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Scientists celebrate 50 years since key RNA discovery

Rich recalls birth of a ‘founding technology’ for biotech

Profound doubts were the frequent response when MIT biophysicist Alexander Rich announced that two single-strand ribonucleic acid (RNA) molecules could spontaneously align themselves to form a double helix, just like those of their famous cousin, DNA. Many biologists thought it impossible; the rest considered it unlikely.

Today, 50 years later, it is abundantly clear that Rich—who made the discovery with David R. Davies while both were working at the National Institute of Mental Health—was onto something big. In fact, it generated a paradigm shift in the science of biology. The discovery changed how research is done at the molecular level and helped spawn what has become the global biotechnology revolution.

To mark the anniversary, Rich was invited to write an article about the work in the December issue of *The Scientist*. Likewise, Professor Alexander Varshavsky of Caltech wrote an article for *Cell* that appeared in the Dec. 29 issue.

In 1956 Rich and Davies announced in the *Journal of the American Chemical Society* that single strands of RNA can “hybridize,” joining together to form a double-stranded molecule. As a result of the discovery and the work that followed, scientists now routinely identify, isolate, manipulate and replace the genes in living things. Such work led to the Human Genome Project and is pushing science toward a fundamental understanding of how life works.

“This was a founding technology of the biotechnology business,” explained Rich, the William Sedgwick Thompson Professor of Biophysics. “The discovery was absolutely remarkable because no one, myself included, thought

such a thing was possible and could work.”

The seminal discovery of double-stranded RNA by Rich and Davies came only three years after James Watson and Francis Crick stunned the scientific world by describing DNA’s structure as a double helix. Watson and Crick not only described a structure but also suggested how inherited information—genetic information—is safely stored and can be passed from one generation to the next. It was a major milestone in the biosciences.

In 1953, Rich—working with famed chemist Linus Pauling at Caltech—was using X-ray crystallography to try to discover the structure of RNA, hoping to learn more about its role in life. One nagging question was whether RNA, like DNA, could exist in a double-stranded helical molecule.

The X-ray images weren’t helping much; they were fuzzy, inconclusive shadows of the gooey, glassy fibers that were pulled from a glob of RNA.

At Caltech, and later at the NIH, Rich and his colleagues “talked a lot about RNA,” he told a reporter from *Chemical and Engineering News* last month. “But nobody—including myself—suggested, ‘Why don’t you mix together Poly A and Poly U,’ the two differing strands of RNA. It wasn’t at all obvious that could work,” he said, in part because everyone felt an enzyme would be needed to stitch them together. “People had no idea that hybrid-

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PHOTO / DONNA COVENEY

Biophysicist Alexander Rich first mixed two differing strands of RNA in 1956 to discover the RNA double helix. He holds a model of tRNA (Transfer Ribonucleic acid).

Berners-Lee receives Draper Prize

Stephanie Schorow
News Office Correspondent

The man credited with inventing the World Wide Web, Timothy J. Berners-Lee, will receive the 2007 Charles Stark Draper Prize, the \$500,000 annual award



Tim Berners-Lee

and gold medalion considered “engineering’s Nobel Prize.” The Draper prize will be presented Feb. 20 in Washington, D.C., to Berners-Lee, who “imaginatively combined ideas to create the World Wide Web, an extraordinary innovation that is rapidly transforming the way people store, access, and share information around the globe,” according to the National Academy of Engineers (NAE), which established the Draper Prize in 1988 to honor engineers whose accomplishments have significantly benefited society.

Berners-Lee proposed his concept for the web in 1989 while at the European Organization for Nuclear Research (CERN). He launched it on the Internet in 1991 and continued to refine its design through 1993.

Now a senior researcher and holder of

the 3Com Founders Chair at MIT’s Computer Science and Artificial Intelligence Laboratory (CSAIL), Berners-Lee continues to guide the evolution of the web as founder and director of the World Wide Web Consortium (W3C), an open, international forum that develops standards for the Web.

“Berners-Lee demonstrated a high level of technical imagination in inventing this system to organize and display information on the Internet,” according to a NAE statement. His innovations include the Uniform Resource Identifier (URL), HyperText Markup Language (HTML) and HyperText Transfer Protocol (HTTP).

More remarkably, Berners-Lee chose to use scalable, public domain software in the web’s basic structure, which allows other to build inventions on its open architecture. “While others made millions off his invention, the soft-spoken programmer went on to found the World Wide Web Consortium,” Mark Frauenfelder wrote in an October 2004 article for *Technology Review*.

Berners-Lee, a native of England who attended Oxford University, has received numerous honors, including Finland’s first Millennium Technology Prize in 2004. He was knighted by Queen Elizabeth in 2004.

The author of 1997’s “Weaving the Web” with Mark Fischetti, Berners-Lee continues to develop new web technologies and recently helped found the Web

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MIT creates 3-D scaffold for growing stem cells

Stem cells grew, multiplied and differentiated into brain cells on a new three-dimensional scaffold of tiny protein fragments designed to be more like a living body than any other cell culture system.

An MIT engineer and Italian colleagues reported the invention—which may one



Shuguang Zhang

day replace the ubiquitous petri dish for growing cells—in the Dec. 27 issue of the *Public Library of Science (PLoS) ONE*. Shuguang Zhang, associate director of MIT’s Center for Biomedical Engineering, is a pioneer in coaxing tiny fragments of amino acids called self-assembling peptides to organize themselves into useful structures. Working with visiting graduate student Fabrizio Gelain from Milan, Zhang created a designer scaffold from a network of protein nanofibers, each 5,000 times thinner than a human hair and containing pores up to 20,000 times smaller than the eye of a needle.

The researchers were able to grow a

healthy colony of adult mouse stem cells on the three-dimensional scaffold without the drawbacks of two-dimensional systems.

In addition to helping researchers get a more accurate picture of how cells grow and behave in the body, the new synthetic structure can provide a more conducive microenvironment for tissue cell cultures and tissues used in regenerative medicine, such as skin grafts or neurons to replace brain cells lost to injury or disease.

The scaffold itself can be transplanted directly into the body with no ill effects.

“The time has come to move on from two-dimensional dishes to culture systems that better represent the natural context of cells in tissues and organs,” said Zhang, whose coauthors on the paper, in addition to Gelain, are from institutes and medical schools in Milan, Italy.

Life in two dimensions

Biomedical researchers have become increasingly aware of the limitations of growing living cells in coated, two-dimensional petri dishes and glass slides.

In the body, cells are attached to and supported by the cells, other structures and proteins around them. A cell’s normal environment is a complex network of tiny

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Media Lab musicians will ‘bathe’ the Music Library.

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William Orme-Johnson, inorganic biochemistry expert, dies at 68

Stephanie Schorow
News Office Correspondent

MIT Professor Emeritus of Chemistry William H. Orme-Johnson, heralded for his four decades of contributions in the field of inorganic biochemistry, died Jan. 1 after a long illness. He was 68.

"Bill (called O.J. by all) was a giant in the field of bioinorganic chemistry," said JoAnne Stubbe, Novartis Professor of Chemistry and professor of biology. "Contributions that his lab made in the mid '70s set the stage for many of the experiments carried out by the bioinorganic community today."

A native of El Paso, Tex., Orme-Johnson received his B.S. and Ph.D. from the University of Texas at Austin. He was a member of the biochemistry faculty at the University of Wisconsin at Madison for 15 years.

In 1980, Orme-Johnson joined the MIT faculty in the then-relatively new research area of biological chemistry; he was an MIT professor of chemistry for the next 18 years. Much lauded for his research, Orme-Johnson coauthored 69 papers in professional journals and held a patent on a scientific procedure.

"Orme-Johnson's was one of the first groups to apply rapid freeze quench methods with analysis using electron paramagnetic resonance spectroscopy to

study metal-based radicals and organic radical intermediates in many enzymatic reactions. His lab was the first to apply ESEEM (electron spin echo envelope modulation) spectroscopic methods to map out the active site of steroid cytochrome P450 systems using deuterated steroid substrates," Stubbe said. "He was one of the first to realize that complex bioinorganic cofactors were assembled by complex biosynthetic pathways."

In 2002, the Journal of Inorganic Biochemistry published a special issue dedicated to Orme-Johnson in recognition of his contributions. The articles were written by Orme-Johnson's former students and collaborators and included an appreciation written by Jack Peisach, professor in the Department of Physiology and Biophysics of the Albert Einstein College of Medicine.

"Bill was a wonderful colleague and great contributor to the field of bioinorganic chemistry. His physical studies of metalloproteins, nitrogenase in particular, were very important contributions. It was always inspiring to discuss science with Bill," said Stephen J. Lippard, Arthur Amos Noyes Professor of Chemistry, who co-taught bioinorganic chemistry classes with Orme-Johnson for many years.

