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DIVISION OF ASTRONOMY AND ASTROPHYSICS
DEPARTMENT OF PHYSICS & ASTRONOMY
475 PORTOLA PLAZA
LOS ANGELES, CALIFORNIA 90095-1547
TELEPHONE: (310)206-0420
TELEFAX: (310)206-2096
EMAIL: ghez@astro.ucla.edu
INTERNET: www.astro.ucla.edu/∼ghez

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Dear John,

We, with one dissenting member, would like to recommend that IGPP appoint Steve Cowley as a new member[1]. Steve is a Professor in the Department of Physics & Astronomy at UCLA (currently at Step IV, but is currently up for a merit increase to Step V effective 7/1/06) and he is also one of two directors of the Center for MultiScale Plasma Dynamics (CMPD). His area of specialization is Theoretical Plasma Physics. With research interests that span several areas within IGPP and clear leadership abilities, he has the potential to play an important bridging role within IGPP. In particular, he could strengthen IGPP's connection to theoretical astrophysics and laboratory plasma. He is one of UCLA's leaders and we (with one dissenting member) believe he would be a great asset to our program.

Steve's research within Plasma Physics is very broad and covers a a number of different problems that intersect with many groups outside the Plasma Physics group. One of Steve's primary interests is in the domain of plasma-astrophysics; specifically the problem of the origin of magnetic fields in large structures in the universe, such as galaxies and clusters of galaxies. In this area he has published a number of papers that address issues related to the dynamo mechanism and the role played by magneto-hydrodynamic turbulence. He has also worked on to understand explosive energy releases in plasmas, which is a topic of great importance in a number of different astrophysical systems. Most recently, he has begun to work on the problem of understanding accretion disks around black holes, many of which are extremely underluminous (emitting as little as 10^{-9} of their Eddington luminsity, which has been difficult to explain). For the past few years, Steve has collaborated with both Jim McWilliams (IGPP/Atmospheric Sciences) and Mark Morris (Astronomy) in a NSF funded

[1] *Some relevant history:* The idea of appointing Steve Cowley initially arose as part of a retention discussion in 2001 when Imperial College was in the process of recruiting him away from UCLA (Princeton had also made earlier attempts). While Steve did leave for two years and thrived at Imperial, he returned to UCLA due to family pressures to be in the US. With serious concerns that UCLA would not be able retain Steve, the idea of an appointment in IGPP was revisited and it was discussed by the Executive Committee. This led to the appointment of the committee to formally consider appointing Steve Cowley to IGPP. While the timing of this discussion was driven by retention, the case for this appointment is a scientific one.

project to address a number of problems in this area through careful computer simulation of turbulent dynamos. A second central topic to Steve's research program is the origin of explosive events in laboratory plasmas. Here, he has been motivated by the international tokamak project (ITER), for which there are a number of problems to solve in order for it to successful. Specifically, he is using theoretical concepts that he pioneered earlier to study solar events in order to address the problem of controlling dangerous, bursty energy releases (a topic he discussed at an IGPP lunch time talk last year). Other aspects of his overall research program include turbulent transport in tokamaks and the structure of the Alfven wave cascade in a collisionaless plasma and its role in astrophysical and laboratory plasmas. Overall, his style of research is to focus of fundamental physics.

A recent kudo for Steve and UCLA has been his success in winning a highly competitive Fusion Science Center - the Center for MultiScale Plasma Dynamics (CMPD). This center, which he, along with Bill Dorland from the University of Maryland, directs, is funded by the Department of Energy, underwent competitive peer review in 2004 and was one of only two such centers funded for 5 years ($6.4 million), with the possibility of renewal for an additional 5 years. The center focuses of Multiscale Plasma Dynamics using facilities at UCLA and the University of Maryland, and involves several other institutions including Princeton University, MIT, and the University of Michigan. Their mission is to extend established first-principles, microscopic, kinetic simulation techniques to problems that intrinsically involve the slow evolution of macroscopic variables, and to validate the simulations against experimental observations. This center will therefore address many of the key issues that will enable controlled thermonuclear fusion for energy production.

Steve is recognized as one of the leading theoretical plasma physicists in the world. The strength of his research program and his leadership is shown in many ways, outside his recent success with a Fusion Science Center. In particular, it is demonstrated by the many attempts to recruit Steve away, the latest and most serious attempt was by Imperial College of Science, Technology, and Medicine, where he spent two years (2002-2003) in the position of Professor and Head of Plasma Physics. His leadership skills are also reflected in the large number of committees where is his services are, and have been, requested, including as Chair of the National Research Council Committee of Plasma Science, as a member of the National Research Council Burning Plasma Experiment Panel to advise the US government on the participation to ITER, as a member of panel charged to perform a decal assessment of the status of Physical Review Letter, one of the most prestigious physics journals, and now as chair of another National Research Council committee entitled Plasma 2010: An Assessment of and Outlook for Plasma Science. Steve is also a prime component of UCLA's plasma group, which was just recently ranked third in the country. While his

publication record is not as substantial as one committee member would like to see in an IGPP appointment, the other committee members felt that the caliber of these publications was high (see also comments from outside letter writers). He has the clear respect from the plasma physics and astrophysics community for his deep thinking and leadership. Steve has and will continue to have a leading role in the future direction of this field and its interaction with other fields.

To further garner how the community outside UCLA views Steve, the committee solicited a number of letters. The responses unambiguously supported the notion of appointing Steve to IGPP.

