

ATHENAEUM
551 SOUTH HILL AVENUE
PASADENA, CALIFORNIA 91106

My Dear Feza and Sukra

As you can see I am writing from Caltech, where I am spending several days at Gell-Mann's invitation !!!! He was at Yale last week for a day and we started talking and here I am. I will give a talk this afternoon and I am therefore quite scared. I have been trying to abstract from the group theory the "free" field theory of the string. Although the theory is not complete, it looks somewhat hopeful. Yesterday I attended a seminar here where the gods attended. The speaker was demolished by Feynman, Gell-Mann left shortly after it started and a guy by the name of Fox topped it all with a demonic laughter at each of Feynman's jab. A charming crew. I am ready to go back to New Haven right now....

As you know we bought a house and we'll move in at the end of May. Everything looks fine. Our daughter is more and more fun. She has blue large slanted (almond shaped) eyes - in short fantastic. She is now standing up but does not yet know how to come down. We the parents giggle idiotically at each of her feats, which pleases her immensely.

Well, I had better end this note, now. Yusuf should go with you shortly and I am sure Ric dominates all your thoughts. Also I heard about Feza's bronchitis only after it was over so I cannot wish him well for it... but I still do.

Please take care and come back to us soon.

You deserved

Persi-

- P.S. 1) I will try to talk to Gell-Mann about octonions.
2) I still do not know if there is money for Jim
3) There is no money for Cengiz next year. I (and Fikri) have tried to have him work with Lamb.

F. Ramond
ATHENAEUM

551 SOUTH HILL AVENUE
PASADENA, CALIFORNIA 91106



AIR MAIL

Prof. Feza Gürsey
Physics Department
Middle Eastern Technical Institute
Ankara

TURKEY.

New Haven March 11, 1973

Dear Suha & Feza:

It is Sunday night and all is quiet, therefore some precious free minutes are at hand to write the forever post-poned letter.

Life has been very busy for us. Tonya is a healthy child and brings us much joy and happiness, but there have been difficult times. Also, Parenthood can be a nerve wrecking experience if one does not adopt a philosophical approach to the whole situation of disorder, chaos and high decibels. I think that you know what I mean. She is becoming more of an "adult", extremely curious and very much aware of her surroundings. On the whole we are very pleased with her.

By now you must be aware that we will be staying in New Haven longer than originally planned, so we have decided to buy a house. Well, it is not easy. We happen to be very difficult to please, born with some sense of esthetics, but little in the way of finances. It is

time consuming, and that makes Pierre very unhappy because it keeps him away from his beloved physics. But we shall continue in the pursuit of our dream house.

Needless to say that New Haven is not the same without the Girsseys. We miss you very much and look forward to your return. We miss those endless discussions and friendly chats about the many weird celebrities that populate this earth.

The Dombos have made their annual pilgrimage to New Haven this January and we spent many pleasant moments. They looked great, very happy and full of life. We plan to see them next week in Baltimore (Pierre will give a talk). On the way back we will stop to visit Pierre's parents. By the way, Pierre's brother and sister-in-law (the psychopath) are getting a divorce.

No surprise for us!

From time to time I meet Yusuf when I am out with Tanya. The buses are on strike in New Haven

so I guess that he has to walk to get to "your place" in Hamden. He looks fine and is turning into a handsome man. Once, when the Domobos were here, a whole group, Yusuf included, went to Leon's for dinner. Don't worry Subo, he has not lost his appetite. I can vouch for it, I was sitting next to him.

I am glad that you had such a nice holiday on the Mediterranean. As for us, we are very much ready for Spring although we cannot complain too much, for the winter has been a quite merciful one.

Pierre will spend this July at Cern. Tanya and I will stay in the States. When are you coming back?

Please give my regards to the Swanks when you see them. How are they? Have they become good Turks? What are their plans?

Well, I hope that we hear from
you soon, in the meantime
I better finish and go to sleep,
since my daughter has this
nasty habit of getting up at 6 A.M.,
every day!

Kisses

Lillian,

Tanya (asleep)

&

Pierre (in absentia
-at the office-)

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Pierre Raymond

New Haven, February 6, 1973.

Dear Suha and Feza

I am very sorry for not having written any sooner, but it has been quite busy around here. Still to make up for it, I am sending you several pictures of your son, the well-known Yusuf (Yp?) who seems to be in excellent health and spirits. These are polaroids and were taken this afternoon. Yusuf has asked me to draw your attention to the new jacket he bought.

Murat has asked me whether or not I had told you of my promotion, which seems to point to the fact that a letter has been lost on the way. I have, thanks to your report, been promoted and await the ratification by the University. Again all my thanks. Lillian (and Tamya) are very pleased and we are beginning to look for more permanent quarters - a house maybe.... Here in New Haven, life goes on as usual except we are all missing the "Feza's". The Democrats were here last month and we all had a pretty good time. It is always nice to see good friends. Lillian tells me she will write to Suha soon.

I went to the New York meeting last week and enjoyed my first such meeting (I already had a job, contrary to all others). Job-wise, Itzchak is doing very well and has offers from everywhere. Yet he seems to want to come back to Yale as a postdoc!! That would just be very nice. Both of you are going to be curious: Martin is giving a seminar on the history of Thermodynamics and Statistical Mechanics; he gave his first lecture yesterday on Sadi Carnot. As usual, one runs out of superlatives to describe his style.

