

International Institute of Nano and Molecular Medicine (I²NM²)

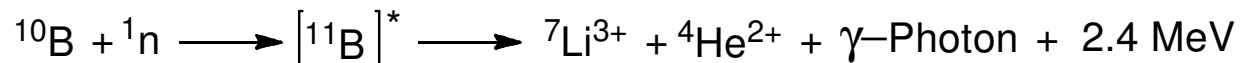
The Vision of the International Institute of Nano and Molecular Medicine (I²NM²)

M. Frederick Hawthorne, Ph.D.
Founding Director



Boron Neutron Capture Therapy of Cancer – A Translational Program

- BNCT is based upon the reaction of ^{10}B with a slow neutron.



- Cell-targeted pre-radiation placement of ^{10}B nuclei in nanoparticles followed by ^1_0n irradiation (reactor or accelerator source) provides highly selective malignant cell destruction.
- The limitation of international BNCT clinical programs to *Glioblastoma multiforme* using ^{10}B target compounds led to loss of support for the method.
- We believe our new ^{10}B nanotarget chemistry and the targeting of tumors such as head and neck, prostate, etc. will result in renewed interest. **Chemistry is the key.**
- The University of Missouri-Columbia will be the site for the animal studies using ^{10}B nanotarget species and a new thermal neutron beam at MURR.
- The BNCT method may also be used for binary radiation mediated synovectomy for arthritis therapy.

International Institute of Nano and Molecular Medicine I²NM²

- Founded in March 2006 by attracting members of Hawthorne research group from UCLA-Chemistry to the MU-Columbia Medical School.
- This migration of research was stimulated by the presence of a nuclear reactor, medical school, veterinary school, engineering, biological and physical sciences; areas needed for a boron neutron capture therapy (BNCT) renaissance at MU-Columbia.
- During 2007-09 the 30,000 ft² I²NM² research building was constructed and equipped to serve forty research workers, office staff and state of the art instrumentation.
- The I²NM² is located about 200 yards from both the MURR (neutron source for BNCT research) and the Dalton Institute (vivarium) in Research Park.

Mission of I²NM²

To facilitate the promotion of cutting edge cross disciplinary research focused on the translational progression of Nano and Molecular Medicine propagated by totally new chemical science while simultaneously providing educational opportunities for students and providing a resource for the University of Missouri, corporate, governmental and academic entities in the community, the nation and the world.

Institute of Nano and Molecular Medicine



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Current Research

- Discrete molecular (monodisperse) nanoparticles which carry multiple copies of, or a combination of, diagnostic and therapeutic agents for cell-specific delivery to malignant cells.
- First demonstration of the proof-of-principle for boron neutron capture therapy of cancer, arthritis and radiation mediated surgery (BNCT).
- Development of nano-sized molecular motors with biomedical applications.
- The development of catabolism-resistant pharmaceuticals based on carborane surrogate chemistry.
- The design, synthesis and characterization of new, high-energy materials for energy storage in structural units ranging from nano dimensional to macroscale.
- The development of advanced chemical storage systems for hydrogen storage based upon nanotechnology and hydride chemistry.

I²NM² Collaborators and Funding

The following organizations are research collaborators with I²NM².

- Aerojet
- Honeywell-Kansas City Plant
- Picatinny Arsenal
- Argentina National Atomic Energy Commission
- Idaho National Laboratory
- Department of Energy
- National Science Foundation
- National Cancer Institute
- University of Missouri