



HIROSHIMA UNIVERSITY

Higashisenda-machi
Hiroshima City, Japan
Tel No. ④ 1221

Jan. 30, 1980

Prof. R. K. Varma
Physical Research Laboratory
Ahmedabad 380009
INDIA

Dear Ram:

Enclosed please find a copy of our President's official invitation letter to you. (The original will be sent to you directly from the President's office). I believe that the conditions are satisfactory. In fact, your monthly allowance is twice as much as mine and will therefore be more than sufficient. A few points I wish to remark:

- 1) If possible, please come to Japan on April 1.
- 2) Please keep all receipts with you.
- 3) You have to prepare a receipt of the air ticket, although it is not written so in the President's letter. I personally advise you to look for a possibility to get a receipt for the first class ticket and to actually travel by economy class or discount fare. Please use air, not train, inside your country. You also have to show an itemized statement of accounts for every transportation means. They will pay you following your statement.
- 4) Your residence will be prepared by us. We will rent an apartment by a contract between the University and the owner of the apartment. We are looking for one with two rooms with kitchen and bathroom of approximately 50m² area. If you have

Kyoji Nishikawa
Institute for Fusion Theory
Hiroshima University
Higashisenda-machi
Hiroshima, Japan
(730)

BY AIR MAIL
PAR AVION

Prof. R. K. Varma
Physical Research Laboratory
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any preference, please let me know it as soon as possible.

Since the University will not pay more than 55000yen per month, you may have to pay the extra if the monthly rental is over 55000yen. I also warn you that the owner of the apartment usually requests to pay extra fee (normally 100,000 yen or so) and deposit which you will have to pay for yourself. This is, however, still a small portion of your monthly salary.

If you have any further questions, please write to me or call me at 0829-49-1292 (office) or 0829-23-0528 (home).

Looking forward to seeing you in Japan

Sincerely,

Kyoji Nishikawa

Director

Institute for Fusion Theory

P.S.

Your registration fee will be paid by us in advance. You have to make a hotel reservation, otherwise you will have to stay in an expensive hotel!

Please write your preference as soon as possible to the Kindetsu International.

P.S. to P.S.

Your visa belongs to category 4-1-7. K.N.
(research and teaching). K.N.



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Tel (0822) 41-1221

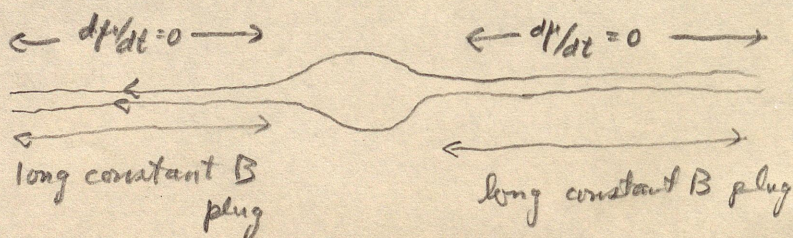
Dec. 27, 1980

Professor Ram Varma
Physical Research Laboratory
Ahmedabad 380 009
India

Dear Ram:

I was meaning to write you earlier, but I have been kept desperately busy in the last two months and was unable to do so. Let me first inform you that there is a high probability for me to attend the Texas Workshop on the Long Time Prediction of Nonlinear Dynamical Systems to be held from March 16 to 19. I received an invitation some time ago and I submitted our joint work on numerical study of nonadiabatic particle motion in a magnetic mirror. I believe that you would not object my presentation of our work at this Workshop. The chance that I can attend the Workshop has become realistic since Japan MOE is planning to send an official deligation to Texas, IFS, around that time for prediscussion of the joint US-Japan Fusion theory collaboration.

Concerning the paper, I am now studying Chirikov's article and am comparing our results with his theory. One point which is difficult for me to understand your theory is that, suppose we have a magnetic mirror with long constant magnetic field plugs in both ends, then your tuunnelling theory predicts exponential decrease of nonadiabatic escape with the length of the plug regions, though obviously there will be no change of the magnetic moments in the plug region where the magnetic field is constant. I would appreciate it if you could give me your interpretation of this apparent paradox.





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Mr. Irie is now busy in completing his thesis work which should be submitted by January 15. After finishing his Ph.D. thesis work, he will restart working on our problem with particular reference to the relation to Chirikov's work. In the meantime, Dr. Tange is helping me in understanding Chirikov's work. I am deeply regretting that I should have spent much more time with you to learn these intensifying problems while you were here.

My schedule for the coming year is quite tight until April, but I shall try my best efforts to prepare for the March Workshop.

My best wishes for the happiest new year to you and to your family.

Sincerely,

A handwritten signature in cursive script, appearing to read 'Kyoji'.

Kyoji Nishikawa

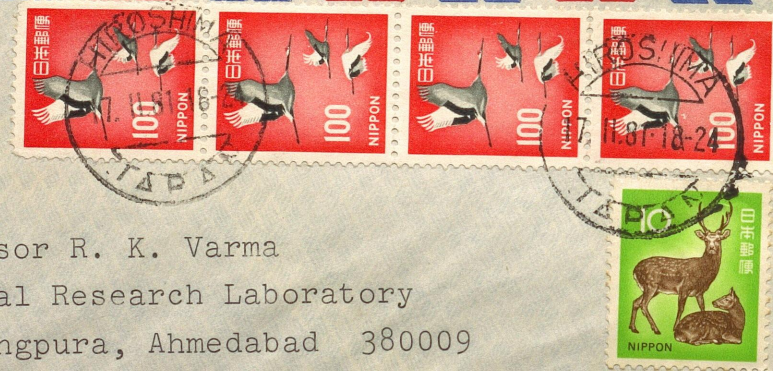
Director

Institute for Fusion Theory

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Professor R. K. Varma
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EXPRESS



HIROSHIMA UNIVERSITY

Higashisenda-machi
Hiroshima City, Japan
Tel (0822) 41-1221

Feb. 17, 1981

Professor R. K. Varma
Physical Research Laboratory
Navarangpura, Ahmedabad 380009
INDIA

Dear Ram:

Thanks for your letter. A desperate time schedule has been preventing me from working on the problem. In addition, the sickness of my wife has become slightly worse and she is now being hospitalized. So, please excuse me for my very slow response to you.

I have still some difficulty in understanding the puzzle I raised you about your quantum mechanical tunnelling picture of nonadiabatic particle decay. Suppose a particle had initially a magnetic moment μ greater than the critical value μ_c and suppose μ becomes less than μ_c after an elapse of time t . We then follow the subsequent motion of this particle. My question is that, even if the magnetic potential barrier has a long width, this particle will have more chance to escape if the magnetic field in the barrier region is almost constant, since there $d\mu/dt = \text{const}$. I do not understand how the probability for this particle to escape decreases exponentially as the barrier width increases. I would appreciate it if you could give me a physical explanation to this question at your earliest convenience. Another point I want to ask you is the periodic nature of the change of μ when the particle is well trapped. It looks as if a particle is making a "trapped" oscillation in a certain phase space. The oscillation period is several times the



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bouncing time in the magnetic mirror and becomes smaller as the value of μ increases. If you have any idea or reference on this problem, please let me know it. I wonder if this periodic behavior is something to do with the superadiabaticity in the presence of electrostatic fluctuations. (M. N. Rosenbluth, P.R.L. 29, 408 (1972)).

Thanking you in advance for your quick response and again let me appologize to you for my very slow response.

Sincerely,

A handwritten signature in cursive script, appearing to read "Kyoji Nishikawa".

Kyoji Nishikawa

Director

Institute for Fusion Theory