Browley has decreased my teaching load to one course (E.M. Theory 102), which enables me to do more research. I have decided to follow the procedure Sophocle and Feza indicated in building the Poincaré group generators for composite hadrons. It turns out that the dual model generators are of the form you advocated i.e. infinitely reducible and IMF to specify boundary conditions. The difference lies in the construction of the little group and of M^2 .

Since there are daughter trajectories (necessary for crossing symmetry if nothing else), the relationship between M^2 and $\vec{T} \cdot \vec{T}$ is not 1-1. The construction in dual model runs as follows -

viewed as an ∞ no. of transversely located constituents with coordinates $x_i^{(n)}$ and conjugate momenta $\pi_i^{(n)}$ obeying the usual commutation relations: $0 = [x, x] = [\pi, \pi]$; $[x_i^{(n)}, \pi_j^{(m)}] = i \delta_{ij} \delta^{nm}$.

then, set $T_3 = \sum_{n=1}^{\infty} (x_1^{(n)} \pi_2^{(n)} - x_2^{(n)} \pi_1^{(n)})$

We still have to make models for the internal dynamics. Use the projection τ to parametrize the internal motion, where τ is defined by $[M^2, \tau] = i \frac{d}{d\tau}$. Physically this makes sense as τ is the time in the rest frame of the hadron. This requires that we have periodicity in the internal motion (or else that M^2 have an integer spaced spectrum) thus we have

$$x_i^{(n)}(\tau + T) = x_i^{(n)}(\tau) \quad \text{etc.}$$

Poincaré invariance requires then that $T_i = \frac{1}{T} \int_0^T d\tau \mathcal{L}_i(\tau)$; $M^2 = \frac{1}{T} \int_0^T d\tau M^2(\tau)$,

for only then do we have $\frac{dT_i}{d\tau} = \frac{dM^2}{d\tau} = 0$.

So far this does not guarantee straight line trajectories. [I] do not quite yet understand how to build them in. Still one finds that (in the dual model)

$$i=1,2 \quad \mathcal{L}_i(\tau) = \frac{1}{M} M^2(\tau) x_i(\tau)$$

where $M^2(\tau) = \sum_{n=1}^{\infty} (\pi_n(\tau) \cdot \pi_n(\tau)) + M^2$
 $x_i(\tau) = e^{iM^2\tau} \sum_{n=1}^{\infty} x_i^{(n)} e^{-iM^2\tau}$
 $\pi_i(\tau) = e^{iM^2\tau} \sum_{n=1}^{\infty} \pi_i^{(n)} e^{-iM^2\tau}$

One finds that the normal ordering causes very great problems! As T_1 and T_2 are bilinear in the a 's and a^\dagger 's (coherent state operators for each constituent), one finds that $[T_1, T_2] = \sum_A i T_3$ only when i runs from 1 to 24 and when $M_0^2 = -1$! i.e. we need rather than $O(3)$ an $O(25)$ little group to close the algebra \rightarrow hence there is no Poincaré group for the model! [I (and nobody else) understands the physical origin of such an

activity. One sees that the $SU(1,1)$ in this formalism act as ladder operators between the various states. As I believe more in special relativity than in dual models, I am trying very hard to overcome these difficulties. One way is to do the little group in a Wigner basis.

Then we can rivast an infinity of coordinates $\vec{X}^{(n)}$ located in the three-dimensional subspace. Then define $S_{ij} = \sum_{n=1}^{\infty} (X_i^{(n)} \Pi_j^{(n)} - X_j^{(n)} \Pi_i^{(n)})$ $i, j = 1, 2, 3$. and $M^2 = \frac{1}{2} \sum (\vec{\Pi}^{(n)} \cdot \vec{\Pi}^{(n)} + n^2 \vec{X}^{(n)} \cdot \vec{X}^{(n)})$. This leads to a Poincare invariant theory with straight line trajectories, exponential degeneracy etc., i.e. all the good things. I am, however, pessimistic of its success as it looks much too easy.

Probably it will not lead to dual amplitudes when the interaction is introduced.

I have also thought of the octonions. It seems to me that if the octonionic charge were associated with an internal group, then it would nearly solve the problem of non-existence of quark states as well as the problem of zero four-momentum for the $q\bar{q}$ state. My ideas are unfortunately too vague to be useful. [By the way, the conformal limit of Dual Models could be nearly obtained by letting T (the period) go to infinity.] I would very much like to hear your comments on the Poincare group approach. It is true that one still has to develop a way of introducing the dual interaction, but I am hopeful this can be done - in perturbation theory of course - if it works I will let you know.

I am going to CERN in July by myself to work with Fubini (who impressed me very much when I was at MIT last November). Another piece of gossip you probably already know: Weinberg has been offered Schwinger's chair at Harvard and will (probably) take it. Ahn Brown has been offered a position at MIT as assistant professor, which pleases me very much.

Well I have rambled enough! Lillian and Tanya send their love. Love back to us soon.

Peter

Boğaziçi Üniversitesi

Arşiv ve Dokümantasyon Merkezi

Kişisel Arşivlerle İstanbul'da Bilim, Kültür ve Eğitim Tanıtı

Feza Gürsey Arşivi



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