July 15, 2001

Professor Jeremy R. Knowles, Dean
Faculty of Arts and Sciences
Harvard University
5 University Hall
Cambridge, MA 02138

Dear Jeremy,

First, we would like to thank you for meeting with a group of us from the Astronomy and Physics Departments on July 10, 2001, regarding our proposal to the Physics Frontiers Centers program of NSF. Since this proposal is directed to the Physics Division of NSF, our group was limited to representatives from the *Astronomy* and *Physics* Departments. However, our initiative has actually a broader context within Harvard University, since it also involves the *Earth & Planetary Sciences* Department with possible links to the *Biology* and *Chemistry* Departments. In this letter we would like to lay out the full details of our initiative.

Overall, we feel that NSF's interests should not dictate the future of our research; instead we should define our plan first and then try to get the necessary funds and office space to meet that goal. But, before we put much more of our time into this effort, we would very much appreciate your perspective on our initiative, and in particular we would like to know whether FAS would be willing to invest seed funds in getting it started. As detailed below, the overall annual budget of our center would be about $2M, and we could imagine that in the long run we will raise a substantial fraction of it from NSF, NASA or DOE, based on the excellence of our research. However, it would be much easier to get outside support if the University puts some seed money into it, because only then would the success and intellectual prominence of the center become apparent to outside agencies.

We believe that the future of our research will be shaped by three major themes: the interface between *particle physics* and *cosmology*, the interface between *planetary physics/biology* and *astronomy of extra-solar planets*, and the interface between *string theory/general relativity* and *black hole astrophysics*. Harvard has expertise in Physics, Astronomy, and Earth & Planetary Sciences but has very limited contact between the corresponding departments. The immediate need for such ties is apparent from the fact that these three departments are currently trying to recruit five(!) excellent people who work at the interface between the above fields. These are: Oded Aharonson (*planetary physics/astronomy*), Sujoy Mukhopadhyay (*geochemistry/cosmochemistry*) Sarah Stewart (*planetary physics/astronomy*), Lisa Randall (*particle physics/cosmology*), and Martin White (*cosmology/particle physics*), with a

potential future recruitment of Nima Arkani-Hamed (*particle physics/cosmology*) by the Physics department. Several of these people raised concerns about the absence of links between the corresponding departments, which, for example, would limit their ability to recruit students that are interested in interdisciplinary research. We strongly believe that we would be able to attract excellence to Harvard University much more easily if the proposed center would be established. In fact, the Physics and Astronomy Departments will form a committee this fall to recommend joint searches. Below we lay out our personnel and budget plans for the proposed center. More technical details about the scientific research that will be performed in the center are summarized in the latest copy of our PFC proposal to NSF, which is attached to this letter.

Center for Interdisciplinary Studies in Theoretical Astrophysics

The people involved in our initiative are:

Current Faculty	**Recruitment**
Astronomy Department	
Lars Hernquist Avi Loeb Ramesh Narayan Dimitar Sasselov	Martin White
Earth & Planetary Sciences Department	
Jeremy Bloxham Paul Hoffman Stein Jacobsen Andy Knoll (joint w/ Biology) Dan Schrag	Oded Aharonson Sarah Stewart Sujoy Mukhopadhyay
Physics Department	
Andy Strominger	Lisa Randall Nima Arkani-Hamed (?)

In total, the center will involve 10–15 senior faculty. The above mentioned people are all theorists, but there is a wider base of people, including experimentalists and observers, who are interested in being involved with the activities of this center. In order to establish a first-class scientific environment, the center will require support for 10–15 postdoctoral fellows, 20 graduate students, 10 visitors per year, two staff assistants, a centralized computational facility and a computer specialist.

The total annual budget for the operation of the center is about \$2M, with the following breakdown: \$350k for two months of summer salaries for the senior faculty

(who will spend most of their time at the center), \$600k for the postdocs, \$ 500k for the students, \$250k for computer hardware, \$200k for salaries of the supporting staff and computer specialist, and \$100k for visitors.

We estimate that the required office space is 5000 sq. ft. in total, but we can start the activities with about half this space.

Following the suggestion of Jerry Gabrielse we have met with George Brandenburg from the Physics department and looked over the upper floor of the HEPL building, which is mostly available and amounts to a total of 2274 sq. ft., with room for staff assistants and the computer hardware in a lower floor. We will be glad to use this space as a start, with no initial cost to FAS. On the long term, a commitment that space will be found in the North Yard Area is more than adequate, since this area is being developed explicitly to enhance science at Harvard – one way being by allowing centers such as ours.

Now that a manageable approach to the office space issue is in view, it seems appropriate to discuss the necessary seed funds from FAS explicitly. In order to demonstrate the intellectual prominence of the center and obtain significant funding from outside agencies we need full support of \$2M per year for several years.

The corresponding department chairs, Jeremy Bloxham, Jerry Gabrielse, and Josh Grindlay, and the CfA director, Irwin Shapiro, are all enthusiastically supportive of our initiative. We are grateful for your support so far and look forward to establishing this center of excellence with your help.

Best wishes,

Avi Loeb
Professor of Astronomy
Harvard University

Attachments: supporting letter from department chairs,

scientific narrative for NSF PFC proposal

Cc: J. Bloxham, G. Gabrielse, J. Grindlay, L. Hernquist, P. Hoffman, S. Jacobsen, A. Knoll, R. Narayan, D. Sasselov, D. Schrag, I. Shapiro, A. Strominger, V. Tompkins