For nine years, Orme-Johnson served as a housemaster at Bexley Hall, and he was active in the Institute on Religion in an Age of Science, a nondenominational,

independent society that works for a positive relationship between science and religion.

"Bill was an extraordinary scientist, a wonderful friend and colleague and a great housemaster to the students in Bexley Hall," said John M. Essigmann, MIT professor of toxicology and chemistry.

In 1992, Orme-Johnson taught an MIT Independent Activities Period class, "Applied Chili Chemistry," that was so enthusiastically received that a second section was formed. "He was widely enthusiastic about science and was a great people-person," Stubbe said. "Bill was a very strong supporter of young scientists and a champion of my cause, which I much appreciated. He had a great sense of humor, a great drive and broad knowledge about just about everything."

Orme-Johnson is survived by his wife, Carol, a former MIT assistant dean, of Cambridge; three daughters, Ruth Orme-Johnson and McGhee Orme-Johnson of Cambridge and Dolly Orme-Johnson of Philadelphia; and brother and sister-in-law David and Rhoda Orme-Johnson of Seagrave Beach, Fla.

A memorial service was held Jan. 6 at First Parish Unitarian Universalist in Arlington. Contributions may be made to the Alzheimer's Association Massachusetts Chapter, 311 Arsenal St., Watertown, MA 02472.

OBITUARIES

Edward A. Perkins Jr.

Edward A. Perkins Jr., 70, of Brookline, formerly of Somerville, died Jan. 2 at St. Joseph's Hospital in Nashua, N.H.

For 33 years, Perkins worked as a heat and ventilation mechanic at MIT, retiring in 1995.

From 1958 to 1963 he served in the Air Force. During that time he was assigned to the 40th Air Refueling Squadron. He was a member of the American Legion, the Union Local # 254 SEIU and the MIT Quarter Century Club. He enjoyed gardening, cooking, camping and listening to jazz music.

Perkins is survived by his wife of 49 years, Louise M. (Macdonald) Perkins; two sons, Edward A. Perkins III of Medford and David J. Perkins of Amesbury; three daughters, Julie Gangemi of Peabody, Pamela P. Little of Marlo, N.H., and Peggy Kilroy of Haverhill; and 11 grandchildren. He also leaves his lifelong friend, James Jordan of Hopkinton.

Burial will be in the New Hampshire Veteran's Cemetery in Boscawen, N.H.

Contributions may be made to Research for Pulmonary Fibrosis, c/o American Lung Association of New Hampshire, 9 Cedarwood Dr., Unit 12, Bedford, NH 03110.

Glenn F. Pippert

Glen F. Pippert, a former MIT Lincoln Laboratory site manager at the Kiernan Reentry Measurement Site in the Marshall Islands who served the Laboratory for 30 years, died Dec. 27, 2006, at his home in St. Augustine, Fla. He was 86.

Pippert was born in Howards Grove, Wis., on March 7, 1920, and was educated in the Howards Grove schools. He served in the United States Navy from 1937 to 1946 entering as a seaman and leaving as a commissioned officer. He saw action in both the Atlantic and Pacific arenas. Glen received his B.A., M.A. and Ph.D. degrees in physics from Boston University. Pippert joined MIT Lincoln Laboratory in 1954 and retired in 1985.

He served as head of the Optics Division from 1980 until his retirement.

Pippert is survived by his wife, Faye; daughters Vivian, Kelly and Christi; sons Richard, Robert, Tim and Ted, grandchildren and great-grandchildren. Also surviving Pippert are two sisters and two brothers in Wisconsin.

A memorial service will be held at 11 a.m. Saturday, March 10, 2007, at the Unitarian Church at 353 Great Rd. in Stow, Mass. Donations should be made to Good Shepherd Manor, P.O. Box 1029, Lucasville, OH 45648, in the name of Glen Pippert. Good Shepherd Manor is a home for mentally handicapped men.

William F. Saunders

William F. Saunders, of Marlborough, a retired employee of Lincoln Laboratory, died Nov. 30 at Youville Hospital and Rehab Center in Cambridge. He was 77.

Saunders retired from Lincoln Lab in 1994.

He is survived by his wife, Ellen L. (Kiernan) Saunders; three brothers, George B. Saunders Jr. of Richmond, Va., Jeremiah J. Saunders of Canton, Ga., and John L. Saunders of Wellesley; two sisters, Mary A. Chappelle of Natick and Winnie C. Golden of Hope Mills, N.C.; and many nieces and nephews.

Donations may be made to Our Danny Cancer Fund, P.O. Box 2795, Worcester, MA 01613.

Ice cream maker still sweet on MIT Toscanini's owner looks back on 25 years

Sasha Brown
News Office

Toscanini's ice cream shop owner Gus Rancatore has sold homemade frozen treats and fresh coffee to hundreds of dignitaries and celebrities during his 25 years in business, but some of his favorite customers have been the students, faculty and staff members of MIT.

Rancatore has long been part of the MIT community, a presence in both his Central Square store and in the smaller shop that filled the Student Center space now occupied by Anna's Taqueria. "MIT is full of perpetually interesting customers," said Rancatore, who also has semi-franchises in other Cambridge and Somerville locations.

Rancatore's close relationship with MIT has endured, despite the closing of his Toscanini's after six years in the Student Center. This year he released an Amazon.com short memoir co-written with Helen Epstein about his experiences over the years running his ice cream business. The book, "Ice Cream Man: 25 Years at Toscanini's," has been a top seller on Amazon since its release in December 2006. In it, he speaks of his affection for the "MIT nerds."

"Winding up down the street from MIT is ironic for a person who once tried to dry his football jersey over a campfire," Rancatore says in his book. "Shortly after we opened, I asked a customer what he was majoring in and he said, 'Aero astro.' I asked what he wanted to do and he answered levelly that he planned to be an astronaut. I think that was the beginning of my great affection for the subculture that is MIT."

As Rancatore says in his book, he never set out to serve what many consider to be the best ice cream in Boston. He came from a family of small business owners and fell into making ice cream after

a short stint at Steve's Ice Cream, which was a Boston and Cambridge institution in the 1970s.

Over the years, Toscanini's has had hundreds upon hundreds of flavors. At least 300 flavors cycle through annually, Rancatore said.

"We still have an ice cream machine that was built during a school holiday by two superconductor students offended by the noise and clunkiness of our equipment."

Gus Rancatore

Some local favorites include coffee ice cream and burnt caramel, but some of the more exotic flavors like Khulfee—an Indian flavor made of cardamom, almonds and pistachio—were born of customer suggestions and are also growing in popularity.

Many of the international flavors that have ended up in Rancatore's freezer started in the minds of MIT students, faculty and staff who suggested them. There was the "rocky road"-like flavor that was named "chocolate sluggo" for an MIT athletic coach. Originally the coach suggested two fruits, two candies and two nuts. "I took his idea and edited it down," Rancatore said with a laugh. "It would have been too much for one ice cream." Nevertheless, taking suggestions from MIT is a tradition, he said.

"We still have an ice cream machine that was built during a school holiday by two superconductor students offended by the noise and clunkiness of our equipment," Rancatore said in his memoir.

Although Rancatore has served ice cream to movie stars like Ben Affleck and Matt Damon, they do not impress him as much as some of those he has met because of the store's proximity to the Institute, he said. In 2003, when the Dalai Lama visited MIT, he came to Toscanini's and ordered a chocolate cone.

Despite leaving the beloved Student Center location, Rancatore can still walk the infinite corridor and see people he recognizes. Although he purports to be "bad with names," he remembers details about his customers—who they dated when they were at school, the finals they failed—with the precision of an old friend.

In his book, Rancatore likens himself to a "host of a B & B, or the director of a day-care center or, sometimes, a cop in a Star Wars bar." But at the end of the day, it is his customers and the relationships they form that most pleases him.

"I feel a bond with Paul Rusesabagina, the hotel manager who succeeded in protecting hundreds of Tutsis in Rwanda," Rancatore says in his book. "The world may be falling apart around him but he retains his civility and kindness. Have a cup of tea, he says, as soldiers are kicking down the doors. I hope you like it."

No Tech Talk next week

In honor of Martin Luther King Day, there will be no Tech Talk on Wednesday, Jan. 17, 2007. The next Tech Talk will be published on Jan. 24. For ongoing MIT news updates, please go to the News Office web site, web.mit.edu/newsoffice/.

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Tiddlywinks team plans return to former glory

Sasha Brown
News Office

The first thing the newly revived MIT Tiddlywinks Association wants people to know about the game of flicking small plastic discs into a cup is that it is not just a game of flicking small plastic discs into a cup.

Instead, according to the North American Tiddlywinks Association's web site, tiddlywinks is a "complex game of strategy and tactics, which involves a fascinating mixture of manual dexterity and intellectual activity as well."

