Applying to the UO / OSU / PSU Integrative Graduate Education and Research Training (IGERT) Program

Introduction

The National Science Foundation funded Integrative Graduate Education and Research Training (IGERT) program, administered by the Materials Science Institute (MSI) at the University of Oregon, invites applications from doctoral students in chemistry and physics. The central goal of the MSI's IGERT program is to train graduate students to excel at research and development in the interdisciplinary and rapidly evolving area of new materials for electronics and optics through control of nanoscale structure. The program aims to help students in this preparation by supporting scientific research and activities designed to assure comprehensive career development. Examples of the latter activities include industrial and academic internships; research collaborations; opportunities to mentor undergraduates or K-12 students; specialized coursework bridging chemistry, physics and engineering concepts; and training in scientific ethics. Students are encouraged to seek out new opportunities commensurate with the broad goals of the MSI's IGERT program. Note: This IGERT program differs from other mechanisms of graduate student support in that participation is required in the program's activities that complement the research experience.

Award Information

The fellowships provide stipends (at the level set by the National Science Foundation) and research support (depending on funding available). The University of Oregon and Oregon State University provide fellowship recipients with tuition waivers. The fellowship is for one year with the possibility for competitive renewal subject to continued funding. Renewal of an IGERT fellowship for a second year of support will be based upon active participation in IGERT activities (at a minimum those required activities listed above) and satisfactory progress in research. Renewal for a third year will be granted only in exceptional cases where the applicant has demonstrated excellence in research and leadership within the IGERT program.

Eligibility

US Citizens or permanent residents that are currently enrolled in the Ph.D. programs in chemistry, physics, and engineering at the University of Oregon, Oregon State University or Portland State University, who are actively working on their dissertation research, and who have received fewer than three years of previous IGERT support are eligible. At UO, applicants from Chemistry must have advanced to candidacy by June 16, 2010. Physics applicants must have passed their Ph.D. qualifiers by June 16, 2010. At OSU, applicants must be admitted to candidacy, i.e., the Ph.D. qualifying exam must have been passed by June 16, 2010. *Applicants must be working under the direction of a contributor to the IGERT proposal*. A list of contributors follows on page 2 of this document.

Selection Criteria

Fellowship recipients will be selected on the basis of academic excellence, research progress, and their contributions and/or appropriateness to the research theme (see final page of application for summary of the research theme) and educational goals of the IGERT program. Evaluation is based primarily on accomplishments while at the University of Oregon, Oregon State University or Portland State University. Applications will be judged on the written content of the application and information gathered regarding student participation in IGERT-related activities.

Timeline

Application materials are due in the University of Oregon Materials Science Institute office no later than 4PM, April 1, 2010. They can be delivered by hand to Anae Rosenberg's mailbox in the MSI office or mailed to: MSI, 1252 University of Oregon, Eugene, OR 97403. Applications may also be emailed to Anae Rosenberg at anae@uoregon.edu. If emailing, be sure to follow the special instructions in section V. Certification. Notification of awards is anticipated to occur in late May, 2010 with fellowships beginning September 16, 2010.

Requirements

IGERT fellows are expected to make satisfactory progress toward their Ph.D. degree, acknowledge IGERT support, and participate in IGERT activities as set forth in the application.

Faculty Contributors for IGERT, 2010/11

University of Oregon / Physics:

Dietrich Belitz; Dave Cohen; Miriam Deustch; Steve Gregory; Roger Haydock; Steve Kevan; Heiner Linke; Raghuveer Parthasarathy; Richard Taylor; Hailin Wang.

University of Oregon / Chemistry:

Mike Haley; Jim Hutchison; Darren Johnson; Dave Johnson; Shih-Yuan Liu; Mark Lonergan; David Tyler.

University of Oregon / Biology:

Karen Guillemin; Eric Johnson.

Oregon State University Chemistry / Chemical Engineering:

Chih-hung Chang; Doug Keszler, Vincent Remcho; Skip Rochefort.

Oregon State University Physics / Engineering:

Brian Paul; Janet Tate; John Wager.

Portland State University / Chemistry:

Mingdi Yan.

Application for the University of Oregon/Oregon State University/ Portland State University IGERT fellowship program. AY 10/11

Applications materials (including an academic transcript) are to be submitted in a single sealed envelope to Anae Rosenberg's mailbox in the MSI office or by mail to: IGERT, Materials Science Institute, 1252 University of Oregon, Eugene, OR 97403. Applications may also be emailed to Anae Rosenberg at anae@uoregon.edu. If emailing, be sure to follow the special instructions in section V. Certification. Applications must be submitted by ***4PM, April 1, 2010****. Late or incomplete applications will not be considered.*

I. General Information

Name:_____
Last First Middle Initial

Email address:_____Office phone:_____

Department:_____Advisor(s):_____

Term of: (a) initial enrollment_____(b) advancement to candidacy_____

(c) anticipated graduation_____

II. Academic History

Coursework.

