



INITIATIVES IN
ENERGY *and the*
ENVIRONMENT

*a quarterly publication of MIT's
Laboratory For Energy and the
Environment*

New Research
Partnerships, cover

ThinkCycle at MIT,
p. 3

World Sustainability
Summit, report, p. 5

Youth Environmental
Summit, p. 7

MIT



**laboratory
for energy
and the
environment**

New Research Partnerships for Sustainability

Alliance for Global Sustainability (AGS) scholars and invited external experts and stakeholders will meet at the Massachusetts Institute of Technology, November 17-19, for the second annual AGS Technical Meeting. Keynote speaker for the meeting will be Dr. Paul Tebo, who, since 1993, has been DuPont's corporate vice president for safety, health and environment. Dr. Tebo has global responsibility for integrating safety, health, and environmental excellence as a core business strategy at DuPont. His address will concern the private sector and academic partnerships for sustainable development.



Dr. Paul Tebo

The heart of the meeting will be four concurrent workshops on grand challenges to sustainable development. The workshops are aimed at developing proposals for the AGS to address these issues through new research partnerships. The four workshops will be as follows:

- 1> New Materials for Sustainable Development:** This workshop will address development of a methodology to address the sustainability of materials choices. The methodology is aimed at an integrated assessment of all of the issues that drive a material's real potential for commercialization in conjunction with its substitution from a number of perspectives.
- 2> Tools for Managing the Mega-cities:** This workshop brings together principal investigators from AGS-focused research on the future of mega-cities and knowledge management through intelligent transportation (IT) systems for sustainable development. They will jointly

continued on page 2

CALENDAR

november **20**

"Sustainable Transportation: Working Toward a Useful Definition," Prof. Joseph Sussman, MIT Dept. of Civil and Environmental Engineering, and Ralph Hall, LFEE. LFEE brownbag seminar series, November 20, 2002, 12 noon - 1:30 pm, MIT, Room E40-496. Contact: Ms. Karen Luxton, 617-253-3478 (kkluxton@mit.edu)

december **4**

"Sustainable Buildings: What Does It Mean for the US, Europe and China?" Prof. Leon Glicksman, Director, Building Technology Program, Department of Architecture, and Department of Mechanical Engineering, MIT. December 4, 2002, 12:30pm-2 pm, MIT, Room E40-496. Contact: Ms. Karen Luxton, 617-253-3478 (kkluxton@mit.edu)

march **24-26**

"Science, Industry and Society: Partnerships for Sustainable Development," the Alliance for Global Sustainability Annual Meeting 2003, University of Tokyo, Japan; March 24-26, 2003. For further information contact Ms. Karen Gibson, 617-258-6368 (Email: kgibson@mit.edu).

All events are held at MIT unless otherwise noted. For the most current listings, see the LFEE website:

<http://lfec.mit.edu/>

Please send MIT-sponsored event listings to Dr. Richard St. Clair, stclair@mit.edu, phone 617-253-9871.

examine needs resulting from the rise of the world's mega-cities, with a focus on the Asian region, and how IT can help to address those needs.

3> Mountain Waters—Resource and Risk: This workshop will bring together scientists and stakeholders concerned with the potential impacts of climate modifications of mountainous areas which may seriously threaten the availability of water resources and increase the downstream landslide and flood risk. The aim is to develop a research program that will lead to better understanding of the sensitivity to climate modifications of mountainous areas and development of tools to assist stakeholders, planners, and managers of governmental agencies.

4> Strategies for Changing Course: This workshop will focus on ways of designing economically and environmentally effective regulatory strategies aimed at improving environmental performance of business and consumers. Workshop participants will explore the potential for synergy in the design of a research program aimed at understanding the conditions and policy reforms that are needed to promote sustainable development from both the supply and the demand sides.

