INTEGRATIVE GRADUATE EDUCATION AND RESEARCH TRAINING (IGERT)

DOCTORAL STUDIES IN GEOGRAPHIC INFORMATION SCIENCE

PROGRAM INFORMATION

NATIONAL CENTER FOR GEOGRAPHIC INFORMATION AND ANALYSIS
TO CONTACT THE SUNY BUFFALO IGERT PROGRAM OFFICE:

IGERT PROGRAM IN GI SCIENCE
NATIONAL CENTER FOR GEOGRAPHIC INFORMATION AND ANALYSIS
STATE UNIVERSITY OF NEW YORK AT BUFFALO
301 WILKESON QUAD, BUFFALO, NY  14261
PHONE: (716) 645-2545, EXT. 47    FAX: (716) 645-5957
EMAIL:  ncgia-igis@acsu.buffalo.edu    WEB PAGE:  http://www.geog.buffalo.edu/ncgia/igert/

**THIS PROGRAM IS SUPPORTED BY NATIONAL SCIENCE FOUNDATION GRANT DGE-9870668, AWARDED TO THE NATIONAL CENTER FOR GEOGRAPHIC INFORMATION AND ANALYSIS AT THE UNIVERSITY AT BUFFALO.**

Version 1 10/01
I. Overview

The University at Buffalo offers an Integrative Graduate Education and Research Training (IGERT) doctoral concentration in Geographic Information Science (GI Science). GI Science is a fast-growing, multidisciplinary field of study, and the goal of the University at Buffalo’s program is to educate and train Ph.D.s who are broadly prepared with multidisciplinary backgrounds, and the technical, professional, and personal skills necessary for a successful career in the field.

Doctoral degree students in eight academic departments are eligible to participate in the SUNY Buffalo IGERT program. The eight academic departments hosting students are: Anthropology, Civil, Structural & Environmental Engineering, Communication (Information Studies), Computer Science & Engineering, Geography, Industrial Engineering, Philosophy, and Political Science.

Students join one of the eight participating Ph.D. programs, and complete all the requirements for a degree from that department. Students also complete a set of GI Science courses, which includes four required courses and at least two elective courses from one of six research areas.

The research part of the program is based in six topical areas of GI Science: cognitive models of geographic space; computational implementations of geographic concepts; geographic information and society; human capital research using GIS; environmental modeling; and regional modeling and optimization.

Students in the program also participate in colloquia, specialized workshops, academic conferences, and in internships in industry and government.

II. Student Funding

With support from the National Science Foundation, enhanced funding packages are available to support a limited number of applicants who are US citizens or permanent residents. The GI Science doctoral curriculum is also available to other students regardless of their citizenship or funding status, and those who successfully complete the concentration requirements may be eligible to receive an Advanced (Graduate) Certificate in Geographic Information Science upon graduation*.

* For more information on the Advanced (Graduate) Certificate in Geographic Information Science program, please contact the SUNY Buffalo IGERT program office.
III. FREQUENTLY ASKED QUESTIONS

How Do I Apply for IGERT Funding?

Step 1  Apply for graduate (doctoral program) admission to one of the eight participating academic departments at the University at Buffalo. The participating academic departments are listed on page 9. The graduate program application should be sent directly to the academic department.

Step 2  Submit a completed IGERT Application to the IGERT program office. The IGERT Application is on the back page of this booklet and is also available on-line at: www.geog.buffalo.edu/ncgia/igert

Step 3  Submit an essay describing your interest in the IGERT GI Science program to the IGERT program office.

Decisions on funding will begin 1 February 2002, but applications will be considered until 15 April 2002 or until all positions are filled.

What Qualifications Must I Have to Receive IGERT Funding?

The IGERT program is a competitive funding program. Participants are selected based upon academic merit, firm intention to complete a Ph.D. degree, and intention to complete the IGERT GI Science program components (as listed on page 3).