Provide a current UO, OSU or PSU transcript (unofficial is acceptable) with your application.

Grade point average:_____(A = 4.0). Number of *graded* credits _____

Cumulative examinations or qualifying examinations

Chemistry			UO Physics / OSU
Cumulative Examination – List All Taken			Masters Qualifier Term Passed:
Term	Area	Grade	
			Ph.D. Qualifier Term Passed:

III. Honors. *List any honors you have received while at the University of Oregon, Oregon State University, or Portland State University.*

IV. Participation in IGERT activities.

Indicate your participation in any of the following. You will have an opportunity to describe your involvement in more depth later. Many of these will likely be most relevant for renewal applications, but new applicants please check those that apply.

1. Taken summer "internship" courses.
   Indicate how many courses taken in each area and year of participation.

Polymer science _____ Semiconductor devices _____ Organic synthesis _____

Optical materials and devices _____

2. Served as teaching assistant for the following summer courses or programs.
   Indicate term(s) of participation.

Polymer science _____ Semiconductor devices _____ Organic synthesis _____

Optical materials and devices _____

POLY Camp _____ ROCK Camp _____

3. Mentored undergraduate(s). *List name(s) and dates supervised.*

4. Completed Ethical Conduct in Research course. ☐ Yes ☐ No If yes, indicate term _____

5. Participated in recruiting visits or hosting faculty from non-Ph.D. granting institutions.
   List institution(s) and date(s).

6. Performed internship or other off-campus educational activity. *List institution(s) and dates.*

7. Participated in a science outreach program for undergraduates or K-12 (eg. a GK12 program).
   Please list program(s), dates, and time commitment of outreach work.

V. Certification.

Involvement in IGERT activities (as listed in the section IV) is a requirement for fellowship recipients. By signing this application form, the applicant acknowledges awareness of this requirement and a willingness to participate in IGERT activities. By co-signing this application form, the applicant's faculty advisor recognizes this requirement and agrees to support the applicant's participation in IGERT activities.

Applicant's Signature:_____Advisor's Signature:_____

For those submitting this application by email:

☐ By checking this box, the applicant acknowledges awareness of this requirement and a willingness to participate in IGERT activities.

In addition, you must have your faculty advisor send an email containing the following language:

"This email is to acknowledge that as faculty advisor, I am aware of and agree to support _____'s participation in required IGERT fellowship activities."

Both emails should be submitted no later than noon, April 1, 2010 to Anae Rosenberg, anae@uoregon.edu.

VI. Publications.

Provide full references including complete author list and title. For current IGERT students, indicate those acknowledging support from the IGERT program. You may attach a separate sheet if desirable.

Refereed

List only those published or submitted.

Non-refereed and conference proceedings

List only those published or submitted.

Manuscripts near submission

Indicate anticipated submission date/journal and list only those sufficiently near completion that an intelligible draft could be provided if requested.

Conference Presentations

Indicate meeting name, date, place, and whether the presentation was a poster or a talk.

VII. Summary of research and educational activities

Use separate sheets.

A. In no more than four pages, inclusive of figures and references, answer the following questions. Clearly number each of your answers, use a font no smaller than 11 point Times New Roman or equivalent, and maintain one-inch margins. Recommended page allotments for each question are given parenthetically, but these should be considered only guidelines.

1. (2 pages) Describe your research as it relates to the research theme of the IGERT grant (see attached summary). Clearly describe the goals of your research and your plans/progress toward achieving your goals. Wherever possible, indicate specific results/outcomes of your research. Be as specific as possible, but direct your presentation to a general science audience. More senior students should focus their presentation on the results of their research.
2. (1/2 page) Describe any research collaborations you directly participate in or are planning (if you discuss any planned collaborations provide letter of support from your intended collaborator)*. Note: Please make a clear distinction between those collaborations that you have initiated and those pre-existing collaborations with which you have become involved. For ongoing collaborations, provide details such as joint publications, or examples of experimental results.
3. (1 page) Describe how you have used or will use the IGERT fellowship to enhance your graduate education including participation in internships, other off-campus educational experiences, and activities such as those listed in the "participation in IGERT activities" listed above (for planned activities, provide a letter of support* where possible).
4. (1/2 page) Describe any initiative you have taken to enhance the graduate educational program in materials at the University of Oregon, Oregon State University, or Portland State University.