On the final day of the technical meeting there will be an open workshop on AGS Education Initiatives. This workshop will explore a range of views on a vision for AGS education initiatives. It will address such questions as, What unique role can the AGS play in educating future leaders? What do students encounter in today's universities and how can the gaps in their education on sustainability be bridged? Reports and updates will be given on existing initiatives such as the Youth Environmental Summit (see p. 7, this issue). A fifth workshop will be held on November 15 on Carbon Management: Social and Political Aspects of Carbon Sequestration Technologies.

AGS Technical Meeting November 17-19

Keynote – Dr. Paul Tebo (DuPont)

Plenary Session

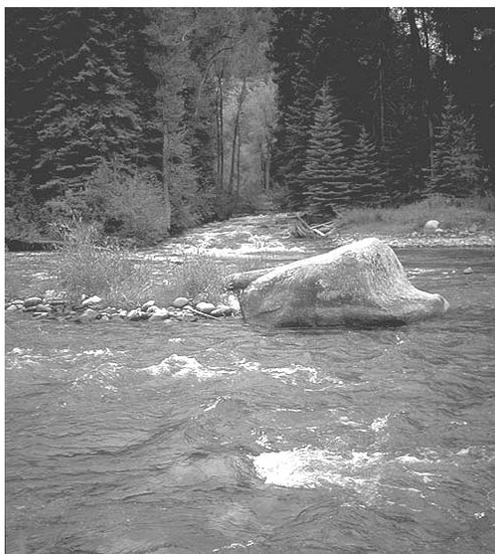
- > Panel: Four Keys to a Sustainable Future
- > Technology and the Future of Sustainable Development – Prof. Lawrence Susskind (MIT)
- > Institutions – Prof. Kenneth Oye (MIT)
- > Innovation – Prof. Eleanor Westney (MIT/Sloan)
- > An Update on Climate Change – Prof. Jeffrey Steinfeld (MIT)

Workshops (see article)

The proposed research partnerships will be in addition to the traditional seed and full projects of the AGS. Genuine collaboration will be emphasized between academics and the broader stakeholder community, including government and industry. The partnerships will influence policy and decision making through both the process of partnering on research and the content of integrated research that leads to new knowledge. To the greatest extent possible, the new AGS research partnerships will include consideration of social and economic as well as scientific and technical dimensions of the problems under investigation.

A high quality of project management and coordination will be necessary to meet the demands of these larger-scale initiatives. Models for this type of project are the China Energy Technology Project (CETP) and the Mexico City Project (see previous newsletter, Vol. 4:2, July 2002, pp. 7-10). Both projects have required dedicated management and coordination across disciplines, partners, and geographic regions. In addition, both projects are highly successful in the implementation of results and recommendations, because the research was developed and carried out in partnership with the stakeholders and policy makers.

Proposals stemming from the November workshops will be due February 14 for funding in 2003. Final selection of research partnerships to be supported by AGS funds as well as the more traditional full and seed projects will be announced in March 2003, prior to the AGS Annual Meeting at the University of Tokyo. Summaries of the research projects currently supported by the AGS are available on the AGS website at www.globalsustainability.org. 



ThinkCycle at MIT: Design that Matters

Academia has the potential to positively influence global development and sustainability. Students, in particular, represent a valuable and largely untapped resource for solving real-world problems in these areas. Developed by students at the Massachusetts Institute of Technology, ThinkCycle is a nonprofit initiative that seeks to identify specific challenges faced by underserved communities, developing countries, and rural entrepreneurs. In ThinkCycle, students work in the field to find solutions to these challenges as part of their university course work.

In Spring 2001, the ThinkCycle group launched "Design that Matters" (DTM), a student-led seminar and design studio at the MIT Media Lab intended to apply the ideas of ThinkCycle. The class features crash courses in mechanical and electrical engineering and weekly guest lectures from experts in sustainability and international development. The goal for MIT students is to work on real-world design challenges, building working prototypes using CAD (computer-aided design) software and rapid prototyping machines, while documenting the evolution of their designs for the benefit of NGOs and future student groups.

