possible that the color of QGP became white for enough time to expand, and the temperature of particles cool below $T_{critical}$. I see two ways to apply this idea to the Big Bang, because "Everything was compressed into a small region":

1. the above chain of ideas, where B and L = invariant, and the initial size (t=0) was large (like to the sun of a supernova).

2, or a lone quark with infinite gluon charges caused the infinite energy. The initial size (at t=0) was small (r=fm). The created particles stay in the near of origin of –kr potential. The background hasn't energy, so the background temperature was 0 K. Then B+L is not invariant, the baryon and lepton genesis was a possibility after the V=-kr potential vanished. I prefer the first case, because to create a point like, divergent lone quark is hard, and on the other hand large initial size is easier to make.

3. Finally (for joke) I think a string (d)effect. The key is charge breaking, so the 3 quarks of a lone proton move to different D-branes, and cause 3 Big Bang and 3 parallel universes...

My theory supports the existence of God. IMHO He is a quantum computer made of supersymmetrical, disappeared particles, if these particles live long and are able compute under the disappeared time. (If two real time dimensions exist, then the energy conservation law breaks automatically). The bases of 11D string theory:

$$1,i,j,k,\ E,I,J,K,\ \Theta,\overline{\Theta},\Theta\overline{\Theta} = 10+1D$$

Ref.:

[1,2] http://czovekimre.tripod.com/
[3] J. Wess and J. Bagger: Supersymmetry and Supergravity 64. p.
[4] J. A. Casas and C. Munoz: Some Implications of Charge and Color Breaking in the MSSM hep-ph/9606212
[5] M. Kaku: Quantum Field Theory
[6] Julius Wess: Non-local Wess-Zumino Model on Nilpotent Noncommutativ Superspace hep-th/0505011.
[7] Masato Arai, Masud Chaichian, Kazuhiko Nishijima, Anca Tureanu: Non-anticommutative Supersymmetric Field Theory and Quantum Shift, hep-th/0604029.