Director, Institute for Molecular Engineering
University of Chicago

Position Specification

The University of Chicago

The University of Chicago is one of the world's leading centers for intellectual inquiry, research, and education. The University operates Argonne National Laboratory and Fermi National Accelerator Laboratory on behalf of the Department of Energy; a medical center with internationally renowned programs in cancer biology, immunology, and gastrointestinal disease; a charter school with four distinct campuses; a pre-K–12 private school; a professional theater; museums; and the nation's largest academic press. More than 80 Nobel laureates are associated with the University of Chicago, including eight current faculty members. One former senior lecturer is currently President of the United States.

The University is home to over 2,200 faculty and academic personnel and more than 15,000 students, and claims nearly 150,000 alumni worldwide. Undergraduates in the College choose among 49 undergraduate majors and 24 minors. Graduate students study in four divisions (physical sciences, biological sciences, social sciences, humanities) and six professional schools (business, medicine, law, divinity, public policy, social service administration). Students also enroll in the nation's first continuing education program. Located in Chicago's Hyde Park neighborhood on Lake Michigan, the University's 211 acres were designated a botanic garden in 1997 and feature traditional English Gothic and modern buildings designed by world-class architects.

The Institute for Molecular Engineering

The University of Chicago has endorsed the establishment of a new academic program in molecular engineering as a top scientific priority. The University possesses a powerful set of strategic resources for advancing cutting-edge research and education in molecular engineering that capitalize on the scientific, social and economic potential of the University and this emerging field. The University has no preexisting engineering programs and thus is not constrained to follow or copy existing programs at other universities. By combining the deep analytical approach that has historically characterized science at the University of Chicago with problems in engineering, the Institute for Molecular Engineering (IME) will be positioned from the start to develop novel engineering tools and approach fundamental problems of societal import from new perspectives.

The University enjoys a close relationship with Argonne National Laboratory, a preeminent federal R&D center, which the University has operated on behalf of the Department of Energy since Argonne's founding in 1946. Argonne is our nation's first national laboratory and applies a unique mix of world-class science, engineering and user facilities to deliver innovative research and technologies to address the most important scientific and societal needs of our nation. Taken together, these intellectual, cultural and structural assets well position the University and Argonne to pursue a promising research area defined by disappearing disciplinary boundaries and to define a new approach to engineering for the twenty-first century.

Position and Organizational Structure

The new Director of the IME will become a senior member of the University of Chicago faculty with a primary academic appointment in Molecular Engineering, with secondary appointments in other University units as appropriate to the Director's scientific interests, and will report directly to the University Provost. The Director may also enjoy a joint scientist appointment in an appropriate Argonne Division. Overseeing and assisting the Director in the development and implementation of the scientific program will be an Internal Advisory Board

chaired by the University Provost and including the Vice President for Research and for National Laboratories, the Deans of the University's Biological and Physical Sciences Divisions, and the Argonne Director. External advice and assistance will be provided by an External Advisory Board chaired by Robert Langer, the David H. Koch Institute Professor at MIT.

The Director will commence searching for and hiring additional faculty immediately after appointment to the University in collaboration with a faculty hiring committee that eventually will be replaced by IME faculty when a sufficient cohort has been recruited. Faculty recruited to the University will have primary tenured or tenure-track appointments in the IME, secondary appointments in other University units as appropriate, and potentially appointments with Argonne Divisions. The Director will have overall responsibility, reporting to the Provost and in coordination with the Internal Advisory Board, with the appointment, reappointment and promotion of IME faculty.

The University will pursue a two-phase approach to establishing the Institute for Molecular Engineering. In phase I (2010-2015), the University will construct new research space for the IME and provide ongoing program and equipment support for 12 new faculty members. In phase II (2016-2020), the Institute will have been sufficiently established to warrant a doubling of its size. In steady state, the Institute for Molecular Engineering is expected to house 24 junior and senior faculty members. The faculty hired into the IME will represent an incremental expansion of the existing University faculty.

Key Opportunities

The University is prepared to invest significant resources to establish the IME, including the recruitment of new faculty, construction of a new research building to house the program, development of new state-of-the-art core facilities to support the research and establishment of new education programs to attract next-generation scientists and engineers. The IME will be situated in ample new research space in the reconstructed Research Institutes building along Ellis Avenue, a prominent corridor on the campus, and will feature state-of-the-art wet labs, imaging areas and clean room. The site is closely located to other research buildings in the north science quadrangle that support advanced research in the physical and biological sciences, and internal connections and walkways exist between each of the buildings, facilitating collaborations among existing scientific research programs and the new molecular engineering program.

