

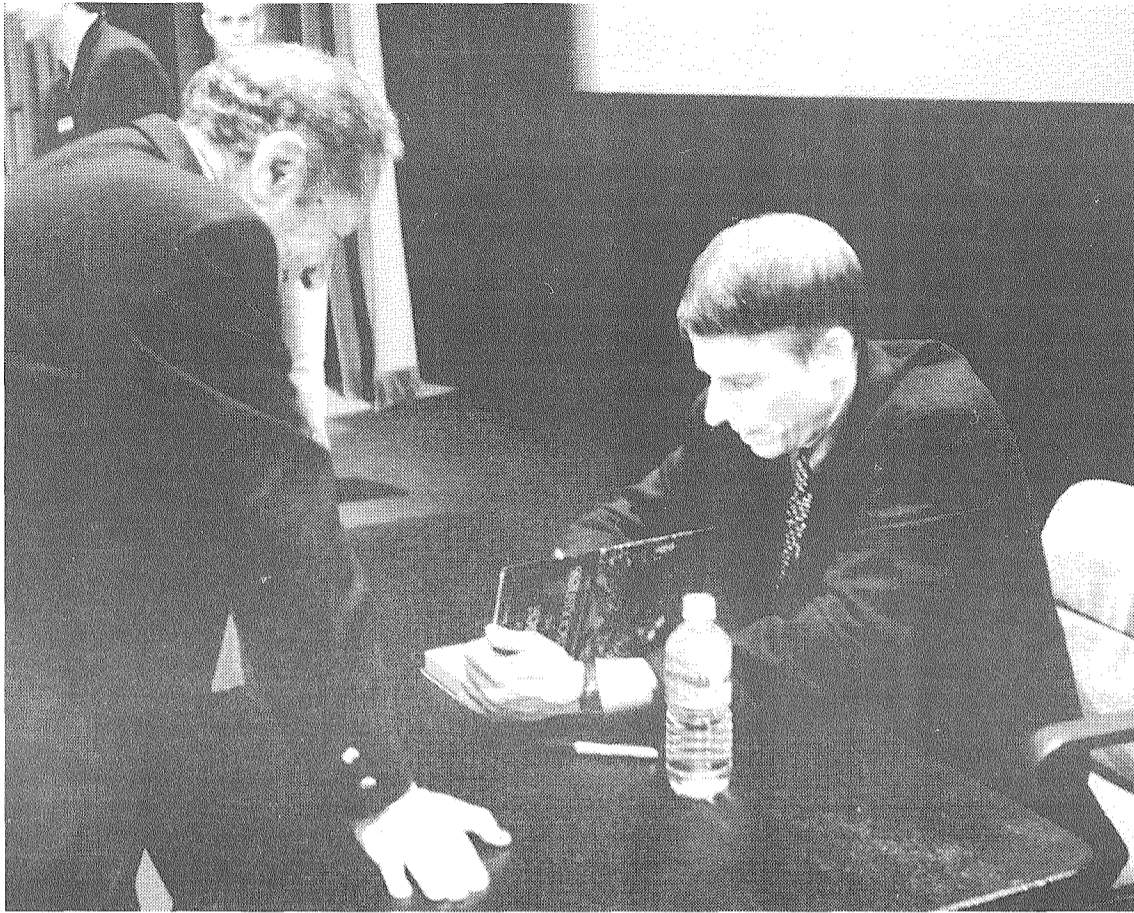


# The California Tech

VOLUME CVI, NUMBER 8

PASADENA, CALIFORNIA

NOVEMBER 15, 2004



A. Green/The California Tech

Professor Christof Koch signs a copy of his book after Wednesday's Watson lecture on understanding the way that consciousness works. Koch had been collaborating on the study with Francis Crick.

## Study of Neurons Holds the Key To Understanding Consciousness

By ZHIYUN GUAN

Science is changing our understanding of human consciousness, Dr. Christof Koch told an attentive audience in Beckman Auditorium on Wednesday night. Koch, a professor of cognitive and behavioral biology, gave the presentation as part of the esteemed Watson lecture series. The lecture, entitled "A Quest for Consciousness: A Neurobiological Approach", focused on findings and theories which Koch discussed in his recent book, *The Quest for Consciousness*.

The "mind-body problem" of the nature of consciousness, Dr. Koch said, has always fascinated him. Humorously using the example of a toothache he experienced 12 years ago, Koch posed

the question: "Why does physical activity give rise to feelings and sensation?" In search of an answer, he collaborated with the late Dr. Francis Crick for 16 years on a research program that examined the relationship between consciousness and the brain.

One focus of this research was the Neuronal Correlates of Consciousness, or NCC. Each NCC, Koch explained, consisted of the minimal neuronal mechanisms needed for any one conscious perception. For each specific conscious sensation, there must be an underlying NCC, he hypothesized.

Furthermore, consciousness appears to be based on activity in the brain and "in order to understand anything about the brain, you have to understand nerve

cells," Koch said. These neurons, he explained, form coalitions that compete for attention, thus dictating the content of a person's consciousness. Comparing this competition to an election, Koch explained that there can only be one winner, or at most two or three and therefore "at any given time, you're conscious of very few things."

Attention to one group of neurons can also suppress signals from other neurons, creating bias. Due to constant changes in neuronal signals, it is difficult to keep attention on any one thing. "A key characteristic of conscious-

*Continued on Page 8, Column 1*

## Traditions Preserved Through Renovations

By JON MALMAUD

The undergraduate housing system has always been of the most unique features of Caltech. From Blacker's epic Star Wars murals to Fleming's booming cannon, the seventy-year old South Houses have been a Caltech landmark. Starting next summer, however, the south houses will be closed for renovations and will emerge in 2006 as modern, fully-featured residences which hopefully will maintain all the personality of the current houses.

Why spend a fifth of a billion dollars renovating houses which have stood for nearly a century? According to Tom Mannion, Assistant Vice-president of Campus Life and frequent holder of information barbecues, "we're under a desperate move to basically get them up to proper living conditions. We will try to get them back into the original stature and grandeur they were originally built in." All south house residences remember the set of false fire alarms several weeks ago. "That's not the worst of it", Tom continues.

Besides for fixing basic safety concerns, the renovations will also add many exciting new features. Courtyards will be made water-tight so they can be flooded in high-style. Wiring for outdoor sound-systems will likely be built in so high-fidelity music can be blasted throughout the courtyards.

No more phone reception problems, either. Caltech is looking to negotiate a deal with a cell phone vendor to guarantee maximum reception in the houses. Even Mannion is frustrated by the current cell-phone woes. "I try talking to students on cell phones and it's fuzzy, like talking to Mars. In fact, I'm not convinced that we can't talk to Mars more effectively. The

hope is to give every student a cell-phone when we're done with this." Of course, the new houses will be fully wi-fi enabled while maintaining wire-bound ethernet. Central air-conditioning will be added as well.

While some construction-minded Moles are sure to be disappointed, students will not be allowed to live in the south houses while they are being renovated. Kim Pependorf, IHC chairman, explains: "There is room for 287 students in the south house and 192 of those students are going to be in modular units on the field north of Avery." All the math majors out there probably realize that this leaves about a hundred students to be placed elsewhere. Braun, formerly a grad student house, will be split into doubles and given to undergrads. Another resident will be added to each of the existing rooms in Chester. Six north house rooms will be made into triples. Hopefully things won't get too crowded.

There's no question, says Kim, that "things will be really, really different" in the module houses. Sixteen of the portables will be for undergrads with two for RA residences and two for a "common area." These common-area modules will replace the lofty lounges the houses now enjoy but there should still be room for Rickett's satellite TV and Blacker's heart-warming fireplace. The individual living quarters will be of comparable size to what they currently are but will feature microwave/refrigerator units and air conditioning.

These small perks won't perk up everyone. Philip Wong, president of Blacker House, admits that "a lot of upperclassmen are certainly disappointed. I would be extremely disappointed if in my

*Continued on Page 2, Column 3*

## LA County Traversed By Voting Watchdogs

By SONIA TIKOO

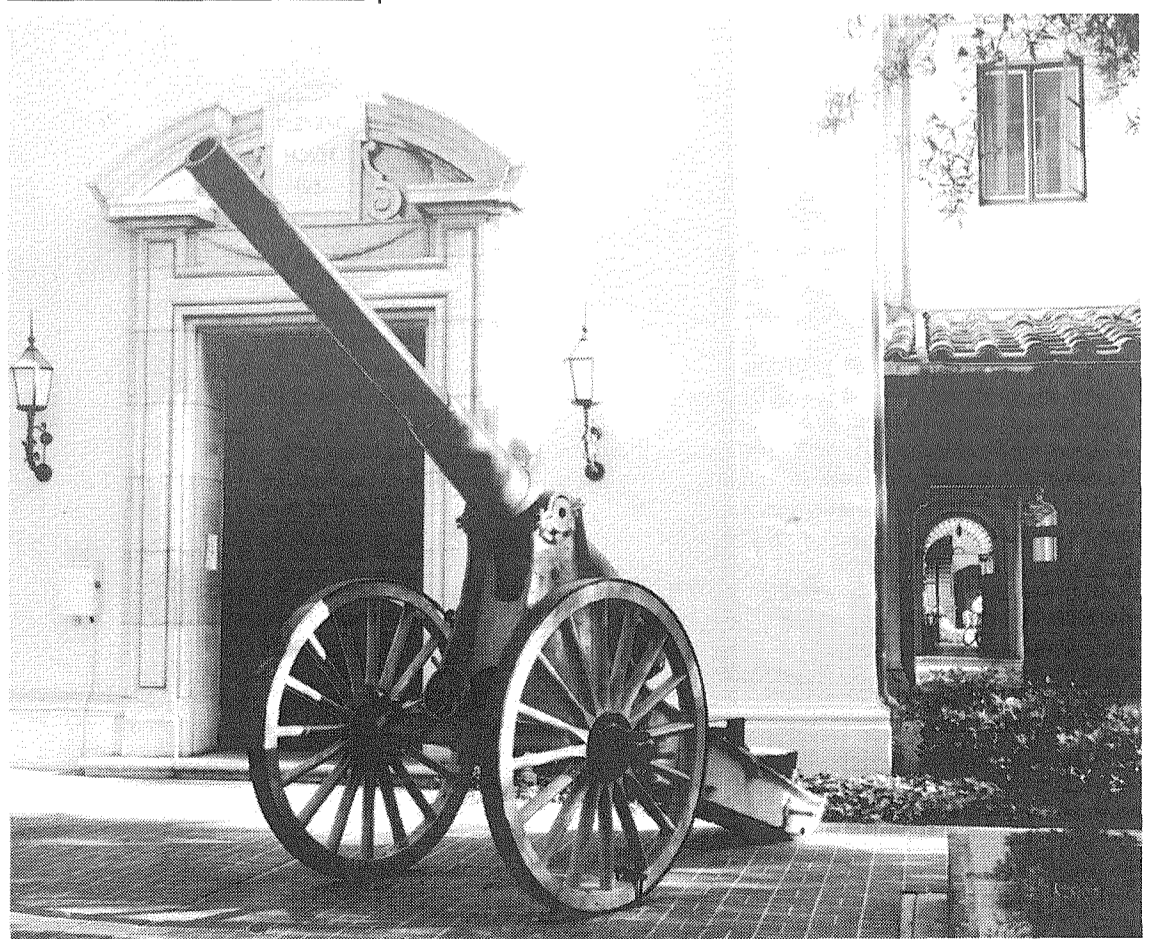
The United States presidential election might be over, but the scrutiny of its ways is just beginning. For the next four years, a combined task force of 13 professors and numerous students hailing from Caltech and MIT, with expertise ranging from political science to computing, will be working to analyze 2004 election data, searching for ways to improve election techniques and assure that every vote gets counted fairly.