The goal for the MIT students is to work on real-world design challenges. ThinkCycle presents a broad spectrum of opportunities to bring students out of the classroom and into communities in developing countries so they can experience these issues first-hand.

ThinkCycle presents a broad spectrum of opportunities to bring students out of the classroom and into communities in developing countries so they can experience these issues first-hand. Students in ThinkCycle solicit community groups and nongovernmental organizations (NGOs) in developing countries for well-defined problems in development and sustainability. These problems are then packaged as curriculum materials, modules, and case studies for educators to use in their undergraduate and graduate courses and as topics of graduate thesis research. Students in engineering, for example, can tackle design challenges in such fields as health care, clean water, and renewable energy, while business school students can

While it may be unrealistic to expect that every student group will achieve amazing results, it is true that by working on these challenges every student will, for perhaps the first time, be exposed to problems faced by that majority of humanity living in the developing world. Students in industrialized countries will become aware of new career possibilities in development and sustainability, while students in developing countries may be inspired to stay and apply their valuable skills at home.

—Timothy Prestero, Design that Matters
Instructor, MIT ThinkCycle Program



IV drip for cholera treatment developed by ThinkCycle students in MIT's Design that Matters class.



MIT Design that Matters 2002 (from left): Carlos French, David Lobosco, Claudio Lopez, Nitin Sawhney (instructor), Aileen Wu, Prasanga Hiniduma Lokuge, Rebeca Hwang, Leo Burd (instructor, seated), Timothy Prestero (instructor), Yael Maguire (instructor) [not shown: Eston Kimani, Bruno Miller, Vinay Prabhakar, William Kalliardos, Saul Griffith (instructor), Ben Vigoda (instructor)]

assist entrepreneurs in developing countries with market studies, innovative financing models, and business plan development.

In the long term, ThinkCycle seeks to develop a nonprofit organization that focuses on creating educational services to connect academia with issues in development and sustainability. Its first goal is to give university faculty in engineering, science, and business education the ability to enhance their curricula with real-world challenges faced by underserved communities in developing countries around the world by providing content, tools, services, and access to the broader community. The second goal is to find ways to help students get out into the field in order to work with these communities and industries in the spirit of participatory education. The third goal is to connect promising student prototypes and case studies with the NGOs, entrepreneurs and institutions in developing countries that can make the most use of them.

Timothy Prestero, a student instructor for DtM and founding member of the ThinkCycle program at MIT, will be working with MIT's Laboratory for Energy and the Environment (LFEE) this year to explore and report on opportunities at the Institute to incorporate elements of development and sustainability into the university curriculum.

Following MIT's lead, courses similar to Design that Matters are now being developed at six universities in four different countries—India, Kenya, Brazil, and Portugal. Prestero notes, "While it may be unrealistic to expect that every student group will achieve amazing results, it is true that by working on these challenges every student will, for perhaps the first time, be exposed

to problems faced by that majority of humanity living in the developing world. Students in industrialized countries will become aware of new career possibilities in development and sustainability, while students in developing countries may be inspired to stay and apply their valuable skills at home.”

One significant issue addressed by ThinkCycle is the rapid and inexpensive treatment of cholera epidemics. Cholera is an acute intestinal infection which, if not treated, can quickly lead to severe dehydration and death. Rehydration through the intravenous (IV) drip infusion of saline is the only technique readily available for the treatment of severe cholera. In a cholera epidemic, where many patients need to be treated as quickly as possible, it is critical that setting up IV equipment and initiating treatment occur as rapidly as possible. In a refugee camp or following a natural disaster, thousands of cholera cases can develop within days. A student team in the Spring 2001 DtM course tackled the problem of how to make the technology of IV drip easier. This new technology makes it possible for the sick to be treated by local volunteers, who may have no medical training and who may not even be able to read. The result of the DtM course was a novel and simple IV drip flow control device to facilitate rapid treatment of cholera patients (see photo, p. 4). This project has led directly to three patent applications for improved IV drip flow monitoring and control devices.