Tiddlywinks started in the late 1800s in England. In 1955, it resurfaced at Cambridge University, where a group of undergraduates were looking for a game to represent their school. Tim Berners-Lee, father of the World Wide Web and recent recipient of the Draper Prize, played tiddlywinks.

The game is played with sets of small, thin discs, known as winks, which are lined up on a mat. Using the larger disc, called the squidger, players pop the smaller discs into flight by snapping one side of the smaller disc with the edge of the larger one.

There are two different versions. The first is the informal child's game in which the small discs are launched into a cup. The formal game is much more complicated with a series of rules and strategies.

Yan Wang, president of the MIT Tiddlywinks Association (MITTWA), said that adult players like to compare tiddlywinks to golf, "because it requires physical dexterity in making shots," and also to chess, "because it requires thinking in turns and

trying to maximize your strategy based on what your opponent could do." MITTWA is awaiting formal recognition from MIT's Association of Student Activities.

MIT has a bright tiddlywinks history, beginning when the game spread across the Atlantic from Britain during the 1960s. "Although tiddlywinks was formalized in England, the dominant team throughout the 1960s through 1980s was MIT," said Wang. "There was much intercollegiate play with Harvard and Cornell, in addition to international trips to visit Cambridge and Oxford."

In recent years, the game had fallen out of favor at MIT because not enough effort was devoted to bringing in new players, Wang explained.

MITTWA, which was reborn this past September thanks to Wang, is hoping to change that with an Independent Activities Period (IAP) "Introduction to Tiddlywinks" that starts on Jan. 10 and ends on Jan. 12, each evening from 4:30 to 6 p.m. in Room 4-145.

Members of the MITTWA who have been playing the game for years will teach the class. On Jan. 13 and 14 from 9 a.m. to 4 p.m., the MITTWA will be holding a tournament for novices and more advanced players alike in the Student Center (W20).

"The tournament will hopefully attract students, staff and faculty who are eager to learn about this piece of MIT history and take part in it. There will be significant attendance by alumni from across the country who all look forward to reviving this part of their student experience," Wang said.

For more information, please visit student.mit.edu/searchiap/iap-7491.html.



PHOTO / MARGO FOOTE

MIT defeated Southampton University in 1972 to win the World Championship. Team members, clockwise from upper left: David Lockwood; William Renke; James Martin; Craig Schweinhart; Timothy Schiller, captain; and J. Frank Christ displayed their victory squidgers.

Colbert announces retirement, will step down as graduate dean

Sasha Brown
News Office

Dean for Graduate Students Isaac Colbert has announced that he plans to retire in June 2007, concluding three decades of achievement in Institute administration. Since being appointed dean in 1999, Colbert has led efforts to develop MIT's graduate community



Isaac Colbert

through such innovative programs as the Graduate Student Life Grants. "Dean Colbert has developed and sustained a strong network of colleagues in a variety of offices around MIT who are committed to graduate students. He has passed his enthusiasm on to countless colleagues who did not realize they were part of the graduate commons," said MIT Chancellor Phillip Clay. "A champion for diversity and inclusion, he has also served as a bridge between faculty and students caught in difficult situations."

Colbert has served a number of different roles at MIT, starting as a consultant in human resources and eventually being named dean in 1999. "I thought MIT would chew me up and spit me out and now, 30 years later, they are still chewing," Colbert said last week in his expansive office overlooking Killian Court.

Though Colbert had not expected to spend so much of his life at the Institute, he knew soon after starting here that he had found a place where he belonged. "This was a place that fit my own style and characteristics as a risk taker and someone with a vision of things to do and how to get them done," Colbert said.

Colbert came to MIT in 1977 as a senior consultant and trainer in human resources, which was then called the Office of Personnel Development. Since then he has held a number of positions at MIT, including serving as the manager of faculty and staff information services from 1981 to 1985. From 1986 to 1988, he worked as the assistant to the vice president for financial operations, during which time he

reorganized the process by which strategic administrative computing systems were acquired.

Colbert, 60, earned his bachelor's degree in experimental psychology from the John Hopkins University in Baltimore, MD, where he grew up. He earned both his M.A. in experimental psychology, primate learning and behavior and his Ph.D. in experimental psychology, human learning and cognition from Brown University.

These psychology skills came in handy during his time in the Graduate Students Office, where he started as associate dean in 1988. Colbert said he found an office that was "drowning in paper. My immediate goal was to make it more student centered than paper centered."

One of the main complaints Colbert said he heard from graduate students was that there was no sense of community. After being named dean in 1999, Colbert committed to changing that. Over the years, he has implemented more social opportunity and campaigned for better on-campus housing for graduate students. Colbert also focused his attention on graduate school alumni and alumnae, whose potential contributions to the current graduate community were, he felt, being neglected.

With the help of the Alumni Office, Colbert called a meeting in Hong Kong with MIT graduate alumni to gauge their level of commitment to the concept of graduate student community. "I would have been happy if 10 people had shown up," he said. "But I walked into a conference room jammed with people." As a result of the meeting, graduate alumni have been more in touch with the Institute, the focus of more attention by the Institute, and strongly supportive of improving graduate life.

Over the years, the close relationships he has formed with faculty and students have become the most important part of his work, Colbert said. He is pleased with what he has accomplished at MIT. "Today the idea of graduate student life is not the oxymoron it was less than a decade ago," he said.

"Ike (Colbert) has set a standard of caring that we hope to find in our next dean of graduate students," Clay said.

After retiring in June, Colbert said he plans to focus on his start-up business ventures. "Life has various stages and I'm eager to see what the next one holds in store for me," he said. "It is time to hand my work off to another generation of leadership."

Admissions' 'matchmaking' is no magic formula

Sasha Brown
News Office

If Dean of Admissions Marilee Jones could make one point to high school seniors and their parents across the country, it would be this: Stress less.

"So many kids are sick because of the way we are raising them," Jones said in her office Dec. 13, just days after MIT completed its most competitive early admissions period to date. The number of applications for early admissions increased 13 percent over 2005, Jones said.

It is hard to turn away so many qualified students, Jones said. She comforts herself and the rest of the admissions staff with the knowledge that "someplace in the world there is a place for each of these children."

In the past few years, Jones' mission has been to spread this idea to parents and teenagers alike. Her book, "Less Stress, More Success: A New Approach to Guiding Your Teen Through College Admissions and Beyond" (American Academy of Pediatrics), co-authored with pediatrician Kenneth R. Ginsburg, was published in September.

"It is not a book about how to get into college," Jones emphasized. Instead, the book was written to help students and parents relax a little and to encourage them to look for the school that is right for them.

Jones has been in admissions at MIT for more than 25 years, has served as dean for eight and has seen and heard a lot from parents who are desperate to get their children into MIT. Expectant parents have even asked her how they can best prepare their future offspring to get into MIT.



Marilee Jones

There is no magic formula, Jones asserts. Admission is a complex process and nothing one can force, said Jones, who likens herself and her fellow admissions officers to "matchmakers" rather than gatekeepers.

The admissions officers at MIT specifically are looking for a unique match of academic excellence and something else—a spark, "the kind of student who builds a telescope just because they want to learn," Jones said. For those students for whom the Institute is the right match, "MIT is the mother ship calling the baby ships home," she said.

MIT certainly does demand greatness, she said, and students who can both do the work and do well here are a "self-selecting bunch." There is a good match for every

student out there, Jones said.

Jones said she worries that parents and many institutions across the country are too focused on the "doingness" of children—the test scores, the awards, the grades—at the expense of who they are as people. "We really want to focus on making a match between the institution and the spirit of the students, their 'being-ness,'" Jones said.

Not every student has to be the smartest or the most talented, Jones said. That pressure is producing children who are terrified to fail or who cannot handle it when they do, Jones said. "The culture is colluding to create a monoculture comprised of all leaders," Jones said. "But why can't each child just be who they were born to be? There is a school for everyone and the college admissions process is designed to find that match."

Jones has been spreading this message across the country at conferences and college admissions sessions. She said parents come to her in tears, thanking her for releasing them.

Jones, who sent her own daughter to college this year, said that in many ways she relates to the parents who come to talk to her. "It is a great act of courage to become a parent," she said. Jones said she hopes her book or her talks might help them a little. "We can't protect them from rejection," she said. "This is how we have to let them grow up."



PHOTO COURTESY / ALEXANDER RICH

Alexander Rich, front row, left, was a member of the RNA Tie Club, which had 20 members, one representing each amino acid. Rich is joined in this 1955 photo by biophysicist James Watson (front row, right), chemist Leslie Orgel (back row, right), and molecular biologist Francis Crick. Watson and Crick together discovered the double-helix structure of DNA in 1953.

RNA

Continued from Page 1

ization could occur by itself.”

Ultimately Rich did try mixing the two strands, resulting in the discovery of double-stranded RNA, but to this day, he said, he can't recall what prompted him to do so. "I've asked my colleagues and searched through my memory, and I don't actually know." But it did work, and that has made all the difference.