In accordance with National Science Foundation guidelines, all students funded by the IGERT program must be Citizens or Permanent Residents of the United States.

What Do I Do If I am NOT a US Citizen or Permanent Resident?

The GI Science doctoral curriculum is available all Ph.D. students in the participating academic departments at the University at Buffalo, regardless of their citizenship or funding status. These students may also be eligible to receive an Advanced (Graduate) Certificate in Geographic Information Science upon graduation. For more information on the Advanced (Graduate) Certificate in Geographic Information Science, please contact the IGERT program office.

While those who are not US citizens or permanent residents are not eligible for IGERT funding, other financial aid, in the form of Teaching, Graduate, and Research Assistantships, and Fellowships, may be available from the home academic departments. For information on applying for these awards, please consult the application materials of the prospective academic department.
What are the Participating Academic Departments and How Do I Get Their Graduate Admission Applications?

The eight academic departments participating in the IGERT GI Science program are listed on page 9 of this booklet. These departments all encourage prospective students to apply on-line, and the application web sites are indicated. Those requiring a printed application may receive one by contacting the departmental graduate program secretary. Necessary contact information is also listed on page 9.

What is expected of students in the IGERT Program?

Students in the IGERT program should...

• Be admitted to one of the eight departmentally-based participating Doctoral programs; maintain status as a full-time graduate student in good standing in the home department; and successfully complete all doctoral degree requirements of the home department.

• Take the four required GI Science core courses, and complete at least two GI Science elective courses in one of the six major research areas of the program. These six courses may also count toward the degree requirements of the home department, and should be completed within the first two years of the student’s studies.

• Demonstrate competence in the use of Geographic Information Systems by the end of the second year of the student’s studies.

• Participate in an IGERT colloquium series, which will vary in format between informal ‘brown bag seminars’ and colloquia centered around visiting speakers.

• Participate in faculty-led research on campus in the six major research efforts, or in other relevant GI Science research projects, including spending one summer or semester working in cooperation with an IGERT faculty member from outside the student’s home academic department.

• Spend at least one summer or semester in an internship in a non-academic research environment, selected from an approved list of major GIS-related companies and other relevant organizations, or at a similar site.

• Attend two research conferences per year in the latter years of their studies, if supported by the IGERT grant during that period.

• Write and defend a dissertation proposal, and complete and defend a dissertation on a topic related to geographic information science selected in consultation with the student’s advisory committee.

In accordance with National Science Foundation guidelines, IGERT funding is available only to U.S. Citizens and Permanent Residents.
Program Elements

I Education
IGERT students take, within the first two years of their studies, a core of four required courses and at least two electives from one of the six research focus areas listed below. Students also demonstrate competence in the use of GIS, either by transcript or by taking an appropriate course or training program. Credit hours appear in parenthesis after each course name.

Check with departments or instructors regarding prerequisites for these courses.
Courses listed may not necessarily be offered every academic year.

Required [Core] Courses

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<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>GEO 591</td>
<td>Introduction to Geographic Information Science</td>
<td>3</td>
</tr>
<tr>
<td>CSE 562</td>
<td>Database Systems</td>
<td>3</td>
</tr>
<tr>
<td>OR GEO 504</td>
<td>Designing Spatial Information Systems</td>
<td>3</td>
</tr>
<tr>
<td>PHI 531</td>
<td>Problems in Ontology: Ontological Foundations of Geographic Information Science</td>
<td>3</td>
</tr>
<tr>
<td>PHI 640</td>
<td>Graduate Research Ethics (also GSC 640)</td>
<td>2</td>
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Electives: Students must take at least two courses from one of the following six research areas:

Electives, Cognitive Models of Geographic Space

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CSE 514</td>
<td>Vision</td>
<td>3</td>
</tr>
<tr>
<td>CSE 526</td>
<td>Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>CSE 573</td>
<td>Introduction to Computer Vision and Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>CSE 572</td>
<td>Knowledge Based Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CSE 575</td>
<td>Introduction to Cognitive Science</td>
<td>3</td>
</tr>
<tr>
<td>GEO 592</td>
<td>Geographic Cognition &amp; Cognitive Geography</td>
<td>3</td>
</tr>
<tr>
<td>IE 531</td>
<td>Human Fac Res Methodology</td>
<td>3</td>
</tr>
<tr>
<td>IE 535</td>
<td>Human Computer Interaction</td>
<td>3</td>
</tr>
<tr>
<td>IE 632</td>
<td>Advanced Topics in Human Factors</td>
<td>3</td>
</tr>
<tr>
<td>LIN 582</td>
<td>Language &amp; Cognition</td>
<td>3</td>
</tr>
<tr>
<td>LIN 538</td>
<td>Semantics</td>
<td>3</td>
</tr>
<tr>
<td>PHI 534</td>
<td>Contemporary Philosophy: Formal and Cognitive Ontology</td>
<td>3</td>
</tr>
<tr>
<td>PHI 520</td>
<td>Philosophy of Science</td>
<td>3</td>
</tr>
<tr>
<td>PSY 639</td>
<td>Cognitive Processes</td>
<td>3</td>
</tr>
<tr>
<td>Or approved other course</td>
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Electives, Computational Implementations of Geographic Concepts

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<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSE 581</td>
<td>Computational Geometry</td>
<td>3</td>
</tr>
<tr>
<td>CSE 634</td>
<td>Multimedia Data Processing Systems</td>
<td>3</td>
</tr>
<tr>
<td>GEO 555</td>
<td>GIS: Algorithms and Data Structures</td>
<td>4</td>
</tr>
<tr>
<td>GEO 593</td>
<td>Computational Geography</td>
<td>3</td>
</tr>
<tr>
<td>GEO 597</td>
<td>Geostatistics</td>
<td>3</td>
</tr>
<tr>
<td>GEO 605</td>
<td>Spatial Statistics</td>
<td>4</td>
</tr>
<tr>
<td>Or approved other course</td>
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</tbody>
</table>
Electives, Geographic Information and Society
GEO 528 Geography and Social Theory (3)
GEO 594 Geographic Information and Society (3)
GEO 666 Geography of the Information Society (3)
PHI 650 Ontology of Society and Social Institutions (3-4)
PSC 681 Politics of Technology and Culture (3)
Or approved other course

Electives, Human Capital Research Using GIS
PSC 500 Introduction to Political Inquiry (3)
PSC 620 Political Culture (3)
PSC 621 Political Geography (3)
PSC 622 Comparative Political Behavior (3)
Or approved other course

Electives, Environmental Modeling
CIE 541 Groundwater Engineering (3)
CIE 543 Water Quality Modeling (3)
CIE 546 Environmental Fluid Mechanics (3)
CIE 554 Numerical Methods in Water Resources & Env. Engineering (3)
GEO 559 GIS & Environmental Modeling (4)
GEO 597 Geostatistics (3)
Or approved other course

Electives, Regional Modeling and Optimization
GEO 520 Transportation Models/GIS (4)
GEO 586 Spatial Decision Support Systems (3)
GEO 605 Spatial Statistics (4)
IE 678 Urban Operations Research (3)
Or approved other course

Other Recommended Courses
PHI 637 Graduate Professional Ethics (also GSC 637) (3)
GEO 502 Survey Methods for Human Geographers (3)
GEO 655 Advanced Topics in GIS: The Art of Writing Grant Proposals (3)
GEO 800 The Art of Teaching (2)
II. Research Areas
Program students will be able to participate in active research programs in six major themes. Short descriptions of the areas and examples of current projects are given below.

