

The Effects of Simulated Microgravity on Microbial Gene Expression-NSBRI Funding

George E. Fox [UH]

The initial funding (PDAF #4) was used for post-doctoral fellow, Dr. Gary Schultz. After the first year, he was replaced by the current fellow, Dr. Don Tucker (PDAF #2). Although ongoing current research is a continuation of these earlier projects, it should be noted that the initial results obtained contributed to the successful effort by Dr. G. E. Fox and Dr. R. C. Willson to obtain major funding from the National Space Biomedical Research Institute (NSBRI). That funding was responsible for multiple publications in the current year. The ongoing work on the current PDAF provided significant preliminary results for the recently announced award from the Office of Biological and Physical Research to Dr. G. Fox and Dr. R. Willson.

The Effects of Simulated Microgravity on Microbial Gene Expression-Astrobiology Center

George E. Fox [UH]

This mini-grant project contributed to the preliminary results presented to NASA as part of an Astrobiology Center proposal that was submitted in early 2003 but not funded. The project is currently on hold but may be incorporated into a joint proposal by Dr. G. Fox and Dr. M. Travisano at a later time.

Rapid Identification of Unexpected Bacterial Pathogens in Space Environments

George E. Fox [UH] / Richard C. Willson [UH]

This mini-grant project also contributed key preliminary results to the successful NSBRI application discussed above. In addition, this work underlies several grant applications in the area of biodefense that Dr. G. Fox and Dr. R. Willson may submit in the future. The key finding of the project, the existence of 16S rRNA signature oligonucleotides, resulted in a 2002 publication in *Bioinformatics*:

Zhang, Z., R. C. Willson, and G. E. Fox. "Identification of Characteristic Oligonucleotides in the 16S Ribosomal RNA Sequence Dataset," *Bioinformatics* 18 (2002): 244-50.

[This paper was highly recognized by the lay science press during 2003, being featured in several stories including:

Ananthaswamy, A. "Getting to Grips with Mystery Space Bugs," *The New Scientist* 177.2380 (1 Feb. 2003): 20.

"Fighting Bacteria in Space," BBC News (15 Nov. 2002) <<http://news.bbc.co.uk/2/hi/science/nature/2480357.stm>>

Rayl, A. J. S. "Above and Beyond," *The Scientist* 12.24 (9 Dec. 2002): 26.

Odyssey Magazine (2003).

Coordination Polymers For Nanofibers

Jack Y. Lu [UHCL]

Abstract

Microporous metal-organic polymers have found a wide range of technological applications, such as molecular separation and pollution prevention in air, liquid, and water systems, where they can be used as ion exchangers and molecular sieves. These novel zeolite-like materials may be fabricated into nanomaterials. One of the key factors for the success of fabricating metal-organic nanomaterials is the synthesis of desirable metal-organic polymers that can be suitable for nanomaterials fabrication. Exploration in this project has produced several novel microporous metal-organic polymers.

SYNTHESIS AND FABRICATION OF FUNCTIONAL MATERIALS represent one of the great challenges in current research. The microporous metal-organic polymers have found a wide range of technological applications such as molecular separation and pollution prevention in air, liquid and water system, where they can be used as ion exchangers and molecular sieves. These novel zeolite-like materials may be fabricated into nanofibers. This project is designed to produce novel microporous metal-organic polymers desirable for generation of metal-organic nanofibers.

Experimental Activity, Results and Discussion

Among the new metal-organic polymers synthesized in our laboratory, $\{[Cu_2(IN)_3] \cdot I_5^{-5/6} \cdot H_2O\}_\infty$ (IN: isonicotinato)¹ is an unusual polyiodide inclusion metal-organic polymer with a novel 3-D nano hollow-channel open-framework synthesized via an oxidation reaction route under hydrothermal conditions. The diameter of the channel is about 1.15 nm, slightly smaller than that of carbon nanotubes (~1.4 nm).

$[Cd(NA)_2]_2$ (NA = nicotinato), a new three-dimensional (3-D) neutral coordination polymer, has been synthesized under hydrothermal reaction conditions. The structure consists of distorted square pyramidal cadmium centers coordinated by two independent nicotinato ligands. One nicotinato ligand is tridentate; the other one is bidentate to cadmium metal centers. Every two cadmium atoms are bridged by two carboxylate groups of the tridentate nicotinato ligands through *O*(2) and *O*(4) atoms to form a binuclear cadmium unit: $Cd_2(NA)_4$. The *O*(4) atom is at the apical site while the two pyridyl groups and the other two oxygen atoms are at the equatorial positions. The formation of the binuclear units created eight-member rings, which are then linked by nicotinato ligands to result in large 24-member rings. There are four eight-member rings on each 24-member ring: two eight-member rings at trans-position to each other are perpendicular to the other two eight-member rings. Four 24-member rings connect to each eight-member ring, via covalent bonding to the binuclear cadmium centers: two 24-member rings are perpendicular to the other two 24-member rings. The propagation of the 24-member rings and eight-member rings extends into three directions to result in a 3-D open framework structure.