Micro-RNA research proves Rich's 1961 'suggestion'

In 1961 Rich made a prophetic suggestion that is just now coming to fruition.

In a book chapter published in 1961, Rich had proposed "an interesting possibility," that a complementary second strand of RNA "may be part of the control apparatus for turning on or off the synthesis of...proteins. One might imagine that one RNA strand is continually used in protein synthesis, while the other strand is used to control the rate" at which the "sense" strand works.

However, in the 1950s and 1960s the rudder of bio-

logical research "was set in one direction," generally away from enthusiasm for RNA research. Instead, DNA seemed more important and got most of the research attention.

At the time, however, a strong consensus had developed that only one RNA strand is made and that if a complementary strand is made at all, it's probably useless and gets rapidly disposed of.

Further, protein production was believed to be regulated by specialized proteins that govern the process.

So these small RNAs were ignored as research moved on, Rich said, because in science "there is a herd instinct. And the net effect is that some discoveries were not made." In fact, for many years RNA seemed unexciting, a relatively mundane DNA-copying molecule.

But ignoring RNA and its hidden talents was a mistake. Major RNA-based discoveries are now being made, and the impact is huge. Very recently biologists found that unusually small bits of RNA—micro-RNAs—do indeed exist in cells and represent an important and powerful mechanism for gene control using complementary pairing, as Rich had suggested.

Drela lauded for aircraft design

Mark Drela, the Terry J. Kohler Professor of Fluid Dynamics in the Department of Aeronautics and Astronautics, has been elected a fellow of the American Institute of Aeronautics and Astronautics (AIAA).

Drela was recognized for his "unique sustained contributions to a broad range of path-breaking aircraft designs (human powered and otherwise) and for development of widely used aircraft design software," according to the AIAA citation.

In 1988, Daedalus, a lightweight aircraft designed by Drela, set the world distance record for human-powered flight by traveling 72.4 miles from Crete to the Greek island of Santorini.

Jack Kerrebrock, professor emeritus of aeronautics and astronautics, noted in recommending Drela to the AIAA that his projects have the "beauty that stems from perfect functionality. The aerodynamic design tools that he developed have set a new standard of accuracy and usefulness for the aeronautical industry."

The distinction of fellow is bestowed by the AIAA and its board of directors on members who "have made notable and valuable contributions to the arts, sciences or technology thereof in aeronautics or astronautics."



PHOTO COURTESY / NASA

Drela has designed not only human-powered aircraft but also innovative flying machines for Boeing and NASA.

Podcasting enables 24-7 foreign language study

James Cain

Information Services & Technology

MIT's Foreign Languages and Literatures (FL&L) section is exploring ways to use podcasting and mobile media players such as iPods in foreign language teaching, thus enabling its students more frequent and nontraditional ways to hear and speak foreign languages.

Podcasting is a method of publishing audio and video files to the Internet, allowing users to receive files automatically.

Five professors in FL&L have now incorporated podcasting into their curricula; of these, Tong Chen, lecturer in Chinese; Kurt Fendt, research associate, German; and Margarita Ribas Groeger, director of Spanish language studies, have actively used podcasts this past fall.

Language Learning and Resource Center (LLARC) systems programmer Joshua Aresty has supported faculty and students in planning, creating and using podcasts this year.

Immersion

The common goal in the faculty podcasting projects is immersing students, as much as possible, in a foreign language during the course of a semester. Given the ubiquity of mobile devices (e.g., cell phones, MP3 players), students can now experience many types of media in non-traditional surroundings 24 hours a day. They can fit in a few minutes of language learning while riding the bus, walking the dog, or exercising in the gym. Podcasting, as a distribution medium, has changed the learning landscape, providing many more opportunities for immersion.

With the availability of free, authentically spoken material online and the ability to stitch together ("reodcast") various podcast sources into a coherent narrative, LLARC has found that it can create effective instructional tools for coursework.

Repodcasting

Tong Chen is a lecturer in Chinese at MIT. He is using podcasting in several courses to prepare students for in-class presentations and assignments. Listening at their convenience, they gain a deeper understanding of class material. As background for a class on the Chinese New Year, for example, students listened to a relevant episode in the course podcast from ChinesePod, a web site for learning Mandarin. This and other relevant material were shared using Google Reader.

In addition, Chen has recorded short paragraphs as podcasts. Students transcribe this audio material into Pinyin with tone marks. After they receive corrected transcriptions, students re-record the same material and send the new audio clips to Chen for another round of correction. Other listening assignments include filling in the blanks and true-false questions. Chen used a free service at blip.tv to upload course assignments. These, along with other feeds, were aggregated through Google Reader and cleaned up using Feedburner to create a podcast for the students.

Video to go

Kurt Fendt is research director in FL&L and Comparative Media Studies. His upper-level German Culture, Media, and Society class is taught entirely in German. This fall, the course focused on recent German short film productions and radio plays. Much of the content came from recent film festivals and radio art programs which, due to copyright restrictions, were made available as streaming media through the Metamedia framework and on iPods provided by LLARC.

Students further subscribed to at least five German podcasts from a variety of public radio and TV stations and other sources. The primary goal was to explore emerging forms of media convergence and how traditional German media institutions seek to incorporate user-created content into new forms of programming.

Podcasts by phone

For her Intermediate Spanish class, Lecturer Margarita Ribas Groeger wanted to give her students more opportunities to improve their fluency in speaking. Using student-created podcasts seemed like a good way to accomplish this task.

Looking for a simple way for students to create their own recordings, Groeger found an application, Gabcast, that lets the students post audio assignments to a class blog—on the WordPress site—by dialing a toll-free number and recording a message. This obviates the need to transform audio files to MP3s or upload them to the blog.

In addition to written assignments, Groeger asked students to describe orally a favorite location, comment on a film, or respond to a news article—in Spanish. These recorded messages were available for the rest of the class to listen to, opening up the possibility of online audio discussions. Other assignments, also using Gabcast, helped students with their pronunciation and intonation.

Even though all the students' recordings were accessible on the Gabcast site, having a blog allowed Groeger and her students to add written comments, pictures and other links to the audioposts.

At Groeger's request, LLARC is investigating tools that would allow for an oral threaded discussion, in the style of a regular online forum.

Engineering systems experts propose sharing flu vaccine costs

With the annual flu season upon us, vaccines remain the primary weapons for fighting influenza outbreaks. Yet, there frequently aren't enough doses to go around.

One major reason is that the contracts between governments and manufacturers do not provide vaccine makers with enough of a financial incentive to produce sufficient doses. Now, MIT researchers and colleagues have come up with a new model for contracts they hope will benefit both parties and prevent vaccine shortages.

The work is the subject of a paper that was recently awarded the 2006 Pierskalla

Best Paper Award in health care management science by the Institute for Operations Research and the Management Sciences (INFORMS). The paper, "Supply Chain Coordination and Influenza Vaccination," is under review for publication.

The authors are Professor David Simchi-Levi of MIT's Engineering Systems Division and Department of Civil and Environmental Engineering, who was recently named an INFORMS fellow; Hamed Mamani, a doctoral student at the MIT Operations Research Center; and Stephen E. Chick, associate professor of technology management at INSEAD, one of the

world's largest graduate business schools, with campuses in Singapore and France.

"Manufacturers and governments have conflicting objectives," said Simchi-Levi. "The manufacturers' objective is to reduce risk, maximize profit and control production so they are not stuck with an excess supply (of vaccine), while governments and health care organizations need to balance the vaccination program's cost with the public health benefit of not spreading the disease," he said.

A new type of contract is needed because manufacturing and distributing flu vaccines brings a unique set of prob-

lems. New flu vaccines must be made in a relatively short period, only six months. Public health officials must first identify which strains are most likely to cause sickness, and then the manufacturers must make, test and distribute the doses.

The usual annual vaccine protects against three strains of flu. Strains of flu undergo slight mutations to their genome, a phenomenon known as antigenic drift. Because of this, the immunity acquired for one year's vaccine may not combat the next year's strains of flu.

Thus, a major challenge is that the strains of flu virus change every year, so old vaccine inventory must be discarded and new vaccine made. Another challenge is that because of the biological nature of the production process, the amount of vaccine produced successfully varies greatly.

It is also difficult to determine the exact number of high-risk patients, such as children and the elderly, who will need vaccine. That is a disincentive for manufacturers to make enough doses to cover a worst-case scenario; they will lose money on any excess.

Simchi-Levi and colleagues have devised a model in which the government and manufacturer would share the costs associated with possible overproduction. That should provide manufacturers with an incentive to make more vaccines, even if they are not sure all the doses will be used.

