

# WUR Journal

Massachusetts Institute of Technology Undergraduate Research Journal

## MIT Science News In Review

- 3 Biology
- 3 Biomedical Engineering
- 3 Materials Science and Engineering
- 4 Astronomy
- 5 Nanotechnology
- 5 Management
- 6 Nuclear Engineering
- 6 Education

## World Science News In Review

- 7 Astronomy
- 7 Biology
- 8 Medicine

## Features

- 11 Hormone Replacement Therapy and Cardiac Risk: Should Menopausal Women Take Hormone Therapy? A Cardiac Risk Assessment of Hormone as Medication  
*Dejah Judelson*
- 17 Development Engineering: Are Engineers Making a Difference in the Developing World?  
*Monica Lewis*
- 20 Tuning the Sound Bytes: Digital Electronic Technology in Music  
*Sharon H. Chou*
- 28 Designer Babies: The Pros and Cons of Genetic Engineering  
*Yin Ren*

## UROP Summaries

- 33 Microfluidic device for rapid isolation of pure leukocyte populations  
*Melis Anahtar*
- 33 Adapting a typical handheld device for Global Positioning System (GPS) tracking within MIT  
*Ojonimi Ocholi*
- 33 Studies of how radiation-induced adaptation modulates toxicity and homologous recombination  
*Scot G. Frank*
- 34 Directing embryonic stem cell differentiation through RNA interference  
*Tiffany Chen*
- 34 Investigations of biochemical mechanisms of inflammation in endothelial cells as a result of advanced glycation end-products  
*Victoria Chang*
- 36 Integrated radiotherapy imaging system for image guided and gated therapy  
*Yin Ren*

## Reports

- 37 Municipal Solid Waste: Effect of State-Level Programs on Waste Reduction and Increased Recycling  
*Matthew V. Brooks*
- 41 Application of the Suspended Microchannel Resonator as a Biosensing Device to Profiling Signal Transduction in Receptor Tyrosine Kinases  
*Lili Peng*
- 45 Unexplained Pawn Pricing Behavior: A Study of Las Vegas Pawnshops  
*Jen-Jen Lao*
- 55 Synthesis and Photoluminescence Characterization of Polymeric Materials for Organic Light-Emitting Devices (OLEDs)  
*Nduka O. Enemchukwu*



**Massachusetts  
Institute of  
Technology**

**UNDERGRADUATE  
RESEARCH JOURNAL  
Volume 12, Spring 2005**

**Editors-in-Chief**

Cameron Sadegh  
Scot G. Frank  
Issel Anne L. Lim

**Editorial Board**

Melis Anahtar  
Daniel Barclay  
Sharon H. Chou  
Lakshmi Nambiar  
Emily D. Slutsky  
Arielle Tambini  
Sherry Xie  
Dawn Zhang  
Min Zhang

**Associate Editors**

Angelin Baskaran  
Nancy J. Benedetti  
Hyeyoun Chung  
James Hill  
Jessica Lam  
Peter J. Mulligan  
Tsung-Han Shen

**Contributors**

Melis Anahtar  
Matthew Brooks  
Victoria Chang  
Tiffany Chen  
Sharon H. Chou  
Nduka Enemchukwa  
Scot G. Frank  
Dejah Judelson  
Jen-Jen Lao  
Monica Lewis  
Ojonimi Ocholi  
Lili Peng  
Yin Ren

**Layout & Production**

Process Corp  
Tom Pixton

Cover: *Citrobacter rodentium* on MacConkey agar plates, examined by Issel Lim at the Schauer Laboratory in the Division of Comparative Medicine and Biological Engineering Department, MIT.  
(Photo: Jee-Yun Kim.)

**Massachusetts Institute of Technology  
77 Massachusetts Avenue  
Cambridge, MA 02139**

PSB 05-01-0027



Welcome to the Spring 2005 issue of the *MIT Undergraduate Research Journal*.

In this twelfth edition of *MURJ*, we showcase research in biomolecular detection using biosensors, synthetic compounds for organic light-emitting devices, municipal solid waste reduction, and the economics of Las Vegas pawn shops. In our UROP (Undergraduate Research Opportunities Program) Summaries section, we also highlight a number of student research projects currently underway. Finally, this term our feature articles present a number of social and scientific issues in fields ranging from genetic engineering to digital music technologies.

As in the past, our goal is to make visible some of the research undertaken by members of the MIT community. We hope that this interdisciplinary publication will serve as a forum for debate and discovery, through which our readers may access arguments relating to the intersection of scientific research and public policy.

Our profound gratitude goes to those who have helped us make this goal a reality again this year. We acknowledge Dean Larry Benedict and the MIT Fund, as well as the Undergraduate Association Finance Board, the UROP office, and Student Life Program office for their financial support of *MURJ*. Special thanks also go to the Departments of Materials Science and Engineering, Physics, Chemical Engineering, Aeronautics and Astronautics for their monetary contributions.

We are continually looking for dedicated staff members, and we encourage you to join our team of writers, editors, reviewers, and contributors. We hope this volume of *MURJ* will inspire you to join our journal by editing or by contributing your own work for the upcoming Fall 2005 issue. As a student-run, nonprofit journal that showcases the research of MIT undergraduate students, we do accept articles that have been published elsewhere. Submissions for the Fall issue are due on September 15, 2005.

To learn more about the *MIT Undergraduate Research Journal*, please email [murj-public@mit.edu](mailto:murj-public@mit.edu) or visit our website, <http://web.mit.edu/murj>.

Sincerely,

The Editors of *MURJ*