Cognitive Models of Geographic Space
Knowledge about how people think about geographic phenomena and about their kinds, relations, and distributions is fundamental to many human activities. Geographic databases are built so that people can use them, and their utility depends on their content making sense to their users. Two tasks can be distinguished: the construction of databases and associated software, and the understanding of how the users conceptualize the phenomena represented. The performance of these tasks must be grounded in sound cognitive principles. Ongoing research efforts in this area at the University at Buffalo include projects on the formal models of spatial relations; ontological investigations of land and property; investigations in the ontology of boundaries, the ontology of geographic categories, and formal-ontological foundations of ecology.

Geographic Information and Society
The possession of information, and the ownership or control of the means to produce, distribute, and consume it, have become significant sources of power in human society. The widespread development and adoption of geographic information technologies are occurring concurrently with the explosion of Internet and WWW access, enabling public participation in decision-making and, simultaneously, greater surveillance and control. Debates concerning geographic information mirror broader debates about information in general, particularly in areas such as ownership of and access to data, and invasion of privacy. Ongoing research projects at Buffalo include research into Public-Participation GIS; the critical history of GIS; nature and society conflicts in suburban environments; and the redefining or remapping of community and place in the information age.

Computational Implementations of Geographic Concepts
Researchers at Buffalo are establishing formalizations of geographic concepts that will allow the development of algorithms and data structures that behave consistently in computational environments. Some specific projects include research on the ontology of fields; interoperable systems for environmental modeling, geographical data management and retrieval systems; accuracy of linearly referenced transportation data; and computational identification of clusters of points.

Environmental Modeling
Research in environmental modeling at Buffalo includes studies of environmental processes, environmental quality, and environmental policy. Since environmental phenomena are spatially distributed and temporally dynamic, the integration of environmental modeling and GIS provides an important instrument for advancing both basic and applied research. Research toward integrating environmental modeling and GIS has taken two directions: the development of more effective GISs that can support the generic demands of environmental modeling, and the adaptation of GISs to facilitate the many data management, analysis, and visualization tasks required by environmental modeling.

Regional Modeling and Optimization
Current projects in this area at Buffalo include the development of improved methods to model the choice among spatially-referenced alternatives, and the design of spatial decision support systems for land use planning and for hazardous materials routing. Another research focus is on the development of spatial statistics designed to detect and to monitor the evolution of clusters. Cluster identification is an important tool in environmental health, epidemiology, crime analysis, and in many other ecological and social contexts. Other researchers are working on integrating GIS technology to improve the estimation of police response time and travel times to help determine the optimal design of reporting districts in a police department.
Human Capital Research Using GIS
Spatially differentiated social, economic, and political processes obviously affect the intensity of human capital development within societies. Geographic information science and geographic analysis, incorporating theoretical and statistical techniques to address the geographic dimension of human capital research, promise to advance our understanding of a variety of questions and issues identified under the major areas of human capital research, namely: employing a productive workforce, educating for the future; fostering successful families; building strong neighborhoods; reducing disadvantage in a diverse society; and overcoming poverty and deprivation. Examples of related research projects at Buffalo include research into the impact of block clubs on neighborhood safety and stability; research into the evolving pattern of racial segregation in cities; and several projects on policing and crime, including community-oriented policing services, and the development of GIS based crime analysis applications.

III. Training Opportunities
Program students will have the opportunity to participate in training experiences relevant to both academic and non-academic careers. These opportunities include:

• Participation in faculty-led research in the areas of:
  Cognitive Models of Geographic Space
  Geographic Information and Society
  Computational Implementations of Geographic Concepts
  Environmental Modeling
  Regional Modeling and Optimization
  Human Capital Research Using GIS
  Other relevant Geographic Information Science research projects

• Internship opportunities:
  Pertinent to academic and non-academic career paths

• Instruction in:
  Research methods and practices
  University teaching
  Preparing grant proposals

• Short courses and technical training

• Participation in conferences, workshops and colloquia
Faculty Participants

**Joseph Atkinson**  
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**Stuart Shapiro**  
Department of Computer Science & Engineering  
shapiro@cse.buffalo.edu