"There also is an incentive for the government to pay for the extra doses," Simchi-Levi said. If influenza spreads, the "social costs," such as hospitalization and lost wages, range from \$1 million to \$6 million per 100,000 people in industrialized countries, according to the World Health Organization. Even with vaccines, influenza kills up to 500,000 people each year.

Simchi-Levi said the importance of the new model is that it suggests a way to mitigate the problem through financial risk-sharing.

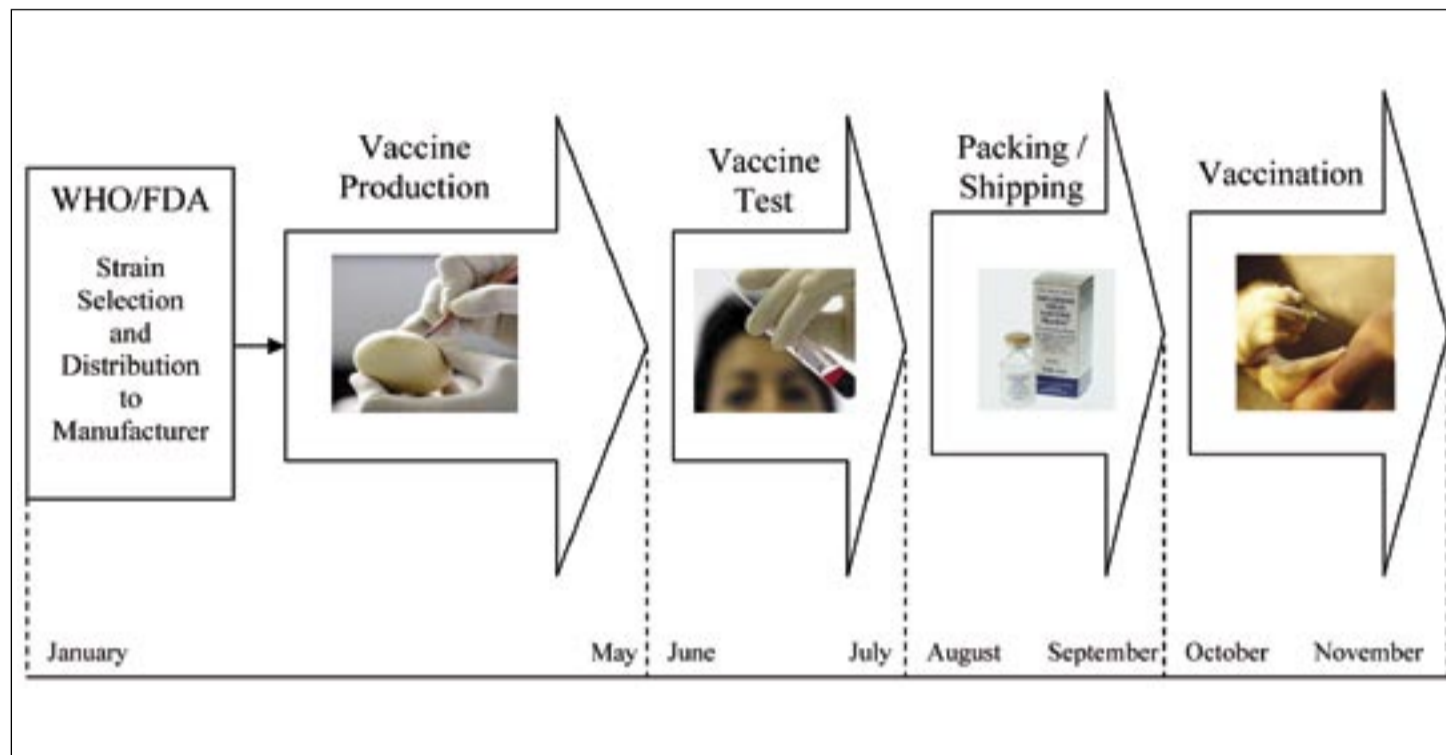


CHART COURTESY / DAVID SIMCHI-LEVI AND COLLEAGUES

Each year, the cycle to develop influenza vaccine begins anew.

Mark Bear named Picower director

Neuroscientist Mark F. Bear, an expert on how the brain changes in response to experience, has been appointed director of the Picower Institute for Learning and Memory, effective Jan. 1.

Bear, Picower Professor of Neuroscience since 2003 and a Howard Hughes Medical Institute investigator, succeeds founding director and Nobel laureate Susumu Tonegawa, who stepped down December 31 after 12 years as director.

"I am very pleased that Professor Bear will take on the leadership of the Picower Institute," said MIT Provost Rafael Reif. "His considerable abilities and accomplishments in neuroscience research and education make him a fitting choice for the job."



Mark Bear

Bear will serve a one-year term while MIT searches for a permanent director. Earl K. Miller, Picower Professor of Neuroscience, will continue as associate director.

Founded in 1994 and renamed in 2002 following a \$50 million gift from Jeffrey and Barbara Picower, the Picower Institute's researchers are focused on unraveling the mechanisms that drive learning and memory and understanding how these go awry in various diseases,

ranging from autism to schizophrenia.

"The Picower Institute was built around a common theme—how experience modifies the brain—and a cutting-edge approach that exploits the tools of molecular biology and genetics to dissect the contributions of specific molecules, synapses, neurons and circuits to behavior," Bear said.

"This experiment has been a smashing success. We now stand at the threshold of realizing a dream of generations of neuroscientists—to be able to selectively and reversibly inactivate (or activate) specific synapses, cells and circuits within a brain region and then assay the consequences by recording the activity of hundreds, if not thousands, of neurons."

Bear's own laboratory has made a key discovery about how synapses are weakened that promises to shed light on disorders ranging from mental retardation to Alzheimer's disease.

Prior to joining MIT, Bear served on the faculty of Brown University's School of Medicine for 17 years. After receiving his B.S. degree from Duke University, he earned a Ph.D. degree in neurobiology at Brown.



PHOTO / DONNA COVENY

Postdoc Joanna Klapacz, left, works with Kennedy-Longfellow School sixth grader Ellie Montgomery in a genetics lab in the Edgerton Center program.

Samson Lab hosts Cambridge middle-school students

Ruth Walker

News Office Correspondent

"So we eat DNA?" one of the kids asks in mid-munch.

What a discovery.

Revolted, maybe, to someone who probably first heard the term "DNA" from a TV murder mystery. Or maybe kind of cool.

"Yeah," the middle-schoolers' tour guide, Lisi Meira, explains. "And not just in bread. In meat and all kinds of things."

An important lesson has been learned, right there in

the conference room. And the young visitors haven't even finished their after-school snack of bread and butter and jam.

The boys and girls are part of Summerbridge, an after-school academic enrichment program offered by the Cambridge public schools. They're here on a field trip to learn something about the yeast that leavens bread and how zapping yeast cells with ultraviolet radiation affects their ability to reproduce.

Their guides at the Samson Lab in Building 56 will also

See **SUMMERBRIDGE**

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PHOTO / DONNA COVENEY

IAP rekindles 'Pleasures of Poetry'

Pleasures of Poetry, the seminar-style, daily IAP gathering to read and discuss memorable poems, began on Monday, January 8 with a lively exchange led by Stephen Tapscott, professor of literature, above, on works by the infinitely tormented Austrian poet Georg Trakl (1887-1914). Today (Jan. 10), Howard Eiland, lecturer in literature, will guide discussion on Walt Whitman's ebullient "Song of Myself."

Upcoming sessions will focus on poems by Allen Ginsberg, Gwendolyn Brooks, Geoffrey Chaucer, Ho Xuan Huong, and Derek Walcott; discussion leaders will include Ben Lanckton, Peter Perdue and Mary Fuller. Pleasures of Poetry is organized by the literature section; it meets each weekday, 1 to 2 p.m., in 14H-304, throughout IAP. A packet containing all of the poems in the series is available in the Literature Office. For a complete schedule, please go to web.mit.edu/lit/www/popiap.html.

SUMMERBRIDGE

Continued from Page 5

be trying to connect the kids' observations of the yeast cells to larger environmental health issues. Beyond that, the youngsters will get a chance to see that a lab is a pretty cool place to work—and that people get paid for what they do there.

The Summerbridge program is part of MIT's ongoing academic outreach work, bringing in students from public schools in Cambridge and other communities and specifically trying to encourage them to consider and prepare for careers in the sciences.

"I'd like to introduce you to the organism you're going to be working on," Meira, a research scientist in the Center for Environmental Health Sciences, says as she begins her presentation to the kids. She plucks a hair from her own head—ouch!—to give the students an idea how tiny yeast cells are. However slender a hair is, the diameter of the shaft is still big enough to hold several yeast cells laid side by side.

Still, yeast cells have more in common with human beings than might be expected, Meira tells the kids. They have DNA, and their DNA is found in nuclei, just as in humans.

Meira suggests the students read the list of ingredients on food items at the supermarket to spot terms like "yeast" in bread, or "bacteria" in yogurt. That's when one of the students has a moment of realization: I've been eating DNA!