The Caltech/MIT Voting Technology Project was placed into action in the year 2000 by university presidents David Baltimore and Charles Vest of the two involved universities in December after the Florida ballot fiasco. The goals of the project are simplistic in nature and involve a critique of the

reliability and uniformity of voting systems nationwide, establish uniform qualities and guidelines for beneficial performance of voting systems and finally to use data garnered through the project to formulate proposals and publish formal reports regarding methods of election improvement as well as procedural trends in each presidential election, their benefits and their liabilities.

Caltech political science professor, election expert and Voting Technology Project analyst Dr. R. Michael Alvarez provided further insight into the history and the current work of the project. "The unique combination of faculty and research skills that we have at Caltech and MIT can uniquely position both campuses to solve some of the problems that rose

*Continued on Page 8, Column 3*



The California Tech Archives

Administrators hope to maintain traditional south house symbols such as the Fleming cannon during the renovations that are scheduled to begin this summer.

# Photonics Research Funded by DARPA

By ROBERT TINDOL

PASADENA, Calif.-The Defense Advanced Research Projects Agency (DARPA) has awarded an \$8 million, four-year, basic-research program grant to the California Institute of Technology to initiate research in photonics technologies.

The technical focus of the effort will be on optofluidics, an



Courtesy of its.caltech.edu

Professor Kerry Vahala

exciting new research area based on the use of microfluidic devices to control optical processes and which is expected to result in a new generation of small-scale, highly adaptable and innovative optical devices.

To conduct the research, Caltech is establishing a new center called the Center for Optofluidic Integration. The center will spearhead efforts directed toward a new class of adaptive optical devices for numerous applications in sensing, switching and communications.

According to founding director Demetri Psaltis, the DARPA-funded center is ideally located at Caltech because the Institute has a longstanding commitment to interdisciplinary research, faculty interaction and the creation of new technologies and avenues of knowledge. The center will also draw on the efforts of researchers at other institutions, including Harvard University and UC San Diego.

"The basic idea of the center is to build optical devices for imaging, fiber optics, communications and other applications and to transcend the limitations of optical devices made out of traditional materials like glass," explains Psaltis, who is the Myers Professor of Electrical Engineering and an expert in advanced optical devices. "A glass lens, for example, is relatively unchangeable optically. Our idea is to use fluids as a means of modifying optics."

This can be accomplished, Psaltis says, by taking advantage of recent advances at Caltech, Harvard and UC San Diego in microfluidics, soft lithography and nanophotonics. The fusion of these three technologies will be the key to developing components that use nanometer-sized fluidic pathways to mix and pump liquids into and out of the optical path.

Among other advantages, this approach allows for the construction of devices with optical properties that can be altered very quickly. The potential products of this line of research include adaptive

graded index optics, dye lasers on silicon chips, nanostructured optical memories, dynamic nonlinear optical devices, reconfigurable optical switches and ultrasensitive molecular detectors. Optofluidics is expected to have a broad impact on areas such as telecommunications, biophotonics and biomedical engineering and robot and machine vision.

The new center will function as a catalyst to facilitate the technology fusion process. One of the more noticeable effects of the center on the Caltech campus will be the creation of a microfluidics foundry to create optofluidic technologies. In the foundry, researchers will be able to easily design and rapidly create the microfluidic layers that will control the flow of liquids to these new devices.

According to Psaltis, the initial members of the center's research team all offer significant expertise in areas critical to the design and fabrication of highly integrated optofluidic devices. Others at Caltech include Stephen Quake, the Everhart Professor of Applied Physics and Physics, who has invented a number of microfluidic devices for biomedicine applications; Kerry Vahala, the Jenkins Professor of Information Science and Technology and a professor of applied physics, who is the inventor of optical devices such as

high-quality optical microcavities; Axel Scherer, the Neches Professor of Electrical Engineering, Applied Physics and Physics, who is best known for his work on photonic band gap devices and who collaborated with Psaltis on the successful development of the first photonic crystal laser tunable by fluid insertion;

Changhuei Yang, an assistant professor of electrical engineering and expert in biophotonics; and Oskar Painter, an assistant professor of applied physics with a background in photonic crystal lasers.

Researchers at other institutions include George Whitesides, the Woodford L. and Ann A. Flowers University Professor at Harvard, who is a pioneer in soft lithography; Federico Capasso, the Robert L. Wallace Professor of Applied Physics at Harvard, who developed quantum cascade lasers; and Shaya Fainman, a professor of electrical and computer engineering at UC San Diego, whose expertise is in nanophotonics.



Courtesy of ee2.caltech.edu

Professor Demetri Psaltis



Courtesy of nanofab.caltech.edu

Professor Axel Scherer



The California Tech Archives

South house activities, including SAC functions, will be relocated to various places around campus. The locations include houses on Hill and trailers.

## South House Residents Displaced To Trailers on North Avery Lawn

Continued from Page 1, Column 5

senior year I had the option of living in a triple with freshmen right next door versus the possibility of the way it is now." Nevertheless, "a lot of people understand that this is something which needs to be done."

The modules will bring other changes to student life as well. First, the modular bathroom ratio will be fair to both genders. Second, despite the exquisitely planned outdoor courtyard areas in the modular park, there won't be enough room to hold house parties. Instead, the administration will lift the ban they enacted years ago and allow all the south houses to hold one giant inter-house party, likely on Beckman Lawn.

The modules will not have their own kitchen. Instead Chandler will be expanded to allow for two concurrent waited dinners. The SAC will also have to be relocated. The Coffee House will be moved to the Red Door Cafe but will maintain its current late-night hours. The music and art rooms will be moved to off-campus housing on Hill until the currently in-development Student Center is constructed. Even the DDR machine will find a new home by the Red Door Cafe.

Trustees, alums and current students alike are anxious to keep up the house traditions even if they lack the traditional houses. Mannion cheerfully states that "our goal is to preserve the customs and traditions of the houses. We will try to accommodate things like hellride. I don't see why we can't." Wong says that the house presidents "worked with [the administration] so [the traditions] wouldn't suffer." For example, the architects will be coating the renovated ceilings with a protective solution but Wong made sure that this won't interfere with the Blacker traditional of throwing up food and defying gravity. Hyperspace, that legendary interwall crawl section, will continue to exist although "in a modified form, certainly." Kim reminds us that

"the people are the same people. You're still going to have the unique character of the houses."

The murals are a special issue to many students concerned with house legacies. "The south houses will have to determine what's important for them to preserve", says Mannion. "It's very important to alumni trustees [to preserve the murals] but we recognize that current students want free expression. Coming up with a happy median of those two is what's going to happen." We must determine "what is a mural and what is graffiti." Wong will be holding a house meeting where students can give their own input on which precious paintings to preserve and the other south house presidents are doing likewise.

Popendorf notes that "if students have concerns about things, they should feel free to swing by the [administrative] offices and make appointments." Indeed, the administration has relied on an immense of student input in the project. Students were on the committee which selected the architect. The IHC and house presidents held numerous meetings with the firm to make sure the new south houses will be partially constructed to student specifications. "The architects have given a lot of time and concern into getting to know the individual houses and their traditions and needs", Kim continues. Only occasionally have their been student-administration conflicts but only because alums are so interested in the future of the houses they once called home. "Various people on the administration and the board of trustees are really concerned about the upkeep of the houses after they're renovated", Kim notes.

Currently Caltech is seeking building permits. "The city of Pasadena has not only the legal right but the legal obligation to review the plans for the renovations", according to Assistant VP of Government and Community Relations Hall Daily. "This [building] is highly regarded not only by Caltech but by the com-

munity at large." Hall also puts to rest the rumor that the south houses would be declared historic and hence untouchable if the school delayed any longer. In truth, "the city just holds us to our promise, which is that we won't tear [the south houses] down."

Pageboys, Loydies and Rudds will get their turn at renovations as well. In some indeterminate number of years, the north houses will be reconstructed because, says Mannion, "we don't want a condition where the north houses are so much less desirable than the south houses". The new north houses will likely feature roof decks with barbecue equipment and outside hallways. Additionally, both they and the south houses will be resized so that each house can hold an equal number of students. While the renovations may be a serious inconvenience for a year, they will result in wondrous new homes which Caltech can enjoy for decades to come. Tom concludes, "it's a win-win for everyone."

### The California Tech

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# Fencing Holds Invitational; Volleyball, Soccer Finish Season

By MIKE RUPP

Caltech Athletics  
Weekly Roundup  
November 8, 2004

## Athlete of the Week:

### Fencing's Katherine Harvard

The sophomore from Great Neck, NY had a brilliant showing at the 2004 Caltech NCAA vs. Club Invitational, leading the Women's Epee squad to a 35-1 record. Harvard herself went undefeated with a 12-0 record, fencing against opponents from UC Irvine, UCLA, UC Santa Barbara and USC.

Last season, Harvard, then a freshman, became the first Woman Fencer in Caltech's history to qualify for the NCAA Championships. Harvard and the rest of the Fencing program will draw blades next this weekend at the UC San Diego Invitational.