* Letters should only describe the planned activity, the partner's commitment to the project and the timeline for the activity. Letters of recommendation or endorsement are not permitted.

B. In no more than an additional 1/2 page, provide any other information that you would like the selection committee to consider.

Summary of IGERT Research Theme

The research theme for this IGERT, the study of materials whose properties are dominated by their nanoscale structure, unifies the chemistry, physics, and engineering of materials with three primary thrusts:

1) **Synthesis and Properties of Nanolaminates and Functionally Graded Materials. (Belitz, Cohen, Haydock, David Johnson, Keszler, Kevan, Linke, Tate, and Wager)**

The electrical, magnetic, thermal, and optical properties of nanolaminated and functionally graded materials depend on the design details of their nanostructure. Understanding and controlling this requires developing synthetic techniques, optimizing processing parameters to minimize defect densities, measuring the change of properties as a function of nanostructure, analyzing how these materials function in devices, and developing theoretical frameworks to account for observed structure-property relationships. All of these tasks provide numerous opportunities for developing new and useful types materials including thermoelectrics, thin-film photovoltaics, giant magnetoresistance materials, transparent electronics, optical and electro- optical devices, as well as technological applications of superconductivity. Researchers in this group will address three key areas that critically limit the development of nanostructured materials for application in these technologies:

- develop *scalable* synthetic approaches to nanolaminates and functionally graded materials; validate these approaches via device demonstrations
- develop techniques both to characterize the defect properties and reduce such defect densities to levels where properties are dominated by the nanostructure, facilitating the realization of practical nanoengineered devices
- develop and understand the structure-function relationships between the nanostructure in these materials and their resultant physical properties

2) **Production, Assembly and Investigation of Nanoparticle-based Materials: Toward Functional Nanoparticle Materials and Devices. (Chang, Deutsch, Gregory, Guillemin, Hutchison, E Johnson, Lonergan, Paul, Reed, Remcho, Taylor, and Wang)**

Researchers in this group are unified in the common goals of synthesizing/manufacturing well- defined, highly functionalized NPs; organizing arrays of NPs; understanding the properties of individual NPs, NP arrays and hybrid nano/mesoscale materials; and realizing functional NP- based devices. In the synthesis of NPs, new materials are being prepared with highly refined properties for electronic and optical applications. In addition, microchannel reactor approaches are being explored for high volume, environmentally benign synthesis of these nanomaterials. In the assembly of NP arrays, molecular templates and functionalized surfaces are being used to fabricate assemblies of NPs not accessible with traditional lithography or to interface nanostructures with mesoscale structures. Optical and electronic investigation of individual nanostructures and arrays will provide a fundamental understanding of their properties and provide a foundation for their use in sensors, quantum logic gates, photonics, and photovoltaics. Interdisciplinary aspects of this thrust group combine biological, chemical, physical and engineering approaches to new materials, the fundamental understanding and applications of complex material systems, and the manufacture of matter with nanoscale spatial organization.

3) **Molecularly Programmed Dynamic Assemblies (Haley, Hutchison, Darren Johnson, Linke, Liu, Parthasarathy, Rochefort, Tyler)**

The object of this thrust group is to create artificial molecular machines and functional materials with specific functional and dynamic properties. The group takes a cradle-to-grave approach, with the vision to actually program in the eventual degradation of the molecular assemblies. The group aims (i) to create synthetic molecular machines capable of performing mechanical tasks, (ii) to equip these machines with sensing capability, and (iii) to program the assemblies to autodegrade after a certain time or when exposed to a specific chemical environment. Molecules and molecular assemblies will be rationally designed with the objective of constructing single and multiple motors that can be integrated with nano- and microstructures, and whose physical performance can be measured. Molecular dynamics and Brownian dynamics modeling are an integral part of this effort. To incorporate sensors into molecular motor systems, the group develops new recognition motifs for a variety of metal ions and small organic molecules, it investigates the dynamic photophysical properties of the new recognition agents and their host- guest and/or metal-ligand complexes; and it studies the dynamic self-assembly of these supramolecular structures. Finally, the team aims to identify the relevant reaction and environmental parameters that affect and determine the degradation of molecular assemblies and functional materials. The specific goal is to identify those factors that control the onset of degradation and the rate of degradation so that adjustment of these parameters will lead to programmed degradation. A dual approach of experiment and modeling is being used to attack the problem of the molecular interpretation of degradation and to correlate assembly morphology with degradation properties.