Then the kids go down the hall for the actual experiment. It involves irradiating two kinds of yeast—a mutant yeast and a normal yeast as a control group—inside a device that looks very much like a micro-

wave oven. The more ultraviolet light the yeast gets, the worse it does at reproducing, the kids find. And the mutant yeast does particularly poorly.

The lab leaders make a connection between a basic cause—radiation—and an underlying predisposition—possibly weaker DNA in the mutant yeast. A comparison is made to people: Sunlight can give anyone a tan or a burn, but people who have an underlying predisposition to skin cancer will be most strongly affected.

Kathy Vandiver, director of MIT's Community Outreach and Education Core, explains in an interview that for today's public schools, the days when field trips could be justified on grounds of general "enrichment" are gone. "Field trips are much more tied to learning objectives," she says.

So she and her team work closely with the schools to make sure they're "providing a field trip experience that dovetails with the curriculum." Because teachers come along on the field trips, they benefit from exposure to ideas for new lesson plans. MIT's close cooperation with the Cambridge schools leads to programming "beautifully attuned to teacher need," Vandiver says.

New emphasis on science in state education requirements has left enrichment programs like Summerbridge hungrier for more science content, Vandiver adds, noting that some 2,000 kids a year come to MIT through the Edgerton Center.

"It's not just more homework" that the kids need, Vandiver says. They need to see careers in science as potentially engaging and fun. "We need to keep their interest up, as well as their exam scores."

STEM CELLS

Continued from Page 1

fibers, gaps and pores through which oxygen, hormones and nutrients are delivered and waste products filtered away. Cells move within their natural environments in response to chemical signals or other stimuli.

Researchers are aware that cells on flat surfaces have skewed metabolisms, gene expression and growing patterns. But the only choices have been glass labware and a product called Matrigel, a gelatinous protein mixture secreted by mouse tumor cells. While Matrigel resembles a complex extracellular environment, it also contains growth factors and unknown proteins that limit its desirability for experiments requiring precise conditions.

"Synthetic biopolymer microfiber scaffolds have been studied for more than 30 years to mimic a living 3-D microenvironment, but concerns exist about their degradation products and chemicals," the authors wrote in the paper.

Other synthetic polymer biomaterials are simply too big. Getting cells to grow on them is like forcing spiders to build webs on skyscraper girders. Zhang's nanofiber scaffold, around 1,000 times smaller than the existing systems, is much closer in size to the extracellular matrices that living cells manufacture themselves.

With the addition of defined amino acid

fragments called active motifs, the scaffold can be fashioned to coax stem cells to behave in certain desirable ways—such as differentiating into needed body tissues or migrating toward bone marrow and other natural destinations.

"What makes these designer scaffolds particularly interesting is that cells survive longer and differentiate better without additional soluble growth factors," Zhang said. "This suggests that extracellular microenvironments may play a more important role for cell survival and for carrying out cell functions than previously thought."

The active motif method could be readily adapted to studying cell-to-cell interaction, cell migrations, tumor and cancer cell interaction with normal cells, cell-based drug testing and other diverse applications.

"I believe that in the next 20 years all cell cultures will be in 3-D with the designer scaffolds, and most textbooks about cell biology will have to be revised when people obtain results from 3-D cell culture studies," Zhang said.

The researchers are now testing the designer scaffold with a variety of cells, including tooth, bone, heart, liver, cartilage, skin, pancreas, blood cells and artery-forming cells.

This work was supported by Olympus Corp. and the National Institutes of Health.

BERNERS-LEE

Continued from Page 1

Science Research Initiative (WSRI), a new long-term collaboration between MIT and the University of Southampton to generate research agendas to probe the web's scientific and social aspects.

He also continues to promote the issue of "net neutrality," recently commenting on his own blog (dig.csail.mit.edu/breadcrumbs/blog/4): "When I invented the Web, I didn't have to ask anyone's permission. Now, hundreds of millions of people are using it freely. I am worried that that is going end in the USA."

On his home page (www.w3.org/People/Berners-Lee/), Berners-Lee answers a "kid's" question on whether the web was

"a good idea or a bad one" at length: "I think the main thing to remember is that any really powerful thing can be used for good or evil. Dynamite can be used to build tunnels or to make missiles. Engines can be put in ambulances or tanks. Nuclear power can be used for bombs or for electrical power. So ... what is made of the Web is up to us."

The Draper Prize, awarded annually, was created at the request of the Charles Stark Draper Laboratory to honor the memory of "Doc" Draper, the "father of inertial navigation," and to increase public understanding of the contributions of engineering and technology. For more information, visit the NAE web site: www.nae.edu/awards.

Experiment.

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MISCELLANEOUS

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Media Lab plans 'sonic bath' for Lewis Music Library

Lynn Heinemann
Office of the Arts

The Lewis Music Library will be transformed into what Tod Machover, professor of media arts and sciences, calls a "sonic bath" next week as graduate students from the Media Laboratory join him in a collaboration with Music Library staff to present "Library Music," a group of interactive music installations that explore the relationships among space, movement, touch and sound.



Tod Machover

Musical stairs, a tactile rainfall and a sonorous, robotic chandelier are among the 10 "experiences" to be featured in "Library Music." Workshop sessions, open to members of the MIT community, will give participants an opportunity to discuss the concepts and technologies behind each installation with Machover and the student designers.

The workshops will take place January 16 to 18, culminating with a demonstration

on Friday, Jan. 19 from 2 to 5 p.m. in the Lewis Music Library (Room 14E-109).

No advance sign-up is required for the workshops, and participants are welcome at individual sessions. The final demonstration is open to the public.

According to Machover, the installations were developed individually but have been assembled so that they work nicely together in a progression through the library spaces, turning the library into a comprehensive, sound-filled experience. Some installations will be explored with use of headphones; some will be set up in separate, enclosed rooms, and some will be in the open spaces.

One of the installations, a robotic Music Chandelier, will be shown for the first time in "Library Music." Mike Fabio, graduate student in media arts and sciences, designed the laser-based system for the chandelier, which can be played by the public in its current iteration. Fabio's chandelier is being developed for Machover's opera, "Death and the Powers," which will premiere in Monte-Carlo, Monaco, in November 2008.

"A library to listen to should be fun!" said Machover, expressing delight that the Music Library, a place normally devoted to listening to and thinking about music in silence, will be transformed by willing staff members and Machover's group into an interactive, musical environment.

At the Jan. 19 demonstration, the student designers will explain the how,

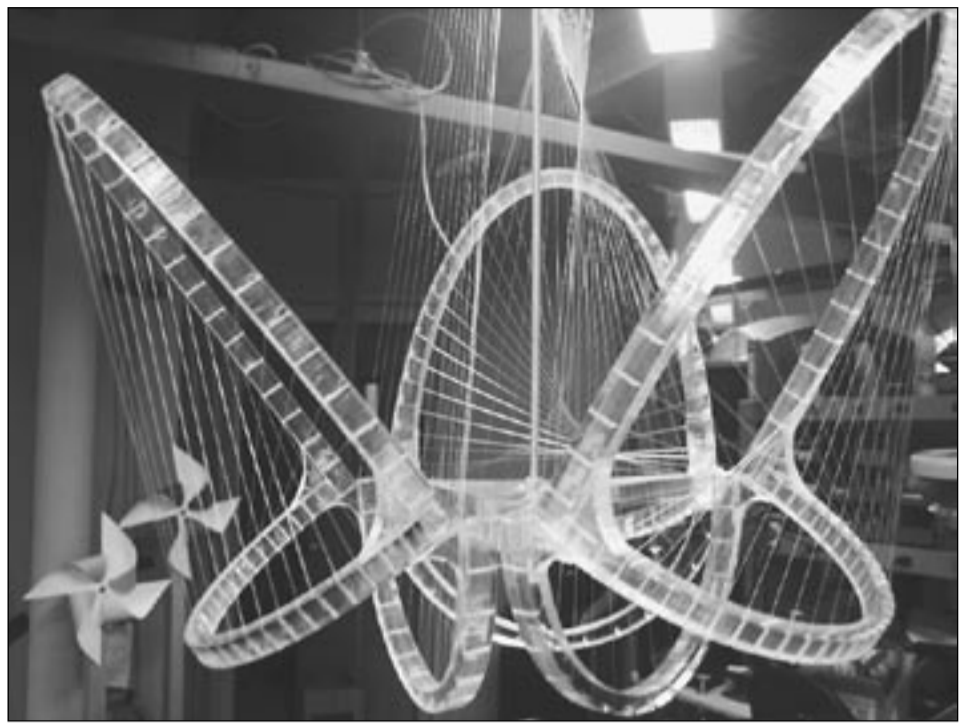


PHOTO COURTESY / TOD MACHOVER

Mike Fabio and Steve Pliam's sonotronic chandelier will help 'wash' the Music Library in sound. Instrumentalists can tickle or pluck the resonant 'strings.'

what and why of their installations and will be available to guide visitors through each experience. Also, Lewis Music Library staff will share some of its hidden treasures that relate to sound installations

and experimental music technology. Refreshments will be served.