### Men's Water Polo honors seniors; heads into SCIAAC Championships

The Caltech Men's Water Polo team wrapped up its regular sea-

son this past Saturday in a 7-16 loss to visiting Claremont Mudd-Scripps.

Senior Jason Lee, playing in the final home match of his collegiate career, had four goals and an assist to lead the way for Caltech. Senior Goalkeeper Paul Wali, likewise in his final home match, had eight blocks.

Lee and Wali were also Caltech's top performers in a week that also saw losses to Redlands and Occidental. Lee had seven goals and four assists, while Wali totaled 17 blocks. Sophomore Daniel Oliver also had a strong week, with six goals, four assists, three steals and 22 errors drawn. Sophomore Tom Jurczak had two goals, three assists and eight steals. Senior Logan Linderman had three goals. Prior to the Claremont M-S match, seniors Lee, Wali, Linderman, Bert Lui and Peter Seidel were recognized for their contributions both to the Men's Water Polo program, and to the Caltech community as a whole.

The team will wrap up its season this weekend at the SCIAAC Championships.

### Fencing hosts NCAA vs. Club Invitational; wins four events

The Caltech Fencing team hosted its annual NCAA vs. Club Invitational this past Saturday, with teams from UC Irvine, UCLA, UC Santa Barbara, USC, Cal State Fullerton and UC San Diego attending.

Caltech was dominant in Women's Epee; Katherine Harvard teamed with Emma Schmidgall and Klimka Szwaykowska to go an incredible 35-1 in the 36 matches they competed in. Caltech also scored winning records in Men's and Women's Sabre and Men's Epee. All three events finished with 23-13 records.

The team's next meet comes this Saturday at UC San Diego.

### Women's Volleyball finishes season

The Women's Volleyball team finished its season this past week with losses on the road at Whittier College and Redlands.

As she has all season, sophomore Outside Hitter Rebecca Streit was the top performer on the team, accumulating 18 kills and

16 digs to lead the way.

Senior Middle Blocker Delia Davies also played well, with seven kills, three blocks, nine digs and a service ace to close out her Caltech career. Sophomore Elisabeth Streit had six kills, three service aces, one block and 20 digs. Freshman Setter Sarah Stidham completed a fine first year campaign with 30 assists and 14 digs.

The team finishes with an overall record of 7-19. Congratulations to the whole team on the conclusion of their season.

### Men's Soccer finishes season; Hosts Alumni Match

The Men's Soccer team finished its regular season with a 8-1 loss at Pomona-Pitzer on Wednesday.

Junior Defender Eric Kelsic scored in the 59th minute, with the assist going to Junior Midfielder Hatem Helal.

Freshman Goalkeeper Elliott Pallett continued his outstanding freshman season with ten saves. Pallett finishes the season with 143 saves; an average save/match ratio of 7.94; threatening to crack the top 20 averages in the country.

The team will host its annual Alumni Match this Saturday at the South Field to wrap up its season. The match begins at 11:00 AM.



courtesy of donut.caltech.edu

Sophomore Katherine Harvard led the Women's Epee squad to a 35-1 record at the Caltech NCAA vs. Club Invitational.

## Time to Check-a Da E-mail: Fans Send Love (and Hate) Notes to a Tech Columnist

By HAMILTONY FALK

This week I've been a bit busy (yes, getting up at 3 p.m. leaves hardly any time for a nap before dinner) and didn't have time to write a full article. Instead, I've decided to answer a few e-mails from my devoted readers<sup>1</sup>.

First one:

Dear HamilTony,

Sometimes when I read your articles I wonder if you've checked all your facts. I've discovered that you've been wrong on a few things. You claimed that the Frosh come to Caltech without being disinfected first, while they are in fact hosed down with soapy water as part of the new anti-terrorism program when flying into LAX. You also claimed that soy ice cream tastes bad, when it actually tastes awful. In addition, you've claimed that Avery was planning a violent revolution. I think that in the future you should check your facts before you publish them.

Sincerely,

(Name omitted because I didn't feel like making one up)

First off, I'd like to point out

that every thing I say in these articles is absolutely true, especially the lies. It's just that when I say "true" I don't mean it. But I think the main problem this reader has is that I might lead readers down a path of deception eventually leading them to the dark side and unspeakable power. This is not what I'm trying to do at all. What I'm really trying to do is build a resistance movement against the oppressive Avery/Chester/Del Mar invasion force that is threatening to take away our very freedom.

Another fan said:

Dear Person who writes those stupid Tech articles (I only assume this was addressed to me, it could really be anyone on the staff if you think about it),

What is wrong with you? Why do you write such awful things? Are you on drugs?

Sincerely,

Someone who probably doesn't even read my column

So the answers to these questions are: I'm addicted to parmesan cheese, they pay me, and nothing illegal or performance enhancing.

Someone sent me this e-mail asking an important question:

Hey funy manb guy! I fond your ee-male on my computer. Manb, Im soo drunkim now Wanted to tell u I think you'r collom is bad. i hate it and you!!!! Dont worry duude, I just messink wit u, cos i wanted to say man, I realy, you kno prespect u. I do man.

(this one was unsigned for some reason)

I'd like to let this person know that they are probably my biggest fan. No one else would even pretend to "prespect" me, even under the influence. Now I can say to everyone who doubted my writing talents: drunken people sometimes e-mail me and tell me that they respect me.

Dear HamilTony,

I've been trying to contact you, but I don't have your e-mail address. Could you tell me what it is?

Ok, for comments on my Tech articles, you can write to HamilTony@gmail.com<sup>2</sup>

Dear HamilTony,

How did that person write you an e-mail without knowing your e-mail address? In fact, how can I send you an e-mail before you publish a column containing the e-mail I referenced, since I don't even know about the aforementioned e-mail? Is aforementioned one of the longest words I've used in this entire fake e-mail? And do you know how to get coffee stains out of wool?

You are not ready to discover the answers to these questions.

Dear To Whom It May Concern,

Interested in fully clothed pseudo-porn? Losing weight through amputation? Find love by building a house out of gingerbread and candy? How about a free cell phone when you pay several hundred dollars for nothing? Some other type of free gift? Maybe I could mow your lawn? All this and more at my site: <http://donut.caltech.edu/>

By tomorrow, you could be helping me and my fellow rich friends give you a huge cash payment!

## Show Your Pride!

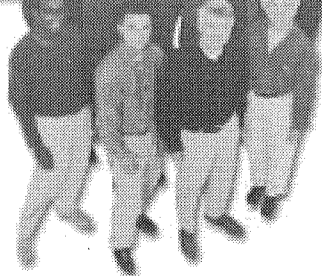


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## Rethinking Civil Marriage What Marriage Actually Represents

By SIMON QUE

Last week, a columnist for the *Detroit News* lamented the passage of measures in eleven states that banned "gay marriage." She writes, "We watched in sadness and anger as voters stamped to the polls to write bans on legal recognition of gay relationships into 11 state constitutions. And we felt assaulted as a president was re-elected after campaigning to amend the U.S. Constitution to remake America into an officially discriminatory nation -- one with liberty and justice for most, not for all." For now, put aside the reference to the federal marriage amendment. The point is that she apparently believes that denying gays the so-called "right to marry" is a denial of liberty and justice.

The basic issue that needs to be addressed is the actual meaning of marriage. From reading news articles about the state amendments "banning gay marriage" and a federal amendment to "ban gay marriage," it would seem that marriage is accepted to mean legal recognition of a certain type of union between two people. But if that's called marriage, then what is this union called? What exactly are two people doing when they "get married?"

While Americans argue back and forth about whether marriage should be between a man and a woman, or between two people, few have stepped back to wonder why marriage should be about a government-issued license in the first place. Based on the way the word is publicly used today, there are actually two meanings to "marriage". One is traditional marriage, the sacred union of a man and a woman. The other is civil marriage, which is the legal recognition of traditional marriage. This is a very important sociological and semantic distinction that seems to be blurred in the gay marriage debate.

Critics of the anti-gay marriage crowd accuse it of "denying gays the right to marry." Well, no one is trying to deny them the right to make a union that is sacred to them. So what they actually mean is denial of civil marriage, or the denial of a license that signifies legal recognition of a same-sex union. Now, licenses are usually issued so that a person can do something such as to drive a car, to hunt game, or to keep a dog. But this is not the case with civil marriage. One person has asked, "What can you do with a marriage license that you can't do without?" You can make vows and commitments and live together without a license. Some would say that you could get benefits such as tax breaks. But that's having things being done for you, not doing things yourself. That's a privilege provided by others, not a right. Such an objection is also weak as it breaks down in the absence of an income tax or of any sort of benefits.

In short, the denial of a marriage license is no violation of liberty or justice. The passage of the state amendments on Election Day violated no one's freedom or individual rights and did not tangibly harm anyone. Same-sex couples could still go on to hold ceremonies, make their vows, and

live together. It's not like they are going to be hauled into jail for doing so. They just won't get the recognition of other members of society in the form of a license. And nobody should have a legal obligation to recognize anyone's marriage or union, especially if they believe (correctly) that same-sex marriage is a blatant corruption of true marriage.

For the aforementioned columnist, the real issue is not liberty and traditional justice but equality. She admits it herself in the same article, saying that denial of marriage licenses to same-sex couples "tramples our birthright of equality by declaring that gay citizens are now and forever unequal." But she seems to accept without question that the state should hand out marriage licenses to anyone in the first place. After all, if it's equality she's after, then there should be no difference between granting licenses to all couples and granting licenses to no one. Instead of justifying her choice of granting to all over granting to none, she, like many other Americans, assumes that marriage is something that should be recognized by government in the first place.

Baloney! Traditional marriage and government have existed side-by-side for thousands of years without the latter formally recognizing the former, yet marriage still persists. In fact, marriage most likely predates organized government, and has no intrinsic traits that would merit recognition by the government. But ever since the state began handing out marriage licenses in the past few hundred years and then increased its involvement in family matters, marriage has been wrecked. There has been legalized divorce with alimony, marriage tax penalties, and violations of parents' rights. Such a system gives people neither liberty nor justice. The gay marriage debate itself shows how much the traditional institution of marriage has been corrupted in people's minds, when they believe that amending constitutions to forbid the granting of licenses to same-sex couples will somehow protect traditional marriage.

Reality check: government can't fix marriage because its jurisdiction is only over civil marriage, a cheap substitute for real marriage. Sadly, traditional marriage has been relegated to the sidelines by civil marriage, which is what many people seem to consider real marriage. People should realize that it is traditional marriage, not civil marriage, that has actual social legitimacy. After all, voluntary social interactions can persist without getting the government involved.