Over the past two years, MIT student teams in DtM have tackled other challenges such as a children’s talking toy for Native American language preservation, “smart canes” for the blind, hand-powered electricity generation for rural computing, and a non-electric incubator for premature infants in developing countries. DtM student projects have won awards such as the MIT Lemelson International Technology Award and the MIT IDEAS Award.

The ThinkCycle group is now working to raise funding in order to spend more time in the field, visiting such regions as West Africa, India, Southeast Asia, and Central America, to meet representatives from communities, local universities, NGOs, and industrial groups. It is hoped this will lead to the contacts and design challenges necessary for the development of an education services program.

For further information about ThinkCycle go to the website at <http://www.thinkcycle.org/>. 

MIT and AGS Send Delegations to World Sustainability Summit

MIT’s Laboratory for Energy and the Environment (LFEE) and the Alliance for Global Sustainability (AGS) sent delegations to the UN World Summit on Sustainable Development (WSSD) held in Johannesburg, South Africa August 26-September 4. Representing LFEE and the AGS at the nine-day summit were MIT assistant professor Bernhardt Trout, Karin Bäckstrand (a Wallenberg Fellow at LFEE from Sweden), MIT graduate student and Councilor for the World Student Community for Sustainable Development Diego Puppini, and LFEE’s Program Assistant Karen Gibson. The AGS also sent four students from the four AGS member institutions, MIT, the University of Tokyo, the Swiss Federal Institute of Technology at Zürich, and Chalmers University of Technology.

One billion people in the world have no access to clean water; two billion have inadequate sanitation; 1.5 billion are breathing substandard air; and agricultural problems such as soil infertility, desertification, and soil salination abound. Science and technology are causes of major problems of sustainability but may also, with enlightened research and multidisciplinary strategies, offer the hope of a sustainable solution to many of the world’s most pressing problems associated with development.

The WSSD brought together over a hundred heads of state and government, national delegates, and leaders from non-governmental organizations (NGOs), businesses, and other major groups to focus the world’s attention and to direct action toward meeting difficult challenges, including improving people’s lives and conserving natural resources in a world that is growing in population with increasing demands for food, water, shelter, sanitation, energy, health services, and economic security. 9000 delegates, 8000 representatives of NGOs, and 4000 media representatives were at the summit. Due to the large number of participants, many were unable to attend all the scheduled events.

At the 1992 Earth Summit in Rio de Janeiro, the international community adopted Agenda 21, an unprecedented global plan of action for sustainable development. Ten years later, the Johannesburg summit presented an opportunity for today’s leaders to adopt concrete steps and identify quantifiable targets for better implementing Agenda 21. To dramatize the need for action, summit organizers estimated

that 290,000 tons of carbon dioxide were produced worldwide during the nine days of the world's largest ever environmental summit, underscoring the magnitude of one of the major problems faced at the meeting.

South Africa President Thabo Mbeki opened the summit with a call for governments to agree on a set of practical measures that will help humanity improve the lives of people everywhere. "The peoples of the world expect that this World Summit will live up to its promise of being a fitting culmination to a decade of hope, by adopting a practical program for the translation of the dream of sustainable development into reality and bringing into being a new global society that is caring and humane," said Mbeki.

"I don't think anyone really expected grand outcomes from the meeting, but rather anticipated pragmatic plans for achieving and progressing goals set at Rio and other conferences since," said LFEE Program Assistant Karen Gibson; "More impressive was the vast number of stakeholders from so many different organizations and business, meeting in parallel events throughout the summit to continue the dialogue and to form partnerships for advancing the goals of the summit agreements."

