Department of Geology
MCMICKEN COLLEGE OF ARTS AND SCIENCES

SUMMER RESEARCH OPPORTUNITIES
FOR UNDERGRADUATE WOMEN

APPLICATION DEADLINE: March 3, 2008

The Department of Geology is pleased to offer the following research project for the summer of 2008. Interested students are urged to contact the faculty member(s) directing the project that most interests them. By contacting the faculty member, you can discover more about the project, learn what your responsibilities will be and, if possible, develop a timetable for the twelve-week research period.

THE EVOLUTION OF AN ANCIENT ISLAND-ARC SYSTEM

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Project Description

Determining the absolute ages (through geochronology) of the igneous rocks that make up ancient volcanic island arcs of the Iapetus Ocean have led to new paradigms of how the Appalachian Mountains of New England and Maritime Canada were built during the Paleozoic Era. Iapetus is the name given to a wide ocean that existed about 600 to 400 million years ago that separated several continents. Adjacent to many of these continents were arcuate chains of volcanic islands. As tectonic plates moved, the ocean evolved and mountains were built where volcanic island arcs were pushed together with continental margins.

While the ages of arc-related igneous rocks are becoming more precisely known, the primary ages and sources of major sedimentary units spatially associated with them remain unresolved. The sedimentary units originally deposited between the arcs and continents define the physical linkage (or separation) among various arcs and continents as Iapetus evolved and arcs and continents converged. The sedimentary units have been folded, faulted, and metamorphosed, but some of their minerals — particularly zircon, $ZrSiO_4$ — retain a memory of what arcs and/or continents were eroded to form them. Constraining the spatial relations through time of the arcs and continents of the northern

Appalachians can be achieved by defining the ages and sources of these sedimentary units.

Our long-term goal is to understand the evolution of Iapetian arc terranes in the northern Appalachians from their origin, collision onto continental margins, and through their subsequent polyphase structural and metamorphic evolution as the Appalachian mountains evolved. The goal for this summer's WISE project is to separate and characterize detrital zircons from a sequence of metasedimentary units exposed in central Vermont that likely record the advance of the "western New England" island arc towards the margin of Laurentia (the name given to ancient North America). The collision of the "western New England" arc and Laurentia produced the Taconic orogeny — the first major mountain building episode in the northern Appalachians.

For this project, the WISE participant will learn the essentials of northern Appalachian geology, including current controversies of competing tectonic models; will produce zircon separations from five rock units (already collected) using a variety of techniques in labs in the Department of Geology; will produce data characterizing the physical aspects of the separations and their inter-sample variation; and will use these data to propose a model for the evolution of arc-continent collision.