NSF Award in Mathematical and Physical Sciences

Principal investigator: J. Fraser Stoddart, chemistry
Weinberg College of Arts and Sciences

- Project: International Collaboration in Chemistry: Structural Mechano sterechemistry of Mechanically Interlocked Polymers and Networks
- Start Date: August 15, 2009
- Total Award Amount: $750,000

How the results of this project will benefit society:
This proposal is a collaboration with Alexandra M. Z. Slawin at St. Andrews University in Scotland. The team will develop the chemistry of mechanically interlocking molecules (MIMs) into higher ordered network materials and characterize these materials by a range of physical techniques, most importantly, single crystal X-ray crystallography. The structural results will be used to inform the development of the chemistry as the results are fed back into the design and synthesis of the new materials. The resultant materials obtained will have enormous potential in a variety of industrial applications. The project presents an opportunity for students to work on highly interdisciplinary research that enables the pursuit of grand scientific challenges.

The problem the project is trying to solve:
The combination of these two teams to tackle the development of multi-dimensional mechanically interlocking molecules represents a significant advance in the area and will be of benefit and interest to a wide range of academics working in the area of supramolecular chemistry.

How this project will work:
There is a well-planned and extensive program for exchanging students between Northwestern University and St. Andrews University, as well as regular cross-institutional visits by the PIs that will be aided by state-of-the-art communication aids, e.g., video conferencing, teleconferencing, and web-based data-sharing. Both PIs support their institutions’ initiative to bring students from underrepresented groups into the classrooms. At Northwestern University, Professor Stoddart runs a research group focused on synthetic and physical organic chemistry with postdoctoral fellows drawn from all around the world, currently including Canada, China, Germany, India, Lebanon, Mexico, Scotland, and Turkey as well as the United States. His present graduate students include Asian and Hispanic Americans, as well as women from the United States and abroad. At St. Andrews University, Professor Slawin runs a world-class X-ray diffraction facility with unique support activities (e.g., Automated Crystallization Facility) in a highly interactive manner with postdoctoral, graduate and undergraduate students from the UK, the EU, and non-EU countries. The value-added and enhanced experience — for research performance and academic quality and for the education and training of students in both groups — will be at a remarkably invigorating level because of the complementary skills that will be gained through collaboration between these two very different laboratories.

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