"Places like MIT can really take a leadership role [in this area], because it's certainly not going to come from the United Nations," said Bernhardt Trout, an assistant professor in the MIT Department of Chemical Engineering, in an interview with MIT's weekly paper, *Tech Talk*. MIT groups such as LFEE "really do have the potential to make a difference," said Trout. However, he was critical of the summit: "In academia we're used to presenting an argument, then asking what are the costs and what are the alternatives. At the summit, there were no such arguments. People just proclaimed things."

"However," said Wallenberg Fellow Karin Bäckstrand, "before condemning a summit like this as a wholesale failure, a reminder is that this is the only existing framework for global environmental bargains between governments, business, and civil society. The Johannesburg summit marks the end of the big theme conferences in the 1990s whose purpose was to raise the issues on the 'margin'—environment, population, women, and poverty—outside the traditional UN and intergovernmental agenda. Time is ripe now to move on and mainstream and integrate environment in the structures and institutions of world affairs."

WSSD Partnerships

The United Nations is calling for two kinds of partnerships to support implementation of the agreements made at the summit: "Type I" are the high-level political declaration

and a program of action for the further implementation of Agenda 21; "type II" is an innovation stemming from the WSSD process. The UN Secretariat for the UN World Summit on Sustainable Development launched the idea of "type II" implementation partnerships, namely international, voluntary, and self-organized cooperation agreements complementary to the governments' commitments. These are foreseen as being key practical mechanisms to implement the goals of Agenda 21 and the UN Millennium Declaration adopted in 2000 at the UN Millennium Summit and signed by 152 heads of state. The proposed partnerships indicate that there will be a change in focus in project funding away from single agency projects towards partnerships and strategic alliances. Partnerships can comprise national, state, and local governments, universities and research institutions, as well as other NGOs and stakeholder groups.

Key outcomes of the summit:

- > The summit reaffirmed sustainable development as a central element of the international agenda and gave new impetus to global action to fight poverty and protect the environment.
- > The understanding of sustainable development was broadened and strengthened as a result of the summit, particularly the important linkages between poverty, the environment, and the use of natural resources.
- > Governments agreed to, and reaffirmed, a wide range of concrete commitments and targets for action to achieve more effective implementation of sustainable development objectives.
- > Energy and sanitation issues were critical elements of the negotiations and outcomes to a greater degree than in previous international meetings on sustainable development.
- > Support for the establishment of a world solidarity fund for the eradication of poverty was a positive step forward.
- > Africa and the New Partnership for Africa's Development (NEPAD) were identified for special attention and support by the international community to better focus efforts to address the development needs of Africa.

The views of civil society were given prominence at the WSSD in recognition of the key role of civil society in implementing the outcomes and in promoting partnership initiatives. Over 8,000 civil society participants attended the summit, reinforced by parallel events which included major groups, such as NGOs, women, indigenous people, youth, farmers, trade unions, business leaders, the scientific and technological community, and local authorities as well as chief justices from various countries. The concept of partnerships between governments, business, and civil society

was given a large boost by the summit and the Plan of Implementation. Over 220 partnerships (with \$235 million in resources) were identified in advance of the summit, and around 60 partnerships were announced during the summit by a variety of countries.

For further details on the summit, go to the official website at <http://www.johannesburgsummit.org/>. 

AGS Youth Environmental Summit

The third Youth Environmental Summit on sustainability (YES) took place this year in Braunwald, Switzerland in the Swiss Alps, in repeat sessions on July 13-27 and August 17-31. YES is a product of and is sponsored by the Alliance for Global Sustainability. This is the third consecutive year YES has brought together graduate and undergraduate students from around the world to discuss their roles as the future leaders in sustainable development.

This summer, 69 students representing 38 nationalities and more than 25 academic disciplines came together to discuss and learn from each other about sustainable development. The participants were offered lectures, workshops, and field excursions, and were engaged frequently in interactive sessions and discussions headed by an international group of faculty and facilitators, including student alumni from the earlier YES summits.