It would be better to separate the state from marriage altogether, so that traditional marriage would once again be recognized as the real deal. But just as government involvement can't salvage marriage, neither can simply getting government out of it. Traditional marriage is a matter of the private efforts of individuals and communities, and that is what it would take to restore it. And the state has no rightful place in such efforts.

*"In short, the denial of a marriage license is no violation of liberty or justice."*

## Part IV in the UnBubbled Series: More Thoughts on the Iraqi War Response to "Brilliance of an Invasion"

By SWAROOP MISHRA

The recent column "The Brilliance of an Iraq Invasion" (Caltech UnBubbled, Part III) is so comically ill-reasoned that I can only assume it is intended as satire. In the unlikely event that Mr Wiktorowicz intends it as serious commentary, I am compelled to point out the column's most egregious flaws.

The author begins with the assumption that a "war on America" was "declared on September 11, 2001." The September 11 attacks were only the most recent and most destructive in a long history of Islamist attacks directed against the United States and its interests. This decades-long assault includes the overthrow of the US-backed Shah of Iran, the 1983 Beirut bombing, the 1993 bombing of the World Trade Center, the 1998 bombing of American embassies in Nairobi and Dar es Salaam, and the 2000 attack on the USS Cole. To address the problem of terrorism, it is critical to understand that the problem did not begin with the September 11 attacks.

Mr. Wiktorowicz finds it "striking that there haven't been any attacks on American soil in the three years since 9/11." He assumes this is because "we are winning the War on Terror." I am appalled that a scientist would draw conclusions using an insufficient sample size and an irrelevant time scale. Eight years passed between the attacks on the World Trade Center. The absence (or occurrence) of significant terrorist attacks in recent years should not be taken to indicate the success or failure of the current "War on Terror."

Throughout his column, Mr. Wiktorowicz displays an inability to distinguish the "War on Terror" from the invasion of Iraq. He assumes that "the Iraq theater... is where the real conflict began" because terrorists will be too occupied by the situation in Iraq to plan and carry out attacks on American soil. This is a ridiculous assertion. Terrorists are not an organized group that engages in battles on specific fronts. They have no incentive to engage in such a battle because they would assuredly lose. The Iraq invasion has not forced anyone "to stream across Iraq's borders to fight our troops." Some foreigners have come to Iraq to fight the American invaders, but it is unlikely that a significant fraction of Islamist terrorists from around the world have traveled to or even have any interest in traveling to Iraq. Islamist terrorists continue to strike elsewhere, from Chechnya to Kashmir to the Philippines.

Even if the Iraq invasion had diverted terrorists from the United States, the invasion would not have been clearly justified. Nearly three thousand Americans were killed in the September 11 attacks, but the number of Americans killed in the Iraq invasion is already well over one thousand and continues to climb. Is it better for Americans to be killed in Iraq by terrorists than killed in America by terrorists? The lives of all

the investment bankers and businessmen killed at the World Trade Center are not more significant or valuable than the lives of the disproportionately poor and poorly-educated people who constitute the American military. We should concentrate on minimizing the number of Americans killed by terrorists, not on changing which Americans are killed and where they are killed.

Make no mistake, it is Americans who are being killed in Iraq. This invasion was not conducted by a genuine "coalition." Mr. Wiktorowicz points out the many nations that "have troops on the ground in Iraq," but over 80% of "coalition" troops are American (<http://news.bbc.co.uk/2/hi/middle-east/3873359.stm>) and nearly 90% of those killed have been American (<http://icasualties.org>). Americans die in disproportionate

*"We should concentrate on minimizing the number of Americans killed by terrorists, not on changing which Americans are killed and where they are killed."*

numbers because they are on the front lines; the Australians cited by Mr. Wiktorowicz are engaged in support activities such as air traffic control (<http://news.bbc.co.uk/2/hi/middle-east/3873359.stm>). Mr. Wiktorowicz also says "some claim we have a weak coalition...because four countries are conspicuously absent." This is absurd. The purported coalition is weak not because of the absence of certain countries but because of the disproportionate burden borne by the United States in terms of decision-making, cost, material, manpower, and casualties. The coalition continues to weaken as countries such as Spain, Hungary, Kazakhstan, and Honduras withdraw the few troops they had sent.

Mr. Wiktorowicz continues his laughable assertions by saying that "we are winning both the Iraq and Afghanistan theaters." Large areas of both countries remain under the control of those sympathetic to the terrorists. Although Mr. Wiktorowicz believes "we are eliminating the terrorists rapidly," attacks continue unabated in Iraq. The impact of these attacks is demonstrated by the continued postponement of elections and by recent statements from the Bush Cabinet that some Iraqis may not be able to vote in the promised elections. In Afghanistan, recently-elected President Hamid Kar-

zai continues to struggle against the warlords who rule much of his country. Most of these well-armed warlords have acquired popularity and power through decades of local leadership, and some have long-standing ties to terrorists from their joint battle against the Soviet Union in the 1980's. The end result of the invasions of Iraq and of Afghanistan is likely to be long-term instability, which is more likely to result in a breeding ground for terrorists than in the triumph that Mr. Wiktorowicz imagines. The historical precedent is clear from the Soviet invasion of Afghanistan, which ultimately led to the rise of the Taliban and produced a base of operations for Osama bin Laden.

The invasion of Iraq was plainly unjustified. This is obvious from President Bush's ever-changing efforts to justify it. First he was pursuing "weapons of mass destruction." Next he sought to bring "freedom" to Iraq. Next the invasion somehow became part of a broader "War on Terror." Mr. Wiktorowicz has his own set of justifications, which include the notion that Iraqis can now "govern themselves." Unfortunately, Iraq is far from a sovereign nation. Mr. Wiktorowicz further believes that the Iraq invasion "scared Libya" in some fashion. Libya has gradually changed course over the past two decades thanks to the policy of isolation successfully pursued by Presidents Reagan, Bush, and Clinton. No one should

be gullible enough to believe that the policies of the current President Bush somehow prompted a sudden change in Libya.

A "War on Terror" is oxymoronic and absurd because terrorism is not war. Applying the only violent means available to them, terrorists attack their perceived enemies in a relentless and suicidal manner. Terrorists' elusiveness is obvious from the continued freedom of Osama bin Laden. Rather than invading other countries and giving terrorists much greater incentive to direct their attacks at us, we should confront the threat by engaging the terrorists and diminishing their perception of us as the enemy. That is not to say that terrorists should not be attacked when possible. Terrorist training camps, funding sources, and lines of communication must be destroyed. Disconnected and ineffective actions such as the invasion of Iraq, however, are most likely to generate terrorism, not undermine it.

There remains no sound basis for the invasion of Iraq. To all those who continue to sing the praises of this ill-conceived and illegitimate conquest, I encourage you to go to Iraq and work to support the occupation. Someone needs to take the place of the hundreds of Americans who have already died for no good reason.

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# A Liberal Counterattack: Making the Voice of the Left Heard

By OLEG KOGAN

## Must Fight!

"The left bewitches with its potions and elixirs, served daily in its strongholds of academe, Hollywood and old media. It vomits upon the morals, values and traditions we hold sacred: God, family and country."

Such were the words appearing in the LA Times article by Frank Pastore on the weekend after Nov. 2. Not too long ago such a narrative would have justly deserved nothing but chuckle if brought up as a conversation filler during a friendly lunch chat. But the only thing permanent is change itself - current political turbulence suggests that the question "is the trend of more than two century of progress about to be reversed?" should be taken seriously. Consider the following mass e-mail sent to members of a certain congregation two weeks before the election:

"The United States of America was originally founded on Christian values and Biblical guidelines and we have prospered and been blessed with God's favor for over 200 years! ... [we are] at a major crossroads! Ungodly elected officials have already been successful in removing God, The Bible, the Ten Commandments and prayer from our schools and government buildings. How you vote in the 2004 election will determine whether a few very powerful, influential and ungodly people will seize control of the United States government and Christians will be persecuted! If we elect an ungodly person as President, or a majority of elected Senators and/or a majority of ungodly House of Representatives our nation will become even more ungodly than it is now! Christians will become subject to newly passed laws, made fun of, put in jails, prisons, persecuted and killed! ... Get involved, speak out and vote for those people who stand for and practice good, moral Christian values!"

As much as it is so easy to see through the cheap tactics invoked by conservative politicians (often for obscure reasons that have nothing to do with an honest concern about morality), as much as it was becoming clear that these words do possess danger - it was hard to guess the extent to which the dim ignorance would prevail over all things that are bright, progressive and intellectual that remains in America.

Anti-gay, anti-gun control, anti-abortion, hawkish - these are almost converse of: progressive, forward-looking, bright, creative, intellectual. During the election campaign Bush was actively pursuing the tactic of intimidating voters against the liberal agenda. The use of the word liberal became synonymous with dirty, evil, immoral, out of touch with plain, hard-working, God-fearing normal Americans. It reached such proportions that at one point in the third presidential debate, the occupier of the White House blatantly stated: look, this candidate makes Ted Kennedy look like a conservative senator from Massachusetts ... then followed a pause designed to create more drama. There is mainstream America he argued, and then there's a liberal senator from Massachusetts.

Massachusetts, with academic centers such as Harvard and MIT has always been the intellectual and progressive engine of this country. We all know that Bush does not side with those values that this historically important state supposedly exemplifies, but why must cowboy values be

forced onto the rest of the American population under a disguise of being moral and mainstream? How much longer will the intellectuals of this country remain silent omega-males, mutely observing that it remains implicit that religious values are something that is under a threat but progressive influence could only use a little reduction?

The culture of reason and progress is under a direct attack! Only those who do not consider themselves worthy remain sheepish - those who believe in their cause fight back. Fighting means that liberal people should come together strong and proud and make clear what values they stand for. It is about having a counter-voice - at present there's a multitude of counter voices in forms of protests and bitter slogans, but no organized counter-philosophy. With the lack of counter-philosophy the extreme right appears to be more put-together and to have more persuasive power over Americans.

Intellectuals and progressive people move the world forward. If we believe that we're brighter, more creative and that no matter what happens in the short term, the progress eventually belongs to us - then why should the progressive people of this country remain on their knees, afraid "not to make it even worse", being fearful not to be interpreted as anti-moral, being cautious not to cause an even greater mess. The more we try to be careful the more powerless we appear to be and the more the conservative extremists can use us as a doormat to walk upon. "[Democrats] cannot be nationally competitive when we don't feel comfortable talking about our convictions" said Bill Clinton in a speech at Hamilton college (Yahoo news), one week after democrats took a beating on Nov. 2nd.