- From Roger Blandford (Pehong and Adele Chen Professor of Physics, Director of Kavli Institute for Astrophysics and Cosmology, Standford University): "He is an outstanding plasma physicist and plasma astrophysicist. Academically, he is having a major influence on plasma astrophysics through his research on dynamos and turbulence. In laboratory plasmas he continues his important studies of transport in spheromaks and tokamaks and is showing great leadership in the community as it moves towards the ITER era." (notes that he perceives this as an "easy case").

- From Ellen Zweibel (Professor of Astronomy & Physics, University of Wisconsin): "Steve has an international reputation in the laboratory plasma physics community. He earned it through a rare combination of breadth of vision and formidable technical prowess. He has a growing reputation in plasma astrophysics, especially for his innovative work on galactic dynamos and on heat transport in clusters of galaxies. Steve was the first to highlight large magnetic Prandtl number (large ratio of viscous to magnetic diffusivity) as one of the defining properties of interstellar and intergalactic plasma, and to undertake a systematic study of magnetized turbulence in this regime." and "Steve's creativity and high standards would make him a strong candidate for membership in IGPP even of themselves, but his scientific style is particularly well suited to an interdisciplinary research institute. He is a natural leader.... He is generous with his time... He also has the intellectual breadth to play an important role in positioning IGPP for future opportunities."

- From Peter Goldreich (Professor of Astrophysics, Institute for Advanced Study): "If I were a member of the IGPP, I would be enthusiastic about having him as a colleague. In addition to carrying out forefront research, Professor Cowley has the ability to lead a group or department"

- Jon Arons (Professor of Physics and Astronomy, Director of the Theoretical Astrophysics Center, University of California Berkeley): "Steve is a world renowned theoretical plasma physicist who has made a variety

of major contributions to his field.... His most intriguing and influential work in these areas include his discovery of a mechanism of explosive energy release in plasmas under magnetohydrodynamic conditions, a subject of direct relevance to explosive energy release in magnetized systems, such as solar flares, magnetic storms in planetary magnetospheres, and possibly explosive phenomena in the larger Universe such as Gamma Ray Bursts.... His more recent work on the small scale structure of MHD dynamos ... is of fundamental importance to our understanding of where energy goes in the generation of magnetic fields in astrophysical environment. The work on dynamos at Prandlt numbers exceeding unit has been especially important in advancing our knowledge of astrophysical dynamos. Most recently, he has joined the astrophysical modeling fray, with interesting and provocative papers on the accumulation of magnetic flux in the center of our galaxy and the relation of this phenomenon to the observed strong large scale field around the galactic center, and on the behavior of magnetic fields in clusters of galaxies, an area where his interest in dynamos and transport combine to give new insight into the observed X-ray emission from these largest gravitationally bound systems in the Universe. He also has work almost complete on the collisionaless MHD turbulence in the high temperature accretion disks around black holes, a field where his results promise to substantially advance our understanding of the accretion process."

" Thus there is all possible evidence of a major intellect in theoretical plasma physics, with wide interests and deep abilities... - I always look forward to my encounters with him, and learn much from them. He is a really valuable member of the UCLA community - I only with we had the means to attract him to Berkeley. You should not hesitate to appoint him to the IGPP - he will add luster to your already illustrious organization."

- Jim Drake (Professor of Physics, University of Maryland): "Prof. Cowley is the strongest theorist of his generation in plasma physics... I have been impressed both with his physical insight in complex problems and his ability to analytically explore their dynamics. He has worked on an enormous range of topics, from instatbilites and transport in tokamak fusion plasmas to heat transport and dynamo activity in astrophysics." and in describing Steve's work on explosive events ".... These calculations are classic "Cowley", elegant analytic calculations that have broad implications on an important topic." and finally "Dr. Stephen Cowley is a very fine scientist who seems to periodically come up with yet another great idea.... It will reflect well on the IGPP for him to be a member of your Institution."

While IGPP does not officially consider teaching skills, Steve's are worth

mentioning. His teaching record is outstanding. He has taught at every level and has been awarded a Physics Outstanding Teaching Award on at least five separate occasions. Steve simply has an outstanding record in every aspect of University life.

We, with one dissenting committee member, strongly believe that an appointment within IGPP would be beneficial to both IGPP, Steve, and Astrophysics at UCLA. For Steve, it would add depth to his professional interactions at UCLA, in particular for his astrophysical interests as the IGPP has a wealth of theorist interested in planetary problems, whereas the Astronomy group is biased towards observers at present. Steve has provided a helpful self-statement, which expreses his interest in astrophysical matters and which describes his possible roles in IGPP (see attachment). While astrophysics at UCLA is quite strong thanks to access to the Keck Observatory, it is dominated by observers. To further improve astrophysics at UCLA will require nurturing theoretical astrophysics. Connections to IGPP made it possible to hire Brad Hansen and adding Steve to this mix would be helpful to further develop this effort. For IGPP, Steve would enhance the interdisciplinary nature of our endeavors, bring greater connectivity between some of the existing groups, and add another member of the highest scientific ability and leadership ability. Furthermore, Steve has a particular interest in fostering a center activity in computational astrophysics that can build on IGPP's strength (e.g., Maha's and Brad's work put more geophysicsal and planetary computations) but reach well beyond in scope what is happening now. This would be good both for IGPP and for the astronomy group at UCLA.

In summary, this is just the sort of appointment that IGPP strives to make - high caliber and interdisciplinary.

Sincerely,

Andrea Ghez

Margy Kivelson

Chris Russell

Jim McWilliams