For more information, contact Ariane Martins, x3-1613, e-mail: ariane@media.mit.edu.



PHOTO / DONNA COVENEY

Silver skates

Freshmen Darren Yin (left), Tracy Li (center) and Dina Kachintseva (right) are on the ice at Johnson Athletic Center, trying out a skating class on the first day of IAP.

Suburbia gets neo-New Deal

An international architecture journal has devoted an entire issue to the results of an MIT urban design studio—results that were further developed by a team of architects, planners, publishers and MIT faculty—addressing how to rescue suburbia after the coming economic crash. Led by Alexander D'Hooghe, assistant professor in MIT's Department of Architecture, the studio took as its premise the possibility that, because of rising debt, the decline of the dollar, burgeoning oil prices and the burst of the real estate bubble, the United States may soon experience an economic setback on a par with the Great Depression.

Such an event would surely impoverish the suburban lower middle-class that lives in what D'Hooghe refers to as "the Grey Goo"—the massive tarmac between our cities' centers and their leafier exurbs—and create "a new underclass eager to consume the rhetoric of fascist populism, thriving on anti-intellectualism, sectarianism, conquest abroad and repression at home."

If such a crisis were to occur, he asked his students, and if the government then stepped in to restart the economy artificially—as it did during FDR's New Deal—what buildings and infrastructures would represent the best investments? What should the nation do first to build a new suburban future?

The studio focused on New Jersey's Passaic County, an area emblematic of many American suburbs, as well as the

focus of Robert Smithson's seminal 1967 article, "Tour of the Monuments of Passaic, NJ." The result was a set of building proposals for the sprawl around New York that would, among other things, curb dependence on the car and offer additional alternative modes of organization.

The results are presented as an "official report" to the fictional Federal Organization for the Reactivation and Modernization of Mankind as a set of program briefs, compiled by D'Hooghe and his students, for federal construction projects to "employ, educate, house and emancipate the proletariat." The report includes proposals for neighborhood development, shopping centers, logistics complexes, housing and education.

The 97-page "white paper" appears in Volume, a bimonthly publishing project of Archis, the national architecture magazine of the Netherlands. Previous issues of Volume have dealt with such topics as the architecture of power, ubiquitous China and broadcasting architecture.

In addition to MIT's proposals for suburbia after the crash, "Volume #9—Crisis! What Crisis?" includes editorials by D'Hooghe and by Ole Bouman, editor in chief of Volume, along with essays by Yung Ho Chang, head of MIT's Department of Architecture, and by Mark Jarzombek, professor of the history of architecture at MIT and director of the department's program in the history, theory and criticism of architecture and art.

Talk on cheese gives a taste of 'terroir'

Robin H. Ray
News Office Correspondent

Plates of handcrafted cheeses, carefully arranged for identification purposes, were distributed to an eager group of auditors on Dec. 11, in connection with a talk given by Heather Paxson, lecturer in anthropology.

However, Paxson admonished the hungry spectators to hold off eating the five mouth-watering cheeses (four American and one French), as she would cue the moment to taste each cheese during her talk, "Reverse-Engineering Terroir: Crafting Nature-Culture in American Artisanal Cheese Production."

The French term "terroir," "famously untranslatable and, for most Americans, unpronounceable" as Paxson noted, means variously "rural," "regional," "of the earth or locality," or, as she translates it, "the taste of place." It comes from the world of viticulture and describes a specific cluster of vineyards, or even vines, whose wine takes its identity from a combination of natural parameters—grape and soil type, climate and topography—and less quantifiable cultural parameters. "In certain renditions," Paxson noted, terroir can refer also to "the soul of the cultivator, as well as the collective cultural know-how behind agricultural products associated with a place that help to constitute its tradition."

Paxson's interest was piqued by the recent importation of the term terroir and how it is being used by artisanal cheese makers in the United States. Her ethnographic fieldwork took her to the 2005 annual meeting of the American Cheese Society (ACS), where terroir was the subject of several papers and panels. It also took her into the field(s): She spent two weeks observing and working at Major Farm in Putney, Vt., makers of Vermont Shepherd, "one of America's most distinguished cheeses."

The small-scale producers, who are not so much reviving as inventing their cheese traditions, are anxious to distinguish themselves—legally if possible, but certainly culturally—from the large-scale dairy operations that churn out mass quantities of cheese. The latter are seeking variously to squash, industrialize and co-opt artisanal cheese making—lobbying Congress to outlaw cheese made with unpasteurized milk, for example, and some of the small producers hope that by developing awareness of cheese terroir and con-

sequent labeling constraints, they stand a better chance of surviving and even flourishing. It was one of the participants at the ACS conference who suggested that the artisanal cheese producers are in the process of "reverse-engineering" terroir: "They think backwards from European examples in order to fashion innovative models of terroir, and of cheese, suitable to the nature-culture demands of distinctly American landscapes," said Paxson.

Some approaches that cheesewrights have taken toward terroir take the form of an "ahistorical materialism" on the "nature" end of the spectrum (cue Cheese 1: Humboldt Fog, an aged goat cheese made by Cypress Grove Chèvre of Humboldt County, Calif., and Cheese 2: Ada's Honor, an award-winning mold-ripened chèvre made by Carlisle Farmstead in Massachusetts). The California cheesemakers claim that the particular material conditions on their farms—climate, fodder and so forth—create cheeses that "could not be replicated elsewhere."

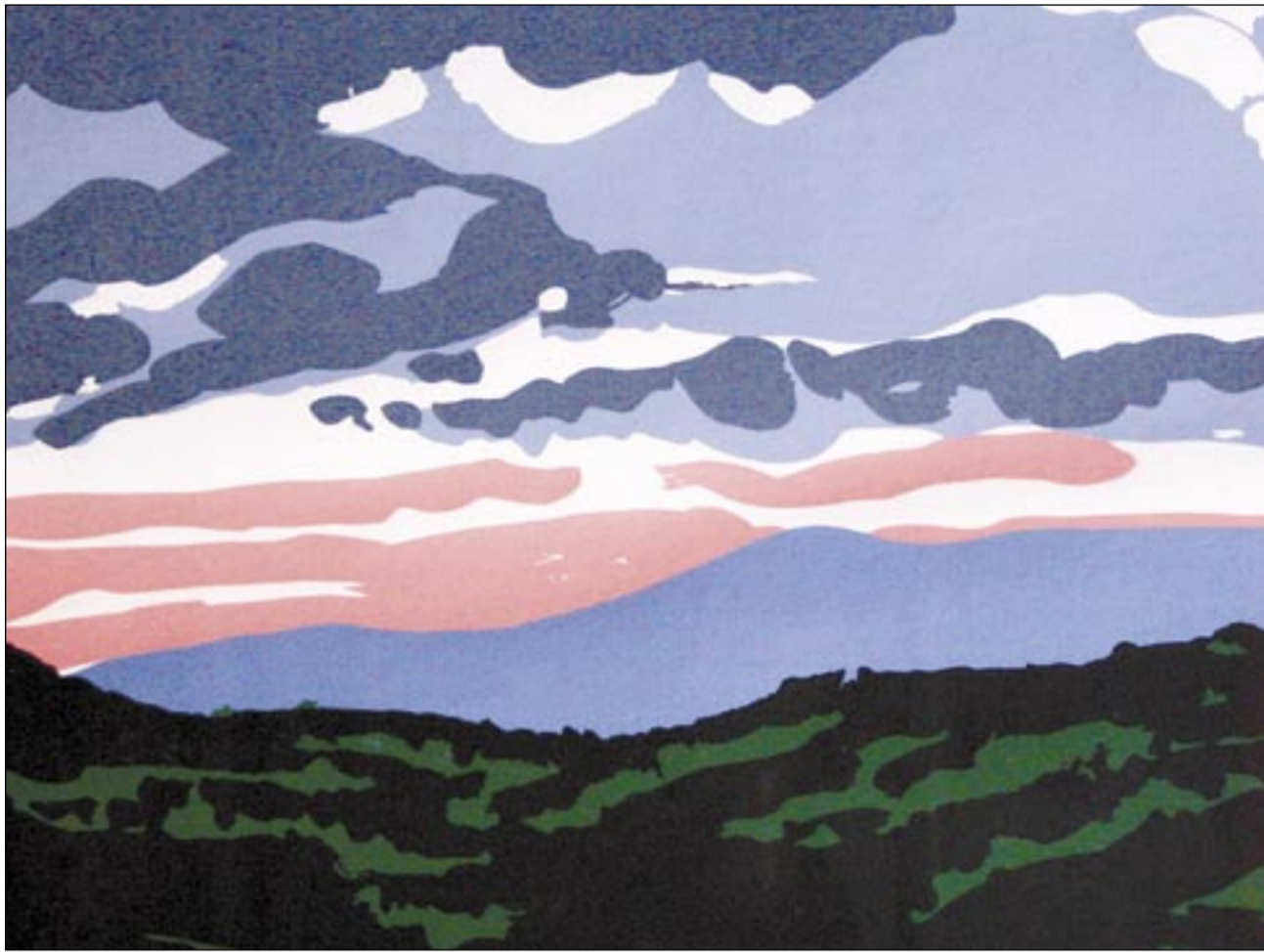
Also closer to the "nature" end of the spectrum is the notion of terroir as "New World innovation." This approach is exemplified by David Major of Vermont Shepherd, who found in the Basque country a close geographic analog to his northern New England dairy farm, and chose his materials and methods accordingly; and by Mike Gingrich at Uplands Dairy in Wisconsin, who modeled his "best of show" Pleasant Ridge Reserve (Cheese 3) on the French Beaufort (Cheese 4), and in many people's opinion bested it.