We have to show that we exist, that we have a spine, that we can take a stance and that we strongly believe for what we stand. We have to show to America that the voice of intellectuals is there and that it is strong ... in the light of current events this means that we have to fight.

The concern for the loss of moral values is probably widespread and for a good reason. I personally detest the tasteless culture of sex and violence that pours out of Hollywood. Hollywood-driven degradation deserves opposition by itself, but the major difference between the Hollywood counter-culture and that of the far-Right Christian conservatives is that the former does not advocate usurping rights of any particular group of people; they do not attempt to amend the constitution to force their values on anybody under the slogan "America Has Spoken." Yes, it is unfortunate that Hollywood became a feeding ground for Democrats - this may soon change, but it does not imply that Democrats or liberal people in general stand for those tasteless values. It just happened to be that Hollywood people are liberal, but the converse is not true - being liberal does not imply siding with the worst of what Hollywood has to offer.

As Michael Kinsley of the L.A. Times put it (Nov. 7):

"It's true that people on my side of the divide want to live in a society where women are free to choose abortion and where gay relationships have full civil equality with straight ones. And you want to live in a society where the opposite is true. These are some of those conflicting values everyone

is talking about. But at least my values -- as deplorable as I'm sure they are -- don't involve any direct imposition on you. We don't want to force you to have an abortion or to marry someone of the same gender, whereas you do want to close out those possibilities for us. Which is more arrogant?"

We on my side of the great divide don't, for the most part, believe that our values are direct orders from God. We don't claim that they are immutable and beyond argument. We are, if anything, crippled by reason and open-mindedness, by a desire to persuade rather than insist. Which philosophy is more elitist? Which is more contemptuous of people who disagree?"

One may argue: doesn't fighting amount to bringing in even more division at the time when we really need to come together. Let's look at the last fifty years for a quick answer to who really uses division as a means to put their grip on power. In his new book "You Have the Power" Howard Dean writes:

"Ronald Reagan used his persuasive charm to bring the extreme Right into the mainstream American politics. The effect of this was to split asunder not just blacks and whites but everyone outside of the upper reaches of the upper middle class. On the campaign trail, this divisiveness played out in the new Republican obsession with hot-button social issues: the triad of 'guns, God, and gays'."

The reality is that conservatives are implementing the politics of divisiveness, while fear and ignorance are the tools to do that. We have to fight that tool, not the population on which the tool is applied! Moreover, it must be a good, peaceful fight - I'm not advocating militarism or violence.

A glance at the election map suggests that the association of liberal with ungodly and less moral is probably more prominent among less educated voters. This prompts a question: does education allow one to see that progressive thinking has nothing to do with denying morality and/or religious values? I believe the answer is yes because morality and religious concepts are usually instilled in us from the early age. As we mature and hopefully see the world with a more open mind, we gain more interpretive power - we learn to think critically and we gain respect for intellectual values, for science, for things of knowledge, but it does not imply that we simultaneously lose respect for those values that were instilled during childhood. Some of our extremist friends don't seem to understand that - that is where the concept of peaceful fighting comes in.

I already hear "aren't you old enough to realize that educating the public is a useless idea - why should they accept your smart-alec learned values if you don't seem to be willing to embrace theirs?" By all means, I am not suggesting a mass re-education of America; the proposition is to fight an uphill battle to make sure that our voice becomes loud enough for everybody to hear... and to hear plenty of it. Again, it seems that at the moment the only audible organized philosophy is that of "moral values against the onslaught of godless liberals". I strongly believe that it is time for liberal people come together and take a stance.

**From rhetoric to ideas of what WE can do**

My philosophy here is that any-

thing is infinitely more than nothing. Any kind of activism, from putting ads on the lamp post to contacting your senators to writing "letters to the editor" of the newspaper is part of the fight. But it is so much more effective in the framework of an organized movement with many participants. Here's a list of the fighting tools:

- Be informed. Be on the constant lookout for news and current events, and in particular events related to Right-wing agenda.

- Be familiar with common Right-wing arguments and common Left counter-arguments. Have a good capacity of counter-opinions and a good reservoir of debatable power for any situation. Be prepared to stand your ground even in the most unanticipated situations, such as overhearing a conversation on a bus.

- Inform other progressive groups of your existence, of your efforts and, of the activism that you take part of.

- Coalesce. Try to be affiliated with other organizations. A fight involves a sense of brotherhood. Many small organizations each pulling in their own direction is ineffective and gets little attention. One strong powerful voice is what does the job!

- Break through any slightest opportunity to voice your opinion. Fight to have your voice heard. Fight to have your letters to the editor accepted. Try to publish in any available newspapers, newsletters, e-mails, contact people in the media - beat with hands and feet to have your voice heard.

- Invite a debate (among friends and foes). Actively challenge far-Right wing opinions.

- Contact big people. Again, this is about being heard - if you just throw slippers at the TV set, at the very best you will get heard by your neighbors. In fact, such venting this is just an excuse to let things slip away. Write letters to Congressmen, Senators, movie directors, invite others to do so, start petitions. There's plenty of room for creativity here. But again - make a lot of good noise.

- Do all you that you can to help push the agenda of more and stronger education.

- Volunteer. Volunteering for an educational cause sets a great example and makes people see you as more than just a loud and mouthy demagogue. Give public talks, organize trips to museums, and organize discussion groups.

Get people to think.

- Remember to avoid perpetuating the myth of a mad scientist, a tree hugging liberal, a pot-smoking hippie. This is not the point! The point is to be heard and "digested" by as many members of the general public as possible. If you project any of the above stereotypes people will automatically dismiss you even if you have plenty to offer and smart things to say.

- BE PERSISTENT. Passion is extremely important. Infect others with your energy. Quantity will transfer into quality - we just have to persistently beat our agenda. For this we need as much help as anyone can offer. The more people the better. Again, doing something is infinitely better than doing nothing.

This narrative was not designed to be a literary masterpiece. You may disagree with some arguments. It may sound unnecessarily controversial, but consider that in less than two weeks after Nov. 2nd, some ultra-conservative groups are already building grand plans to ride on their momentum. For example, Jerry Falwell, a religious broadcaster has already put together a national campaign to oversee the "evangelical revolution". It was ok to take such threats lightly in the yesteryear, but let's keep in mind that the current world is especially turbulent, and as history demonstrates, radical groups have often gained power during turbulent times. Thus I hope you will nod to my main thesis - at present there are reasons to be concerned that America is vulnerable to slipping away towards the Right-wing extreme. We must do all we can to actively challenge the tendency of the ultra-Right to grab onto the American population in the name of morality. In his aforementioned speech Clinton asserted:

"I think the current divisions are partly the fault of the people in my party for not engaging the Christian evangelical community in a serious discussion of what it would take to promote a real culture of life ..."

For this, we need to have a broad participation from everyone; no matter how little each one of us can contribute. I would like to organize a group of people who feel the same way; e-mail me first and we'll go from there: [oleg@caltech.edu](mailto:oleg@caltech.edu).

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# Maria Gracefully Enters the Heart

By HARRISON STEIN

With all of the sequels and event pictures littering the Hollywood release schedule, it's easy for the year's most powerful movie to be hidden under a scrap heap. Last year, *Lost in Translation* was the year's biggest treasure, yet it was buried at the box office as it grossed about eight times less than the inferior *Return of the King*. On July 16, an unknown independent movie opened alongside Hollywood juggernaut *I, Robot* and for the duration of its run, it was largely ignored by the public. A mere four months later, the year's most important movie is at the end of its road, sure to face an uncertain shelf-life on DVD. However, *Maria Full of Grace* does not deserve this fate, as it is a movie no one should miss.

With all of the acting talent present in the Hispanic world, it is surprising that so few Spanish-language films have succeeded in America. *Amores Perros*, *Abre Los Ojos*, and *Women on the Verge of a Nervous Breakdown* are well-loved Hispanic films, but Joshua Marston's spellbinding *Maria Full of Grace* is the best I have ever seen.

In Colombia, 17-year old Maria (an amazing debut by Catalina Sandino Moreno) is a precocious child forced to slog through a menial job paring flower stems in order to feed her large family. After a dispute with her cantankerous boss who doesn't allow her to take multiple bathroom breaks, Maria quits her job and is forced to struggle for employment.

Maria is recommended by a friend to become a mule for a dangerous Colombian drug lord. As a mule, Maria must swallow sixty wrapped pellets of heroin, transport the drugs across the American border, and deliver them to gang-banger drug dealers in New York. Maria must brave ultimate danger and face three life-shattering fates. American officers might catch wind of her plan and imprison her in a foreign country. Additionally, if the drugs don't all arrive, the drug lord will harass

her family as retribution. Worst of all, if any of the pellets unravel in her stomach, she will die a most agonizing death.

Maria is accompanied by her stubborn best friend Blanca (Yenny Paola Vega)

and a veteran mule named Lucy (an equally stunning debut by Guilied Lopez), a poised woman who teaches Maria the tricks of the trade. Predictably, something terrible happens to one of the main characters, and the others are forced to deal with the harrowing consequences.

*Maria Full of Grace* is inherently downbeat, as it deals with very disturbing subject matter. The life of a Colombian peasant is so terrible that thousands of people are forced to resort to occupations similar to Maria's. Even though Maria's specific story isn't real, the pitfalls she has to overcome throughout her journey most certainly are.

*Maria Full of Grace* is expertly written and directed by Joshua Marston, who triumphantly depicts the Colombian culture to the extent that there is no evidence that the film was made by Americans. The film is very well paced, as it never lags even when the last thirty minutes ought to be anticlimactic. The dialogue is very sharp and the relationships between the three girls are hauntingly realistic. Finally, unlike most Hollywood movies that have lame-brained names, the film's title excellently depicts the heart of the film.

Most of all, though, *Maria* is an epic triumph for rising star Catalina Sandino Moreno. While we never truly develop coherent feelings for Blanca or Lucy, we feel the utmost sympathy for Maria



courtesy of <http://www.film.ru/ing/shots/>  
**Maria Full of Grace** expertly tells the tale of a Colombian girl that must resort to drug smuggling to make a living.

who suffers a meteoric fall from grace. Moreno's performance is so poignant that we can relate to Maria at every juncture of the film, even though none of us have had remotely similar experiences. Moreno's performance is the most powerful debut in recent memory and ranks with Tatum O'Neal (*Paper Moon*) and Eva Marie Saint (*On the Waterfront*) among the greatest first roles in movie history.