Throughout this year's YES sessions, students and faculty reflected on the role and effects of "Agenda 21," a blueprint for action to achieve local and global sustainability that was adopted in June 1992 at the UN Conference on Environment and Development held in Rio de Janeiro. YES participants were also mindful of global preparations for the UN-sponsored World Summit on Sustainable Development (WSSD, also known as Rio + 10) held this summer in Johannesburg, South Africa (see story, p. 5).

The YES sessions were built around four modules focusing on the topics of society and ethics, climate and energy, food and water, and technology. Each of these modules was held over a two-day period beginning with lectures by the faculty and outside experts, followed by intensive group work and discussion among the participants. The program was designed to maximize creative thinking and sharing of different viewpoints of the participants.



In the session on "Energy and Sustainable Development," Dr. Walter Ernst of ETH-Zürich presented his "Personal Energy Calculator." The energy calculator is a tool that helps individuals estimate the total energy expended to produce the goods and services they consume. Household energy use, automobile fuel, and calculations of "life cycle" production and transportation energy use for goods such as food, clothing, and appliances are included. The big surprise for many participants is the enormous amount of energy consumed and carbon dioxide produced in the category of travel, particularly air travel. Said student participant Kiran Shinde (July session attendee), "The Personal Energy Calculator was an eye-opener and a revelation on my contribution towards problems, and it showed a way in which I as an individual can help achieve sustainability."

In the August session, the food and water module challenged participants to develop their own set of indicators of sustainability for a water and wastewater management system. Professor Greg Morrison of Chalmers University engaged students in lively small group discussions that simulated the challenging process of deliberating whether the final disposal treatment of sewage sludge should be to "burn or return" it—that is, incinerate (and recover energy from the sludge) or return it to the land as agricultural fertilizer.

In addition to plenary and small group discussions throughout the four modules, students worked together in small groups to develop final projects on each of the following themes as related to sustainable development:

- > Gender
- > The role of science
- > The role of technology
- > Globalization
- > Indigenous peoples
- > Local demonstration projects to engage citizens

concluded on back cover

October 2002, Volume 4, No. 3

Initiatives in Energy and the Environment is published by MIT's Laboratory For Energy and the Environment. For more information about the Lab, please see the Lab's website: <http://lfee.mit.edu/> or contact the Lab staff at:

Laboratory For Energy and the Environment
Massachusetts Institute of Technology
1 Amherst Street
Building E40-455
Cambridge, MA 02139
Tel.: 617-258-8891
Web: <http://lfee.mit.edu/>

To submit story ideas for this newsletter, contact:

Dr. Richard St. Clair, Editor
MIT, Building E40-392A
Cambridge, MA 02139
Tel.: 617-253-9871
email: stclair@mit.edu

or to be placed on the mailing list, contact:

Ms. Karen Gibson
MIT, Building E40-469
Cambridge, MA 02139
Tel.: 617-258-6368
email: kgibson@mit.edu

In these small working groups, students collaborated to craft suggested plans for responding to the challenges of Agenda 21 and sustainable development in the context of their particular topic. Prior to arriving in Braunwald, the participants researched the local and national implementation of one of these five topics for their home country. The cultural and academic diversity of collaborating groups was evident in the final presentations and draft "action plans" they prepared. The cumulative projects presented by participants in YES 2002 were rich both conceptually, including an unusual range of perspectives, and pragmatically, calling for fundamental changes in how one understands critical sustainability problems as well as for a range of specific actions to be undertaken at the global, national, local, and individual level. Taking advantage of the unique opportunity afforded by the WSSD, participants of both the July and August sessions of YES traveled to Johannesburg to be included in these significant deliberations.

All the details of this summer's YES, including faculty lectures and student presentations, will be posted on the web site at <http://www.globalsustainability.org/Education/YES2002>. 

Laboratory For Energy and the Environment
Massachusetts Institute of Technology
1 Amherst Street, Room E40-455
Cambridge, MA 02139

NON PROFIT ORG.
U.S. POSTAGE
PAID
Cambridge, MA
Permit No. 54016