**Barry Smith**  
Department of Philosophy  
phismith@acsu.buffalo.edu

**Jean-Claude Thill**  
Department of Geography  
jcthill@acsu.buffalo.edu

**Aidong Zhang**  
Department of Computer Science & Engineering  
azhang@acsu.buffalo.edu

**Ezra Zubrow**  
Department of Anthropology  
zubrow@acsu.buffalo.edu
Participating Academic Departments

Department of Anthropology
University at Buffalo
369 Fillmore, Ellicott Complex
Buffalo, NY 14261
Phone: (716) 645-2414
Fax: (716) 645-3808
Application: http://wings.buffalo.edu/anthropology/programs.html
Web: http://wings.buffalo.edu/anthropology/
Graduate Admissions Secretary:
Mary Anne Lang, (716) 645-2414
Email: mal@acsu.buffalo.edu

Department of Civil, Structural & Environmental Engineering
University at Buffalo
202 Jarvis Hall
Buffalo, NY 14260
Phone: (716) 645-2114
Fax: (716) 645-3733
Application: http://www.civil.buffalo.edu/Graduate/forms.html
Web: http://www.civil.buffalo.edu/
Graduate Admissions Secretary:
Diane McMaster, (716) 645-2114, ext. 2333
Email: dianeh@civil.eng.buffalo.edu

Department of Communication*
(Information Studies)
University at Buffalo
357 Baldy Hall
Buffalo, NY 14260
Phone: (716) 645-2141
Fax: (716) 645-2086
Application: sis.buffalo.edu/COM/index.html
Graduate Admissions Secretary:
Patty Rackl (716) 645-2141
Email: rackl@buffalo.edu

* Doctoral Degree offered in Department of Communication with a concentration in Information Studies

Department of Computer Science & Engineering
University at Buffalo
226 Bell Hall
Buffalo, NY 14260
Phone: (716) 645-3180
Fax: (716) 645-3464
Application: http://www.cse.buffalo.edu/grad/admission.html
Web: http://www.cse.buffalo.edu/
Graduate Admissions Secretary:
Yvette Gilbo, (716) 645-3180, ext. 122
Email: cse-gradinfo@cse.buffalo.edu

Department of Geography
University at Buffalo
105 Wilkeson Quad, Ellicott Complex
Buffalo, NY 14261-0023
Phone: (716) 645-2722
Fax: (716) 645-2329
Application: http://www.geog.buffalo.edu/
Web: http://www.geog.buffalo.edu/
Graduate Admissions Secretary:
Joe Murray, (716) 645-2722, ext. 13
Email: jlm@acsu.buffalo.edu

Department of Industrial Engineering
University at Buffalo
301 Bell Hall
Buffalo, NY 14260
Phone: (716) 645-2537
Fax: (716) 645-3302
Application: http://www.eng.buffalo.edu/Departments/ie/Graduate/gradonline.html
Web: http://www.eng.buffalo.edu/Departments/ie/
Graduate Admissions Secretary:
Patricia Brock, (716) 645-2357, ext. 2102
Email: brock@eng.buffalo.edu

Department of Philosophy
University at Buffalo
135 Park Hall
Buffalo, NY 14260
Phone: (716) 645-2444
Fax: (716) 645-6139
Application: http://wings.buffalo.edu/philosophy/department/grad_program/graduate1.html
Web: http://cas.buffalo.edu/philosophy/
Graduate Admissions Secretary:
Judy Wagner, (716) 645-2444, ext. 207
Email: jjwagner@acsu.buffalo.edu

Department of Political Science
University at Buffalo
518 Park Hall
Buffalo, NY 14260
Phone: (716) 645-2251
Fax: (716) 645-2166
Application: http://wings.buffalo.edu/soc-sci/pol-sci/Polsciapply.html
Web: http://wings.buffalo.edu/soc-sci/pol-sci/
Graduate Admissions Secretary:
Margaret Kasprzyk, (716)645-2251, ext. 518
Email: pscmmk@acsu.buffalo.edu
INTEGRATIVE GRADUATE EDUCATION AND RESEARCH TRAINING (IGERT) DOCTORAL STUDIES IN GEOGRAPHIC INFORMATION SCIENCE

APPLICATION FOR FUNDING FALL 2002

A limited number of funding packages are available for U.S. citizens and permanent residents. Others may be eligible for financial support from other sources.