Photo by Debbie V. Bush

TRAVELS—Dr. Irving N. Rothman, Professor of English and a specialist in Restoration and eighteenth-century literature, has studied historical literature devoted to space travel in Defoe's England and Joseph Dennie's America.

Acknowledgments

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References

¹J. Y. Lu and V. Schauss. "A Novel Nanostructured Open-Channel Coordination Polymer with an Included Fused-Polyiodide Ring," *Eur. J. Inorg. Chem.* (2002): 1945-47.

²J. Y. Lu and E. E. Kohler. "A Non-Interpenetrating 3-D Coordination Polymer Built from Binuclear Cd Units Elaborated with Square Pyramidal Geometry of Cadmium," *Inorg. Chem. Commun.* 5 (2002): 196-98.

Using Shuttle Images to Study Suspended Sediment Transport in Galveston Bay

Theron Sage [UHCL]

This ISSO mini-grant was part of a longer-term ISSO effort that was not completed because the post-doctoral fellow, Dr. Jeff Waters, tendered his resignation July 2001. It was not possible to find a replacement. The project was terminated.

Unfortunately, no publications or research grants have stemmed from the mini-grant.

The Literature of Flight and Space Travel

Irving N. Rothman [UH]

HISTORICAL AND MYTHIC LITERATURE HAS DEALT extensively with subterranean and ocean travel, terrestrial travel, and travel into space. Dr. Rothman has studied fantastic voyages as chief textual editor for the Stoke Newington Daniel Defoe Edition. *The Consolidator*, published in 1705, proved a satire on human conduct and governance as author Daniel Defoe described the race of Lunarians whom an inventor met when he ascended to the moon in a flying machine. (See "The Man in the Moon—an International Debate in Defoe Studies," Y2001 *Annual Report* [2002], pp. 102-105). A second subject of interest was America's response to hot air balloons, as noted in the Philadelphia magazine *The Port Folio*, edited by Joseph Dennie, 1801-12. This anti-Jeffersonian magazine offered poetry and prose to describe Pierre Blanchard's balloon flights in America on Jan. 9, 1793, from the Walnut Street Prison in Philadelphia. (See "Joseph Dennie, a Sceptic, and Philip Freneau, a Celebrant of Ballooning in Early America," Y2002 *Annual Report* [2003], pp. 119-23.)

Dr. Rothman continues his editorial responsibilities with the Defoe edition and is currently editing the three volumes of Robinson Crusoe, *The Life and Suprizing Adventures of Robinson Crusoe* (1719), *The Farther Adventures of Robinson Crusoe* (1719), and *The Serious Reflections of Robinson Crusoe* (1720). Work also continues in the identification of the Defoe canon to determine whether works listed in the canon can be proven to be Defoe's by stylometric analysis. In this work, Dr. Rothman teams closely with two colleagues, Dr. Rakesh Verma, associate professor of computer science, and Dr. Thomas Woodell, Jr., associate professor of English/Linguistics (ret.) and Luke Gilman (senior).

Dr. Rothman continues his efforts to produce an anthology of the poetry of *The Port Folio* during the editorship of Joseph Dennie. The poetry will be organized by classical literary genres. Students designated as University Scholars who have been selected in competition to work with professors on their projects have aided or are aiding in this project: Brandy Towers-Egli, and, in the fall semester 2004, Heath Harper; each student receives a stipend of \$1000 from the university to engage in literary research. Doctoral student James Hall has also assisted in bibliographic study and textual entry. From these studies may come more critical analyses of poetry or prose with space-related themes.

In recognition of his scholarship, Dr. Rothman has been appointed the Martha Gano Houston Research Professor in Literature, 2004-05, in the Department of English.

Publication

Defoe, Daniel. *The Political History of the Devil*. Ed. I. N. Rothman and R. M. Bowerman. The Stoke Newington Daniel Defoe Edition. New York: AMS Press, 2003. 750 pp.

Funding

"Testing the Defoe Canon: Stylometric Analysis," NEH, 2004-2005, \$160,655 (*unfunded*).