Assisting this launch will be very powerful research elements that are already in the University's research portfolio. Our strengths in physical, materials, and synthetic chemistry; biochemistry; condensed matter physics; neurobiology; molecular genetics and cell biology; large-scale computation; and medicine are a subset of the disciplines that provide the enabling environment for nucleating a new engineering effort, and, in turn, stand to benefit directly from the establishment of a research arm in molecular engineering. We find pronounced synergies among departments in the Physical Sciences and Biological Sciences Divisions, especially those that have as their foundation the molecular sciences. Moreover, there already exists a powerful cohort of interdisciplinary Research Institutes, Committees, and innovative multi-investigator federal grants such as the Materials Research Science and Engineering Center (MRSEC) that will play a key role in establishing the IME and in helping to weave its program into our highly interactive and cross-disciplinary research milieu. The University has many beneficial adjacencies in the basic sciences that will further bolster this effort, including, for example, assembly of hybrid organic-inorganic functional materials; biomimetic design of functional materials; molecular electronics; polymer synthesis; nanostructures and self-organization; protein engineering; synthetic chaperones; nanomedicine; molecular imaging and sensors; and synthetic biology.

The molecular engineering research themes that may be pursued will be bolstered by extant strengths in the basic and biomedical sciences at the University and Argonne. Examples include expertise in catalysis, solar

energy conversion, materials research, biosciences, and computation. Excellence in interdisciplinary research located within the James Franck Institute and the Institute for Biophysical Dynamics in the form of substantial intellectual efforts in the basic sciences will provide critical intellectual support to the proposed activities below. Potential thematic areas include:

- Energy Conversion, Transport and Storage
- Photonic Materials and Systems
- Molecular Electronics and Devices
- Smart and Adaptive Materials
- Bioinspired Materials and Machines
- Engineering Complex Systems
- Molecular Imaging
- Bioengineering of Membranes and Their Applications
- Engineering of Evolvable Systems
- Medical Therapeutics

The University's relationship with Argonne National Laboratory will provide several key benefits to the IME. Solving the big problems in molecular engineering will inevitably require the formation of diverse teams and access to unique large-scale capabilities available at Argonne such as the molecular-scale imaging capabilities at the Center for Nanoscale Materials (CNM), the Advanced Photon Source, Electron Microscopy Center, the Sub-Angstrom Microscopy and Microanalysis (SAMM) Laboratory, the synthesis and nanofabrication capabilities at the CNM and the extraordinary computing resources that are poised to exceed 10,000 teraflops suitable for the large-scale calculations that will be used for modeling systems and quantum mechanical behavior at the molecular level. Relevant programs in the Materials Science, Chemistry and Biological Sciences Divisions at ANL will offer additional routes to productive research. Mutually advantageous joint appointments between the University and Argonne will also arise with this new initiative, further augmenting its engineering impact and scope.

The introduction of engineering education at Chicago will have broad impact on the University's programs across all divisions. Forefront research in the basic physical, biological and medical sciences is presently undergoing revolutionary change with respect to critical linkages to the applied sciences and engineering. Students throughout the University's graduate programs must be exposed to an appropriate and broad palette of basic science *and* technical engineering skills, especially for research at the molecular scale. As such, many seemingly unrelated programs of study will benefit from the IME since future breakthroughs in the basic biological sciences and medicine in critical fields such as drug discovery, genomics, proteomics and cellular dynamics will continue to flow up from research in molecular engineering. Similar impact in the physical sciences will also occur, with training in molecular engineering enabling studies on such diverse topics as nanomaterials, molecular electronics, complex systems and energy. We also anticipate important ties to areas in the social sciences and with the professional schools, including behavioral sciences, business, economics, law, philosophy, political science, and sociology.

<u>Ideal Experience and Qualifications</u>

The new Director will develop and implement the scientific vision required to attract funding, talent, and institutional partners to the IME. The Director will seek opportunities to collaborate and cooperate within the University and with affiliated institutions and will leverage resources to help create a distinctive profile for the IME within the national scientific community. The successful candidate will ideally have:

- An internationally recognized track record of achievement in molecular engineering and closely related fields as evidenced by an outstanding publication record and the appropriate external indicators.

- A track record of visionary leadership, strategic thinking, and effective planning coupled with the demonstrated capacity to build consensus and provide the decisive leadership required to implement a strategic vision and build the operating platform to support it.

- Experience working in complex, multi-stakeholder environments and strong communications skills that will enable the Director to build successfully at multiple interfaces (e.g. University divisions and departments, Argonne, and industry) and to integrate activities such that the IME and its partners are mutually strengthened through collaborations.

- Significant and successful management experience in large research and development enterprises including a demonstrated record in building and leading divisions, departments or institutes/centers of comparable scale. The candidate will also have a demonstrated ability to recruit, retain and direct first-rate scientists.

- Enough experience with large government agencies, foundations, industry and philanthropy to have developed a thorough understanding of funding opportunities and pathways and strategies to successfully attract sufficient support to ensure the financial success of the Institute.

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