9/2/85

Boris,

This nomination will likely fall on deaf ears, but Giulio and I thought it might be worth at least a try.

I would say, "enjoy the autumn," but I am not certain that Novosibirsk has an autumn. But if it does, hope you enjoy it.

Warm regards to all,

Joe

Sinai & Ruelle!

Georgia Institute of Technology

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College of Sciences and Liberal Studies
School of Physics

2 September 1985

Professor J. L. Lebowitz
Chairman of the IUPAP Commission on Thermodynamics and Statistical Mechanics
Department of Mathematics
Bush Campus, Rutgers University
New Brunswick, New Jersey 08909

Dear Joel:

We, the undersigned, hereby nominate Professor Boris V. Chirikov of the Institute of Nuclear Physics, Novosibirsk, USSR to receive the next Boltzmann Award.

At first thought, it might seem unorthodox to recommend a pioneer in nonlinear dynamics/chaos for an award in thermodynamics and statistical mechanics. But in fact, such a nomination is not only appropriate, it is overdue. For over thirty years, nonlinear dynamics/chaos has addressed itself to finding the origin of randomness in deterministic systems, both classical and quantal. In so doing, it has sought to complete the program begun by Boltzmann and continued by Birkhoff and von Neumann, among others. The progress achieved over the past thirty years is more than spectacular, it is revolutionary. During the past few years, broad segments of even the popular press have recognized that something new is afoot in dynamics. Under such circumstances, should statistical mechanics not also recognize and reward these achievements? Specifically, should it not recognize and reward one of the most noted pioneering physical scientists in nonlinear dynamics/chaos?

In 1954, Fermi, Pasta, and Ulam startled the statistical mechanics community by exposing a system of coupled, weakly nonlinear oscillators which did not yield the expected approach to equilibrium. In the same year, Kolmogorov announced a theorem (now known as the KAM theorem) capable of explaining the FPU result. Before others in the physics community even knew this theorem existed, Boris Chirikov had digested it and used it not only to explain the observed near-integrable behavior but to also predict the parameter values for the onset of chaos in the FPU system. In the physics community, Chirikov was the first to understand the transition (or route) to chaos via overlapping resonances. Like many pioneers, his early work here received almost universal neglect, but it is quite widely known and used now.

Following his work on the transition to chaos in isolated systems, Chirikov pioneered the study of transport properties as derived directly from deterministic, time-driven Newtonian systems. Selecting the simplest possible model-- that of a periodically kicked rigid rotator-- Chirikov predicted the transition to chaos for this model and, operating in the chaos regime, he verified a diffusive energy absorbtion by this deterministic rotator which had all the expected statistical properties. He showed that probability does not, as long supposed, have to be "inserted" into Newtonian dynamics; it has been there, innate, all the time. Despite the seeming artificiality of Chirikov's rotator model, it led to the now well-known Chirikov's Standard Map which has found wide applicability in nonlinear dynamics, plasma physics, and accelerator physics.

These classical dynamical investigations were followed by a study of the periodically kicked quantum rigid rotator. Here Chirikov was the first to discover specific limitations on chaos placed by quantum mechanics. When his work is combined with that of others, the net result appears to be that there may not be any chaos (randomness) in Schrodinger quantum mechanics outside the inherent randomness of the wave function and the like, which if true, would be revolutionary indeed. Laboratory experiments on the possible chaotic (if any) ionization of hydrogen by microwave radiation are currently underway at Stoney Brook and Pittsburgh. Chirikov and collaborators have already published a Phys. Rev. Lett. indicating the limits to chaos which should be observed in these experiments. From 1950 to the present, Chirikov has always been a pioneer.

Among the various Soviet honors Professor Chirikov has received, the highest came only recently. Last year, he was elected to membership in the Soviet Academy of Science. Since he has at last been honored in the East, we urge that he now also be honored in the West.

Respectfully Submitted,

G. Casati

Giulio Casati
Professor, Istituto
di Fisica, Milano

Joseph Ford

Joseph Ford
Regents' Professor