

## **b. Vision, Goals, and Thematic Basis**

Geographic Information Science (GIScience) is an emerging interdisciplinary field that seeks to understand the nature of geographic information and its role in science and society, and to provide theoretical foundations for Geographic Information Systems (GIS) and related technology. GIS constitutes a multi-billion dollar industry in the United States with many applications relevant to topics ranging from environmental health, national security, and the economy to basic science and engineering. GIScience seeks to formalize geographic principles using logic and mathematics, to explore scientific, engineering, and policy-related uses of geographic information, and to elucidate the complex relationships that individuals and society have with GIS and associated technology. GIScience also provides a framework for scientific and engineering studies of physical and social environments. The present project brings together some thirty faculty members from seven academic departments to engage in doctoral education and research training in GIScience. Our research seeks to advance GIScience and to extend the use of theoretically grounded GIS technology in these disciplines, and to educate and train a new generation of researchers who will be able to operate effectively in this emerging interdisciplinary area.

An extensive interdisciplinary research and graduate education program built around GIScience has already been established in Buffalo, and the present proposal seeks support for its continuation. Graduates of the program are expected to have a significant impact on the further development of GIScience in academic, government, and industry settings, both nationally and internationally. Continued external support will allow completion of the institutionalization of the program, producing a lasting effect on graduate education within the participating departments, throughout the University at Buffalo and beyond. Our Discipline-Plus model of doctoral education ensures that all graduates will be both fully qualified under the standards of their home disciplines and broadly prepared for the types of interdisciplinary research and education that GIScience encourages. The core of four courses, plus the competency requirements of the program, expands the educational experiences of all of the students in the program, and helps to form them into a single interdisciplinary community with shared experiences. Before our current IGERT began, few if any Doctoral students would have included both an ontology course in Philosophy and competence in GIS software and spatial databases within their programs. The result of such combinations is broadly educated scholar researchers who will be uniquely prepared to contribute to their home disciplines and to GIScience.

The value-added aspects of our proposed activities for the next five years come from several innovative components. These include an evolution of the scientific core of the project, new structural elements in the student trainee experience, and a change in the participating academic disciplines, most notably the addition of Geology. Over the next five years, the project will focus on three major research themes: basic geographic information science, geographic environmental science, and geographic social science. The addition of the Geology department will greatly enhance the research experience of IGERT Fellows in the environmental area, and will provide a valuable bridge between research in environmental science and engineering and work on societal impacts of environmental change. The structural changes include a new required core course in ethics and professionalism, a systematic program of individual international research internships, and an International Summer School. The last two elements will be open to early-career scholars in GIScience from other US institutions, helping our IGERT Fellows establish social networks within the wider research community both in the United States and abroad and broadening the impact of the IGERT-funded graduate research training beyond the University at Buffalo (UB).