Even though the film invariably loses steam after an engrossing introduction and an amazingly gripping second act, the story holds better than anything else that has come into cinemas in 2004. All of the first time actresses are revelations and the movie ought to be talked about for years to come. Unfortunately, in addition to being a six million dollar box office bust, *Maria Full of Grace* probably won't be nominated for a Best Foreign Film Oscar because it was directed by an American and largely takes place in New York.

On the other hand, *Maria Full of Grace* is the best film so far in 2004 and movies like this tend to be remembered. I wholeheartedly recommend that you rent the DVD when it is released on December 7 or try to sneak a final peak of the film in a second-run theater. Full of heart, full of joy and full of grace, *Maria* is one movie that you will never forget.

\*\*\*\* out of \*\*\*\*



## Trim-Trimming Contest

The Tech Express will be hosting its second annual Tree Trimming contest. The contest starts on November 29th, and judging will take place on December 8th. Last year's winners are on display. Wonderful prizes will be given out to the winner.

## November at the Women's Center.

Women's Center Student Programming Board

All undergraduate students are invited to participate in the Women's Center Student Programming Board. The SPB meets regularly to develop and implement programs of interest to the undergraduate women's community. SPB members also participate in outreach and admissions activities throughout the year. If you'd like more information, please contact Jennifer at [jcichock@studaff.caltech.edu](mailto:jcichock@studaff.caltech.edu)

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Women's Health and Wellness Series

Topic: The Great, the Good and the Ugly: Explore the Key to Healthy Relationships

Date: November 18, Time: 12-1pm

Location: Women's Center located in room 265 of the Center for Student Services. Lita Mercado, from the Los Angeles Commission on Assaults Against Women (LACAAW), will discuss the components of healthy relationships - from value clarification to communication styles. Learn how to spot unhealthy relationships and the skills to do something about it for yourself, a family member, or a friend. Lunch provided.

RSVP required! To sign-up please call ext. 3221 or email: [wcenter@studaff.caltech.edu](mailto:wcenter@studaff.caltech.edu)

## Ballroom Dance Club

The beginner international style ballroom class is held Sundays and will continue until November 28th. This class will

cover 4 dances and will be taught by CBDC guru Derrick Bass. Instruction is from 4:30 to 6:30 pm in Winnett Lounge and as always no partner or prior dance experience is required! Cost is \$50 for the full 8-week series for Caltech students and \$80 for the series for non-students.

Our intermediate international style class is taught Thursdays by Caltech's own Tudor Stoenescu and Gwyneth Card. Class begins at 8 pm in Winnett Lounge; the first hour will cover standard and the second will cover latin. The series runs 8 weeks and the cost is \$25 for Caltech students, \$40 for non-students.

The Ballroom Dance Team will also be offering Team Practice, held each Tuesday in the Braun Gym multipurpose room from 9 to 11 pm. The practice will feature the assistance of a professional coach so that team members can get advice and tips to improve their dancing. Team membership is required and there is a \$5 fee to enter the gym if you do not have Caltech/JPL issued ID.

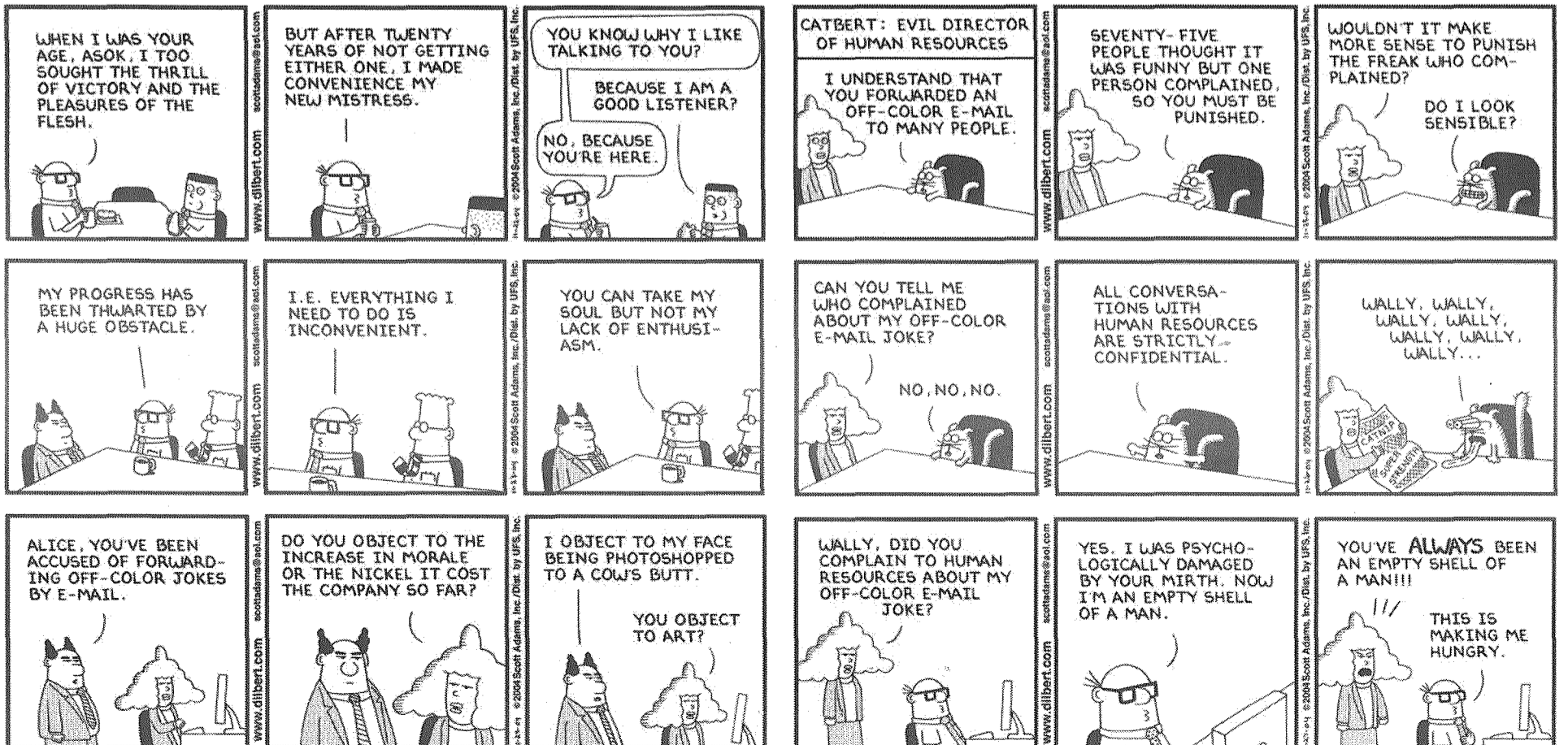
Join the Ballroom Dance Club on Saturday, December 11 in Winnett Lounge for our end-of-term blowout holiday dance party! We'll begin at 8:30 pm with a mini-lesson followed by general dancing from 9 pm until LATE. As always you can get in scot free, and no partner or experience is necessary! Although certainly not required, please feel free to get into the holiday spirit and bring along a new, unwrapped toy as we will be collecting donations for the "Toys for Tots" Foundation. Hope to see you there!

## Society of Women Engineers

The first general meeting of the Caltech section of the Society of Women Engineers is Monday, November 15th at lunch in 210 Thomas. Lunch will be provided.

## The California Tech

*The California Tech* is looking for new writers, photographers, copyeditors, layout artists, and members for our business staff. Great benefits include pay, credit, and Friday lunches. Email [tech@tech.caltech.edu](mailto:tech@tech.caltech.edu) if interested.



# Rat Experiments Revealed Clues About Memory Path

By MARK WHEELER

PASADENA, Calif.- Biologist Erin Schuman is interested in how memories are formed--or forgotten. The landscape the professor of biology at the California Institute of Technology explores is the hippocampus, the part of the brain known to be crucial for memory in humans and other animals.

In 2002, Schuman and Miguel Remondes, her graduate student, published a paper in the journal *Nature* that suggested a possible role for a well-known but poorly understood part of the brain known as the temporoammonic (TA) pathway. Using rat hippocampal slices, they suggested two possible roles for the TA pathway that were not previously known: to serve as a memory gatekeeper that can either enhance or diminish memories and to provide information to help animals know where they are in their environments.

The researchers' next step was to prove their theories by looking at a possible role for the TA in memory at a behavioral level. That is, says Remondes, now a postdoctoral fellow at MIT, "to do the real test."

To understand how memories are formed, many scientists have focused on the "trisynaptic circuit," which involves three areas of the hippocampus: input from the senses is first sent from the cortex to the dentate gyrus, where this signal is processed by two sets of synapses, then sent back to the cortex. That's the circuit. An often overlooked separate input to the hippocampus, though, is the TA pathway. It makes direct contact with the neurons that are at the last station in the trisynaptic circuit, thus short-circuiting the traditional trisynaptic pathway.

Reporting in the October 7 issue of the journal *Nature*, Remondes and Schuman, also an associate investigator for the Howard Hughes Medical Institute, now show they were correct in their belief that the TA Pathway is important in spatial or location memory. The scientists used rats as their experimental animal and the Morris Water Maze, a standard test for location memory in rodents. The animals swim in a pool of opaque water until they find a hidden goal--a platform which allows them to escape the water. To find the platform, the animals rely on the geometrical relation-

ships of cues away from the pool (e.g., on the walls of the maze). In other words, says Remondes, "they have to navigate and remember where the platform is in order to escape the water."