Name (First, MI, Last): _____________________________________________________________________________

Current Mailing Address
________________________________ _________________________________
________________________________ _________________________________
________________________________ _________________________________
Phone: _______________________________________________________________________________________
E-mail: _______________________________________________________________________________________

Permanent Address (if different)
________________________________ _________________________________
________________________________ _________________________________
________________________________ _________________________________
Phone: _______________________________________________________________________________________
E-mail: _______________________________________________________________________________________

Please enter the date until which you may be reached at the Current Mailing Address: ____/____/____

US Citizen: YES NO If NO, are you a US Permanent Resident: YES NO

SUNY Buffalo Department (“home department”) applying to: (if indicating more than one, please rank in order of preference)

________ Anthropology
________ Civil, Structural, & Environmental Engineering
________ Communication (Information Studies)
________ Computer Science and Engineering
________ Geography
________ Industrial Engineering
________ Philosophy
________ Political Science

IGERT Research Concentration(s) of Interest: (if indicating more than one, please rank in order of preference); See page 5 of the IGERT Program Information Booklet for a description of each concentration.

________ Computational Implementations of Geographic Concepts
________ Cognitive Models of Geographic Space
________ Geographic Information and Society
________ Human Capital Research Using GIS
________ Environmental Modeling
________ Regional Modeling and Optimization

All applicants are required to take the Graduate Record Examination general test. Enter below the date and location you will take or have taken this test, and your score (if known). Submit original score reports to the home academic department to which you are applying.

<table>
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<tr>
<th>Date of Test</th>
<th>Location</th>
<th>Verbal Score</th>
<th>Quantitative Score</th>
<th>Analytical Score</th>
<th>Cumulative Score</th>
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Colleges or Universities Attended: Enter names of all post-secondary institutions attended (beginning with the most recent). Enter the institution name, its location, dates of attendance, major field of study, the exact name of the degree received, and the cumulative grade point average.

<table>
<thead>
<tr>
<th>Name of Institution</th>
<th>Location (City, Country)</th>
<th>Dates of Attendance: From To</th>
<th>Major Field</th>
<th>Degree Received</th>
<th>Cumulative GPA</th>
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References: Enter the names, institutions, and contact information of three persons who know your intellectual accomplishments and ability.

<table>
<thead>
<tr>
<th>Name of Reference</th>
<th>Institution</th>
<th>Phone</th>
<th>E-mail</th>
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Essay: Applicants should ensure that they include a written statement, approximately 1-2 pages long, describing their interest in the IGERT GI Science program.

Responses to the following questions are optional, and provision of any of this information is not a precondition for admission. If you choose to not provide this information, it will not negatively impact your chances for IGERT funding.

Race Select one or more from the following categories:
- American Indian or Alaska Native
- Asian
- Black or African American
- Native Hawaiian or Other Pacific Islander
- White

Gender
- Male
- Female

Disability Status
- Hearing Impairment
- Visual Impairment
- Mobility /Orthopedic Impairment
- Other
- None

Ethnicity
- Hispanic/Latino
- Not Hispanic or Latino

Note: Submission of this application for funding does not constitute formal application for admission to the University at Buffalo. Prospective graduate students must also submit a complete application for admission to one of the participating academic departments of the University at Buffalo.

Applications considered until 15 April 2002, or until all positions are filled. Please send this completed IGERT application to the following address:

NCGIA-IGERT Program
SUNY at Buffalo
301 Wilkeson Quadrangle
Buffalo, NY 14261