

SUMMARY

The proposal describes a Postdoctoral Fellows Program targeted on theoretical and mathematical science at the interface between disciplines. The postdoctoral fellows (“CTMS Fellows”) supported under this program will be expected to perform research based on mathematical methods under faculty mentorship at the junction between different sciences (applied mathematics, computer science, statistical science, theoretical biology, chemistry, and physics) and will serve as a bridge between productive research groups, including empirical and experimental scientists. The proposed program will be an integral part of the Center for Theoretical and Mathematical Sciences (CTMS) at Duke University.

Intellectual merit: The goal of the program is to educate a cohort of talented mathematical scientists and theorists who have extensive experience in self-determined trans-disciplinary research and will be strong candidates for faculty positions in a broad range of disciplines, from applied mathematics, to physics, chemistry, biology, and even engineering or environmental science. In doing so, it is hoped to create a strong, diversely educated group of mathematical scientists with a bias to working across disciplinary boundaries. Simultaneously bringing the mathematical sciences to new areas, cross-pollinating the areas which already exist, and enriching existing applied mathematics groups by infusing new topics.

In order to achieve this goal, the Fellows will be selected for their demonstrated ability to conduct innovative research, their interest in transcending disciplinary boundaries, and the availability of a dedicated faculty mentor. Special emphasis will be made to attract women and underrepresented minorities. While in the program, they will be expected to engage in research on trans-disciplinary topics and participate actively in the program of the Duke Center for Theoretical and Mathematical Sciences. During their three-year appointment, they will be expected to teach a high-level course on a frontier topic of their choice, organize a graduate seminar, and give a “general public” lecture on their field of research. They will also be encouraged to supervise a summer project at the undergraduate or high-school level. Career building education will include attendance of a grant writing workshop and the supervised writing of a grant proposal. Fellows will be annually evaluated for their progress by their mentor and the PIs. The CTMS will also host two postdoctoral conferences to extend the reach of the program to other universities.

Broader impact: By creating a pool of talented mathematical scientists and theorists with experience of performing research at the interface between sciences, the program will contribute to the national Science and Engineering workforce in fields of high societal impact, which often require a combination of sciences to solve complex problems. It is specifically aimed at counteracting the dearth of truly interdisciplinary training programs for postdoctoral researchers, which are not programmatically defined and thus limited in their intellectual scope. The CTMS Fellows program will also create a mechanism for continuously infusing new intellectual topics at the interface of theoretical science and applied mathematics. By teaching a graduate topics class or seminar, the Fellows will not only strengthen their own academic credentials and increase their future chances of securing a faculty position, but they will also provide a constantly renewing source of cutting edge mathematical tools and techniques for other members of the campus community.

The proposed Fellows program will provide outstanding opportunities for broadly interested and talented, young applied mathematicians and theoreticians to develop their careers. From a longer term perspective, it will serve as a pilot for a permanent trans-disciplinary postdoctoral fellows program in the theoretical and mathematical sciences which is supported by a combination of sources including a core of institutional funds. If successful, the program will also constitute a model which could be duplicated elsewhere as a mechanism for fostering a more integrative and cooperative applied mathematics and theoretical science community across the institution.