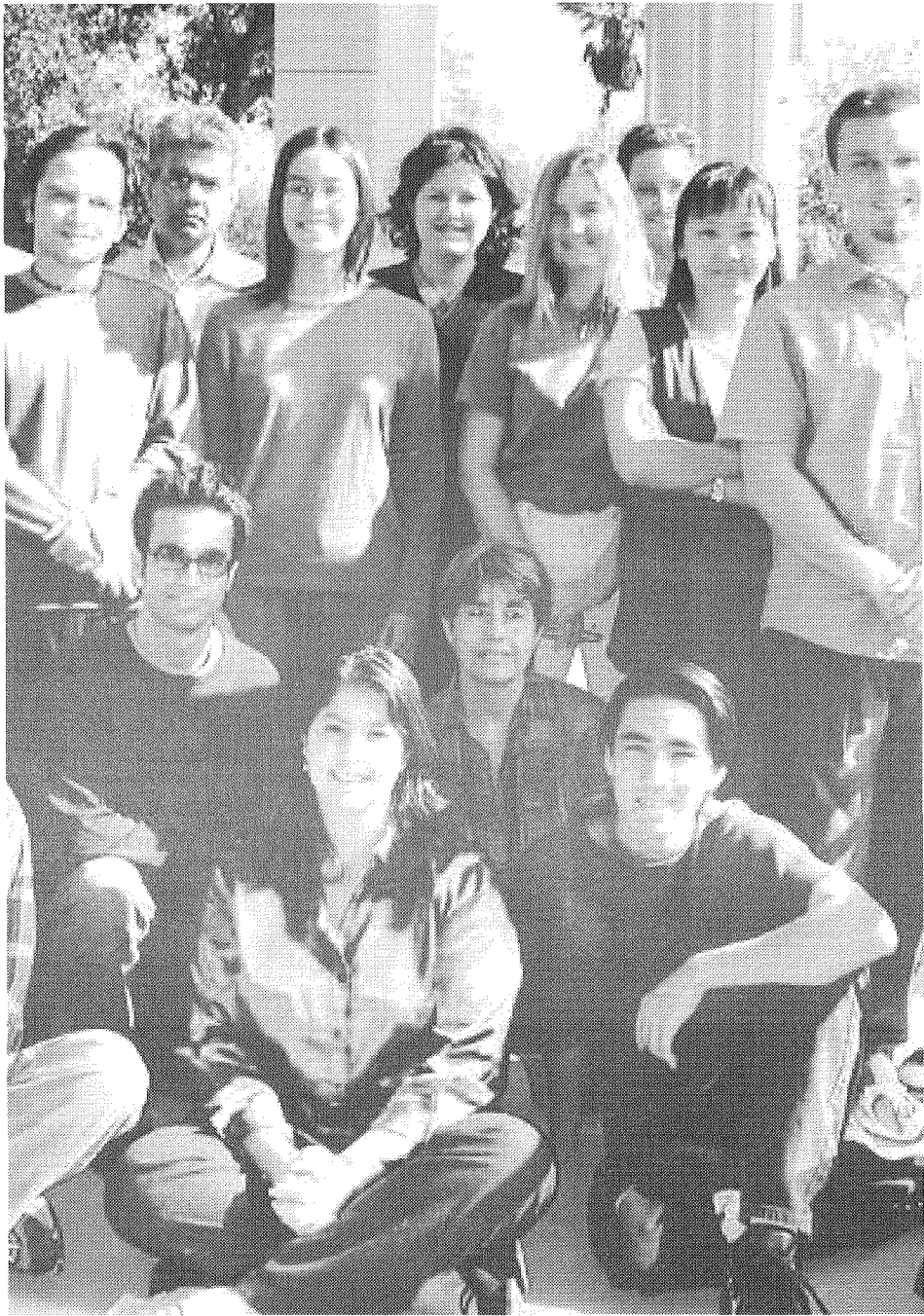
The researchers tested both short-term (24 hours) and long-term memory (four weeks). The TA pathway was lesioned (disabled) in one set of rats; another set was used as a control. Having learned the location of the platform, both sets of rats still remembered where it was 24 hours later. But when tested four weeks later, only the control rats remembered where it was. The lesioned rats forgot, which showed that the TA pathway played some role in the retention of long-term memories. But what was the role?

"It led to a second question," says Schuman. "Because long-term memories require something called consolidation, an exchange of information between the cortex and hippocampus, we wanted to know if the TA pathway was working in the acquisition phase of memory or in its consolidation."

Using two other groups of rats, the pair conducted a second set of tests. After confirming the rat's memory of the platform after 24 hours, one group was immediately lesioned. These animals lost their long-term memory when tested 4 weeks later, indicating to Schuman and Remondes that ongoing TA pathway activity was required on days after learning to stabilize or consolidate the long-term memory.

The second group of rats was also lesioned, but not until three weeks later. The researchers found that this group remembered the platform's location, showing their memory had already been adequately consolidated after three weeks. This proved the TA pathway is required to consolidate long-term location memory.

"These data indicate there must be a dialogue between the hippocampus and the cortex during long-term memory consolidation," says Schuman. "Clearly, the TA pathway plays an important role in this discussion." Further, she notes, "understanding the mechanisms of memory formation and retention may shed light on diseases like Alzheimers, where memory is impaired."



Courtesy of [its.caltech.edu](http://its.caltech.edu)

Professor Erin Schuman (center, rear) and her group conducted the experiments lesioning the temporoammonic pathway in rats to learn about memory.

# Geologists Develop Method For Studying Microbial Life

By ROBERT TINDOL

PASADENA, Calif.--Geobiologists are announcing today their first major success in using a novel method of "growing" bacteria-infested rocks in order to study early life forms. The research could be a significant tool for use in better understanding the history of life on Earth and perhaps could also be useful in astrobiology.

Reporting in the August 23 edition of the journal *Geology*, California Institute of Technology geobiology graduate student Tanja Bosak and her coauthors describe their success in growing calcite crusts in the presence and absence of a certain bacterium in order to show that tiny pores found in such rocks can be definitively attributed to microbial presence. Micropores have long been known to exist in certain types of carbonate rocks that built up in the oceans millions of years ago, but researchers have never been able to say much more than that the pores were likely caused by microbes.

The new results show that there is a definite link between microbes and micropores. In the experiment, Bosak and her colleagues grew a bacterium known as *Desulfovibrio desulfuricans* in a supply of nutrients, calcium and bicarbonate that built up just like a carbonate deposit in the ancient oceans. The mix that contained the bacteria tended to form rock with micropores in recognizable patterns, while the "sterile" mix did not.

"Ours is a very reductionist approach," says Dianne Newman, the Clare Boothe Luce Assistant Professor of Geobiology and Environmental Science and Engineering at Caltech and a coauthor of the paper. "This work shows that you can study a single species to see how it behaves in a controlled environment and from that draw conclusions that apply to the rock record. The counterpart is to go to nature and infer what's going on in a system you can't control."

"We were primarily interested in directly observing how the microbes disrupt the crystal growth of the carbonate rocks," adds Bosak. In essence, the microbes are large enough to displace a bit of "real estate" with their bodies, resulting in a tiny cavity that is left behind in the permanent record. The micropores in the study tend to be present throughout the crystals and they not only mirror the shape and size of the bacteria, but also tend to form characteristic swirling patterns. If the micropores had been formed by some kind of nonliving particles, the patterns would likely not be present.

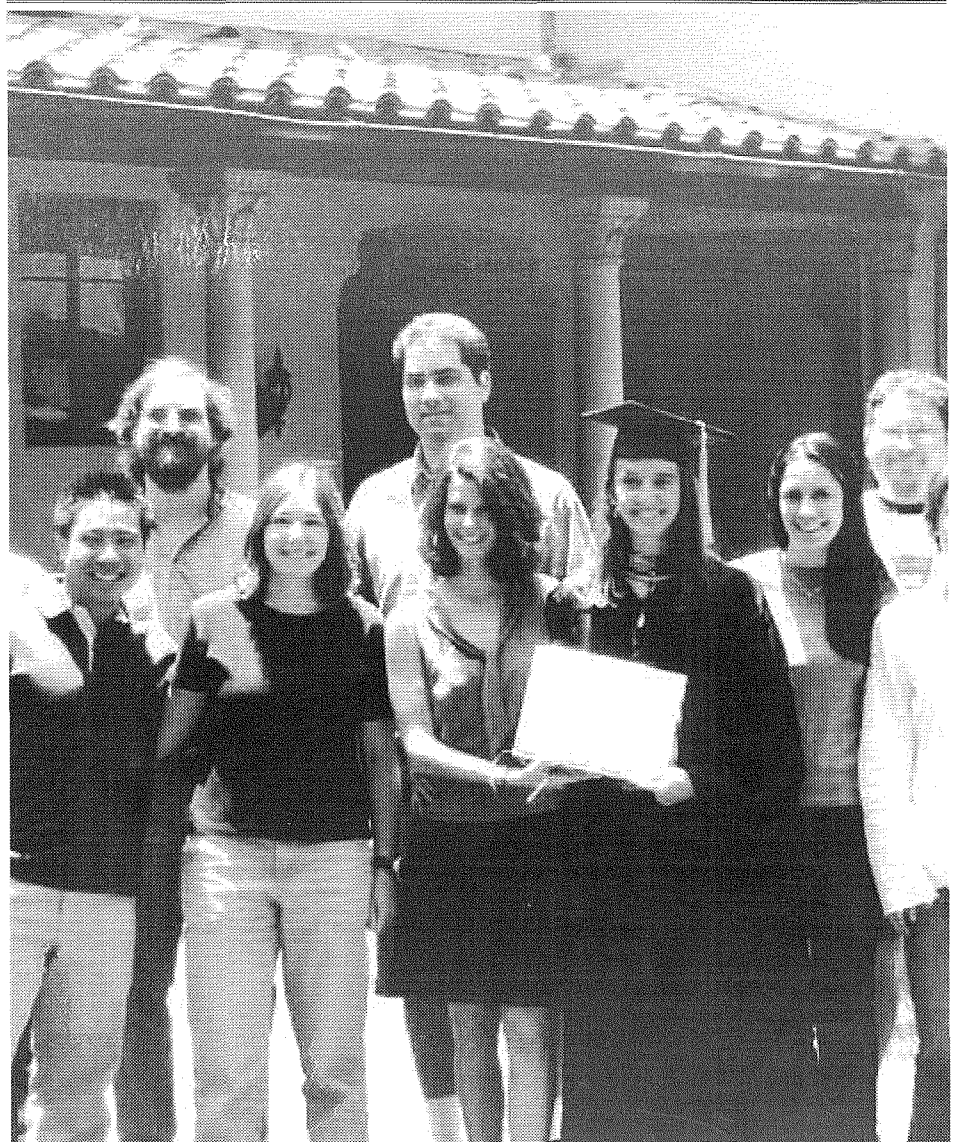
The next step in the research is to run the growth experiments with photosynthetic microbes. The information could help scientists determine which shapes found in certain types of rocks can be used as evidence of early life on Earth. In the future, the information could also be used to study samples from other rocky planets and moons for evidence of primitive life.

Primarily, however, Newman says the technique will be of immediate benefit in studying Earth. "If you really want to look at life billions of years ago, in the Precambrian, you need to study microbial life."