Nearer to the "cultural" side of the nature-culture spectrum, one finds notions of terroir with more political and overtly moral content, as part of the "slow-food" movement and as a facet of environmental awareness. Here we find the Kehlers, two brothers and their wives who make a variety of cheeses (including Cheese 5, Constant Bliss) at Jasper Hill Farm in Vermont's Northern Kingdom. According to Paxson, they "view cheesemaking as [their] personal response to globalization," and they are trying to find ways to make dairying economically and environmentally sustainable in that struggling region.

Paxson added, "It's interesting just how relevant MIT is turning out to be in my research...[M]any artisan cheesemakers speak of what they're doing in the language of engineering; they see themselves as, in a sense, hacking the system of food production in this country. Teaching at MIT has given me an appreciation for this."



Heather Paxson



Welliver's travels shown

Seven works by Neil Welliver are on view at the Dean's Gallery (Room E52-466) through Monday, Jan. 15.

The landscapes, all serigraphs, evoke the mystery and majesty of the Maine coast and woods, which Welliver, who died in 2005 at age 75, painted for over four decades.

Welliver worked from open-air sketches, toting some 75 pounds of art supplies deep into the woods in search of what he called "places of power," according to an obituary in the Boston Globe.

Welliver described these places as "often nondescript corners, small things," yet they yielded large canvases, sometimes as large as 8 by 10 feet. Critic Robert Hughes of Time magazine called Welliver's works "among the strongest images in modern American art."

In his paintings, Welliver persisted in depicting the rushing water and rocky hills of his chosen home even as tragedy stalked his personal life. The works in the Dean's Gallery were completed in the 1970s, the decade in which Welliver's wife and daughter died and his home and studio were destroyed.

Welliver's works hang in major museums, including the Hirshhorn Museum and Sculpture Garden in Washington, DC; the Boston Museum of Fine Arts, and the Metropolitan Museum and the Museum of Modern Art, in New York.

Welliver graduated from the Philadelphia College of Art and received the M.F.A. degree from Yale University. Welliver taught at Yale and at the University of Pennsylvania Graduate School of Fine Art.

PHOTO / LIST VISUAL ARTS CENTER

Detail (left), Neil Welliver, 'Landscape,' 1973, serigraph. Gift of the Albert and Vera List Collection.

MIT international students advise fellow voyagers

Sarah Foote

MIT Sloan School of Management

MIT Sloan students from around the world offer the Institute community their thoughts on what a visitor may find in their country of origin, and in return, what they learned about living, working and studying in the United States.

Lydur Thor Thorgeirsson, M.B.A. '07, a native of Iceland, has been in the United States for just over a year.

Thorgeirsson's advice to someone who is going to work or live in Iceland:

Don't expect much formality in meetings, adherence to hierarchy or emphasis on processes. Everyone is focusing on the end results and is willing to try new methods and listen to your ideas. You'll work hard, but on the flip side, you'll have several weeks of vacation.

Advice to someone who is going to school or to study for a period of time in Iceland:

It will be fairly inexpensive because of government subsidies. Expect standard lectures across the board. Presentations and case classes are few and far between. The bulk of Icelandic students like to emphasize extracurricular activities and then cram before finals.

Three necessary visits or experiences in Iceland:

The Blue Lagoon. A geothermal power plant uses ultrahot seawater from the bowels of the earth for production of hot water and electricity. The pool of excess water is so rich in minerals it has become one of Iceland's biggest tourist attractions.

Downtown Reykjavik on a weekend night. The nightlife in Reykjavik is ranked among the best in the world and celebrities frequently visit the island because of it.

Hvannadalshnjukur is Iceland's highest peak, located on the largest glacier in Europe (2,111 meters/6,900 feet above sea level). Walking the glacier takes about six hours. Get a good guide and arrive in spring before the snow melts to avoid big crevasses.

Thorgeirsson wished someone had given this advice about living in the United States:

Expect to write and mail lots and lots of checks (everything is done online in Iceland). The only eatable cheese in the continental United States is called Monterey Jack Mild from Farm Valley and can only be found in one store in the Cambridge area. Get a car quickly or sign a Zipcar agreement so that you can go to Costco. Also beware that childcare in the United States is prohibitively expensive.

Wished-for advice about studying/attending school in the United States:

Jump right in and participate in class.



Reykjavik, Iceland.

That's the best way you'll build up confidence in speaking the language. Try to meet as many people as possible and start building friendships right away.

Wished-for advice about working in the United States:

You'll quickly realize that this is the country where Dilbert is drawn. That being said, you'll also quickly realize why U.S. corporations are so successful globally. Finally, take John Akula's law class to prepare you for work in the United States. Wherever you're from, you'll be amazed to learn about the U.S. legal system and how that will dramatically affect some of the decisions you might face.

Tsahala David, Sloan Fellow '07, of Israel, has lived in the United States for six months.

Advice to a visitor to Israel: Get used to a very high tempo in a very spontaneous environment. Subtleties don't work—be direct about what you want or object to. Expect people to be very emotional about things, and that covers the entire array, from anger to happiness.

Advice to a student planning to spend a period of time in Israel:

Expect little to no privacy. Israelis are very warm people and specifically love Americans. You will find your schoolmates will go out of their way to help you and be shameless about asking you questions. If someone invites you to dinner at his house after knowing you for two hours don't be surprised. It is genuine friendship. People bond very fast very tightly.

Three necessary sights or experiences in Israel:

Jerusalem—the capital city of Israel. A place with a history of thousands of years.

The center for three religions: Christianity, Islam and Judaism. A fascinating walk back in time to another era.

The Dead Sea—a natural phenomena considered one of the eight wonders of the world. The minerals of the sea have therapeutic powers due to unique and high concentration of minerals in the water. The sensation of bathing in the salty water is unequalled.

Tel Aviv—the city of beaches, bikinis, culture, night life and fun!

Wished-for advice about living in the United States:

That life here is far easier and more comfortable than in Israel. That service people here are far less efficient than in Israel, so be patient and plan a backup because whatever they promised is not going to happen.

Wished-for advice about studying or attending school in the United States:

That when students go out for beers you don't actually have to drink beer. As a person who dislikes alcohol, I kind of avoided the beer meetings, assuming everyone gets a bit drunk and makes jokes I probably can't understand. Apparently that is not the case. And going out for beers here is the equivalent to going out for a coffee in Israel.

Wished-for advice about working in the United States:

How do you land the job of your dreams?

Aparna Chennapragada, system design and management fellow '06, is a native of Hyderabad, South India, who has lived in the United States for the past nine years.

Advice on going to work or to live

in India:

India is a wonderful country, caught between its promising potential and staggering poverty. Even its chaos is colorful (to my biased eyes, admittedly).

Make a conscious effort to remove the western lens and absorb the uniqueness of the place instead of attempting to map it to familiar categories.

The size of the population can be shocking to people who have lived in far less populous countries, but it can be quite an interesting experience to find yourself in a sea of humanity.

On a practical note, if you have low immunity, watch what you eat and drink!

Advice on studying in India:

Work with people across departments and fields. Step outside the bubble of the school or university. Learn a new language (or two).

Three necessary visits or experiences in India:

Ancient temples in South India (architectural marvels with rich history).

Tour around Hyderabad (my hometown with its friendly people and laid-back environment).

The Taj Mahal (although I myself haven't seen it yet).

Wished-for advice about living in the United States:

I wish I were told to travel more and explore America beyond its touristy cities and iconic landmarks.

Wished-for advice about studying/attending school in the United States:

Get involved with the community, not only within the school but the extended community in the town/city.



Kapaleeshwarar Temple in Mylapore, Chennai, India.