



## Research Inventory

As a member of the Association for the Advancement of Sustainability in Higher Education (AASHE), Swarthmore College participates in the **sustainability tracking, assessment, and rating system (STARS)**, an online self-reporting framework for colleges and universities to gauge relative progress toward sustainability. As part of its reporting process, the Sustainability Committee takes an annual inventory of research at the college related to environmental sustainability.

The committee has adopted the following definition of sustainability research:

*"Sustainability research includes projects that are oriented to the natural environment and relationships between human practices and the natural environment, including related issues of social and economic equity."*

The online **inventory tool** for collecting information from the college's faculty, staff, and students will remain open to gather information for STARS reporting each April, and we **invite the college community to participate**.

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### April 2011

#### Biology

Kaplinsky, Nick (faculty). "Identification of proteins required for cellulose synthesis."

Cellulose is the most abundant organic molecule on the planet. Cellulose is made up of long chains of sugars made during photosynthesis - it is how plants store the energy in sunlight. How cellulose is synthesized is poorly understood give the importance of this molecule in global carbon cycling. Our research is focused on identifying and characterizing molecules involved in cellulose biosynthesis.

Machado, Jose-Luis (faculty). "Stoichiometry of the soil-plant-atmosphere continuum: a long-term ecological field-based curriculum for biology undergraduates."

This proposal seeks to enrich the ecology curriculum at Swarthmore College by establishing a long-term field study demonstrating the mechanistic and experimental nature of ecological science in which undergraduates can engage at all levels of instruction, from freshman to senior year. The subject is ecological stoichiometry. The setting is the Crum Woods of Swarthmore College, a tract of 236 forested acres (95 ha) adjacent to the College. Students will investigate the balance of multiple chemical elements, their influence on distribution and productivity of plant populations, community structure, and ecosystem functions and services.

Vollmer, Amy Cheng (faculty), Elizabeth Matlock (student), and Arthur McGarity (faculty). "Assessment of polyaromatic hydrocarbons in the local watershed."

This is an honors research project by Elizabeth Matlock '12. She will determine whether polyaromatic hydrocarbons (which in part of road asphalt) have leached into the local watershed. We are using bacterial biosensors and chemical analysis to measure the concentrations of PAHs.

#### Chemistry and Biochemistry

Holliday, Alison Eileen (faculty). "Detection of fungicides in natural waters using ion mobility spectrometry."

This project is focused on the development of a new method for detecting pesticides in natural waters at physiologically and environmentally relevant concentrations. Thus far, solid phase microextraction has been combined with electrospray ionization-ion mobility spectrometry to detect triazole fungicides at a level of 50 parts per billion in water.

Holliday, Alison Eileen (faculty). "Chiral biodegradation of triazole fungicides."

Many pesticides are produced and applied as a mixture of stereoisomers, but, in most cases, one stereoisomer is much more effective than the other(s). If biodegradation pathways are chiral, agricultural soils may become disproportionately depleted in one stereoisomer, which may or may not be the effective stereoisomer. This project investigates the chirality of biodegradation of triazole fungicides using particular species of bacteria in a controlled, lab environment.

## Engineering

Everbach, Erich Carr (faculty), Andreas Bastian (student), and Kanti Somani. "Solar Composter."

Two rotary composters were purchased as part of a Pennsylvania Department of Environmental Protection grant and were modified to be powered by photovoltaic panels. These solar composters have been deployed to receive vegetable waste from Sharples Dining Hall and act to reduce these wastes to soil in a matter of days. The rotary composters turn several times a day for several minutes, to mix and aerate the compost, based upon a programmable timer. The solar panels trickle-charge a deep-cycle marine battery through a charge controller, which power supplies all the power necessary for the composters to operate year-round.

Moreshet, Tali (faculty), R. Iris Bahar, and Maurice Herlihy. "Energy-Aware Memory Synchronization for Embedded Multicore Systems."

This project investigates the energy implications of system-level concurrency issues in high-end embedded systems such as smart phones, game consoles, GPS-enabled automotive systems, and home entertainment centers. In particular, it aims to develop energy-efficient techniques of synchronizing memory accesses, and tries to understand the optimal division of tasks between hardware and software.

Moreshet, Tali (faculty) and Uzi Vishkin. "Power-efficient easy to program 1000-core desktop supercomputer."

This project addresses the energy-efficiency of a new approach to parallel computing, which targets single task completion time in a many-core processor. Ensuring that the new architecture meets power and thermal constraints will enable it to serve as a viable alternative approach to parallel computing.

## Religion

Wallace, Mark I. (faculty). "Green Christianity: Five Ways to a Sustainable Future."

Green Christianity uses sustainability research to rethink Christianity as an earth-centered religion.

## Sociology and Anthropology

Schuetze, Christy (faculty). "Restoration and Expansion of Gorongosa National Park, Mozambique."

Ethnographic research on the expansion of a national park in central Mozambique to include the upper elevations of a nearby mountain. The research examines social, historical, economic, and political aspects of the creation of protected areas for conservation and ecotourism projects in the global south.