"Even today the diversity of life is predominantly microbial," Newman adds, "so if we expand our perspective of what life is beyond macroscopic organisms, it's clear that microbes have been the dominant life form throughout Earth history."

In addition to Bosak and Newman, the other authors of the paper are Frank Corsetti of USC's department of earth sciences and Virginia Souza-Egipsy of USC and the Center of Astrobiology in Madrid, Spain.

The paper is titled "Micron-scale porosity as a biosignature in carbonate crusts," and is available online at <http://www.gsa-journals.org/>.



Courtesy of [gps.caltech.edu](http://gps.caltech.edu)

The discovery of the method for growing microbes in micropores was made by members of Newman lab (Professor Dianne Newman, center).

## New Voting Technology Performs Well After 2000 Election Disaster

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out of the 2000 election and our initial focus was obviously heavily on voting technologies, but as we worked in late 2000 and early 2001, we quickly realized that the parameters of the problem were larger than the voting machines. We released a report in 2001 where we estimated nearly four to six million votes were lost in the election, the overwhelming majority of which were lost in voting registration and other procedural problems, not just the voting equipment itself."

Between 2001 and 2004, the team worked to propose changes to the voting system by publishing reports online as well as providing them for the benefit of research, policy makers, the media and the general electorate. The two university divisions continually communicate their ideas and findings to each other via the Internet, through conference calls and also during two conferences held in March 2001 at Caltech and October 2004 at MIT. In addition to the renowned faculty members of these universities, a group of dedicated students have also provided valuable insight into U.S. electoral procedures.

Graduate student Betsy Sinclair has published several papers on VTP-related topics and conducts research into the merits and demerits of punch card ballots, absentee voting and also voting by mail. Delia Grigg spends her research exploring various forms of voting technologies. Sarah Hill, another graduate student, has written a paper examining California's policy of recounting

every ballot of every race by hand in one percent of the precincts. Through this system, Caltech receives empirical data from the Los Angeles County recounts and the project is able to compare the results of the punch card machines to the hand recounts.

Among the undergraduates involved in the projects are sophomore Dan Knoepfle and junior Eugenia Iofinova, both of whom conducted research via the SURF program in this area. Knoepfle took a forensic approach in his analysis of the past elections and developed a data mining technique to detect election anomalies, while Iofinova has a paper pending regarding a survey of other democratic nations and their procedures regarding their citizens overseas and their involvement in the political process, raising the question of the practicality of secure voting over the Internet for U.S. citizens and military personnel living and working abroad.

For the 2004 election, Grigg, Sinclair and Alvarez fanned out across southern California to watch polling precinct procedures and watching how they played out. Alvarez commented, "In my opinion, going out and seeing things happen in person—going out and watching them tabulate votes—is a lot like watching sausage being made. It really is a process that you don't think a lot about. It is critically important, obviously, to making the product, but it's messy to see. Delia and Betsy were calling me all day long on my cell phone because every precinct they went to, they had a story. Something funny

happened. Something strange happened. Something unusual happened. That really is what is interesting in general about this process—it's not perfect. But in the end, we tend to get it right, which is what is kind of remarkable."

Overall, Alvarez believes that the 2004 election proceeded relatively smoothly, claiming that despite the presence of procedural problems such as voter registration issues, long lines at precincts and provisional balloting, the classic technological problems or issues with punch card ballots appeared absent for the most part.

The Caltech/MIT Voting Technology Project cannot begin its definitive analysis of the 2004 election until all the data is certified and released by the counties, states and the national electoral systems, but Alvarez anticipates only a handful of glitches in voting technologies. Nevertheless, the technological task force provided by the two universities will certainly be hard at work over the next four years analyzing this election's procedures and results, exploring the worlds of precincts, punch cards, touchscreens, optical scanners and so on, working towards the ultimate goal of an accurate and fair electoral process in years to come.

More information regarding the Caltech/MIT voting technology project can be found at <http://vote.caltech.edu>. On the website are provided links to various reports, media releases as well as the guide, "Seven Steps to Make Sure Your Vote Gets Counted."



*Courtesy of [hss.caltech.edu](http://hss.caltech.edu)*

Professor Michael Alvarez is taking part in the joint Caltech/MIT effort to improve voting methods across the country.

## Identifying Correlates Among Koch's Goals

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ness," Koch said, is that "it's ever waxing and waning" like a "never-ending dance."

On the other hand, many routine actions, such as reaching for an object, require little or no conscious effort in spite of their complexity. Koch calls these actions "zombie agents" and claims they are different from conscious actions. Many common and necessary tasks that a person has little time to contemplate doing become zombie agents, which are complemented by a "general-purpose conscious system", according to Koch. Together, these two systems interpret sensory input and turn it into motor output. This is the reason, he theorized, that consciousness evolved in some animals, eventually leading to self-consciousness in humans.

Perception is another concept vital to the understanding of consciousness. For any attribute, Koch said, perception is all-or-none; "you see that motion, or you don't." Conscious perception also has the characteristic of occurring in discrete episodes, discontinuous snapshots "a little bit like a movie," he said.

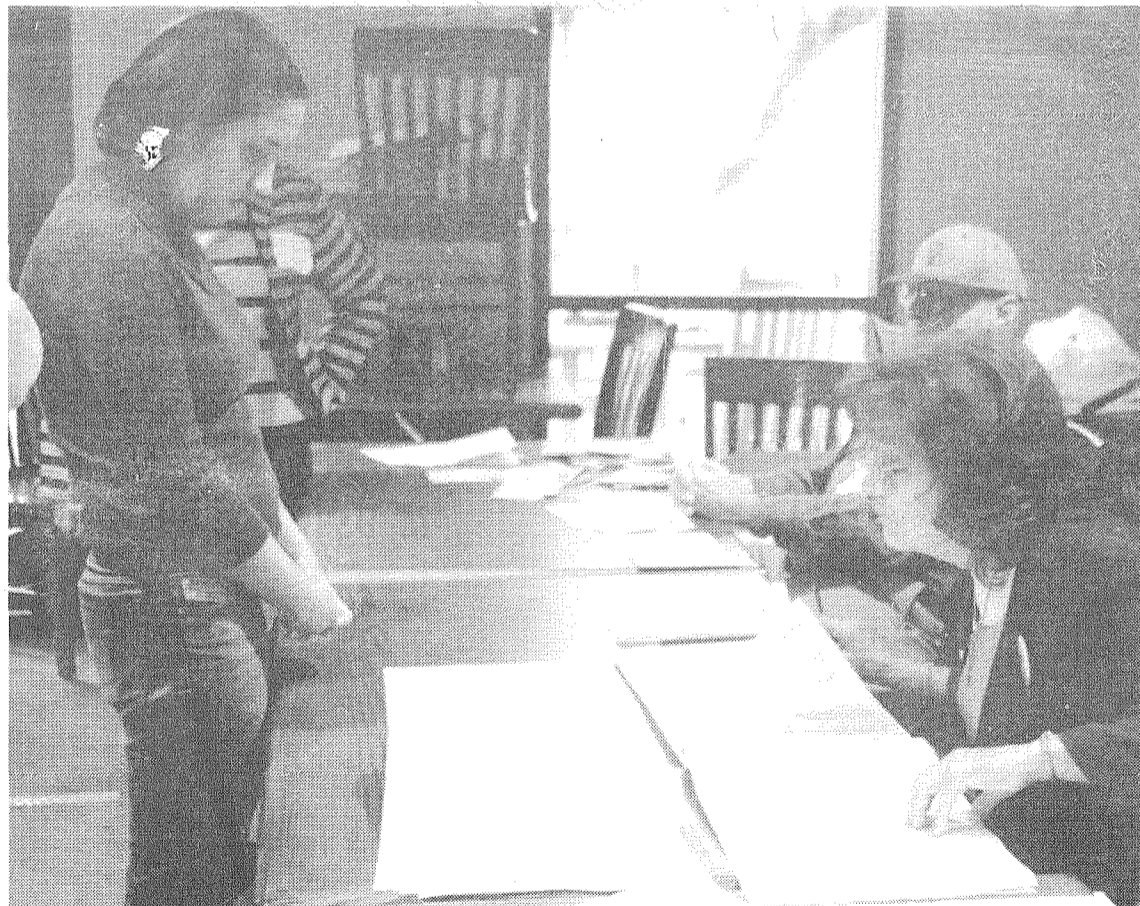
A variety of visual illusions complemented Koch's explanation of perception. In one demonstration, yellow squares were superimposed on a moving blue background; because the blue image competed more successfully for the attention of the viewer, the squares seemed to vanish. Koch also demonstrated the afterimage effect, where exposure to bright colors caused the audience to see their complementary colors on a gray background. This effect, he explained, depends on physical exposure of the retina to color, not on "consciously seeing" it. In fact, a person often perceives a vastly different image than one actually shown to him.

Flashing two seemingly identical photographs to the audience, Koch challenged them to spot the difference. Although the change was as substantial as a missing engine on an airplane, most viewers could not see it. This phenomenon

is known as "change blindness," and occurs because a person only sees specific details from an image in a brief interval, according to Koch. In some experiments, he said, when subjects mistakenly thought they had seen a change, they produced a neural signal just as strong as when they had actually seen one. These results show that conscious perception can influence the visual cortex of the brain more strongly than actual physical stimulus.

During another experiment, Koch said, neurons were found in subjects that responded to specific images. Using a visual illusion called flash suppression, one image was projected toward to subject's left eye, while a different one was shown to the right. Because one image was shown after the other, the newer image would suppress perception of the first. One of these images should stimulate a specific neuron. However, the neuron only responded if the image was perceived and never when it was suppressed. The experiment leads to other questions: can the stimulation of a neuron "bring up" an image? Does thinking about the image cause the same neuronal response? More experiments are needed to provide an answer.

"Ultimately," Koch concluded, "we need to understand consciousness at the molecular level." Goals for the future include practical tests on a genetic animal such as the mouse that could later be expanded to primates and humans. Eventually, specific NCC and the conscious perceptions they lead to will be identified. While some may insist that consciousness is a philosophical and not scientific question, Koch reminded them that just decades ago, many people did not believe molecules of DNA could contain all the genetic properties of life. "Consciousness is the central aspect to all reality," Koch said and it would be a mistake to assume that it can never be explained by science.



*A. Green/The California Tech*

A Caltech student checks in to vote during the general election at Chandler. Analysts believe that this year's election went much smoother than the previous presidential election.

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