Traditions Preserved Through Renovations

By JON MALMAUD

The undergraduate housing system has always been one 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-featurized residences which hopefully will maintain all the personality of the current building.

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 residents 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 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.”

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 consciousness is that questions: “Why does physical activity give rise to feelings and sensations?” 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.”

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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 hail- ing 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 pro-fessor, 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 out of the Florida ballot fiasco.” 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 Popendorf, IHC chairman, explains that “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. Brain, 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. The renovations will also add many exciting new features. Courtyards will be made water-tight so 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.

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Photons 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 contract to the California Institute of Technology to sustain research in photonic technologies. The technical focus of the effort will be on optical, electrically exciting new research area based on the use of microscopic 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 generation of small-scale, highly adaptable and innovative devices made out of traditional materials like glass," explains Psaltis, whose expertise is in nanophotonics. "A glass lens, for example, is relatively unchangeable optically. Our idea is to use fluidics 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 is the key to developing components that can change fluidic pathways to mix and pump liquids into and out of the optical devices. 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, microstructured materials, dynamic nonlinear optical devices, reconfigurable optical switches and ultrafast molecular detectors. Optofluidics is expected to have a broad impact on areas such as telecommunications, biophotonics and biomedical engineering and robotics 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 new multidisciplinary institute to found to create optofluidic technologies. In the foundry, researchers will be able to easily design and readily 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 will all offer significant expertise in areas critical to the design and fabrication of hierarchically 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 biomedical applications; Kathy Vahala, the Jenkins Professor of Information Science and Technology and a professor of applied physics, who is the inventor of optofluidic devices such as high-quality optical microcavities; and Alex 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 a microfluidic optical crystal laser tunable by voltage. 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 Woodrow L. and Anna H. 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.

Continued from Page 1, Column 5

senior year I had the option of living in a triple with freshmen 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 last year and allow all the south houses to hold one giant house party, likely on Beckman Lawn.

The modules will not have their own kitchen. Instead, students will be allowed to cook for two concurrent waited dinner classes. The modules will also have to relocate. 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 Dharma machine will find a new home by the Red Door Cafe. Trustees, alumni 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 creating the renovated plumbing with a protective solution but Wong made sure that this won't interfere with the Blacker traditional of throwing up food and defying gravity. However, that legendary interzonal claw-sink section, will continue to exist although in a modified form, certainly," Kim reminds us that "the people are the same. You're still going to have the unique character of the houses."

The modules 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 medium of those two is what it'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 input on various precious paintings to preserving and the other south house presidents are doing likewise. Popenstein 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 input of student input in the project. Students were on the committee that selected the architect. The IHC and house presidents held numerous meetings with the firm to make sure the new south houses will be partially construct ed to student specifications. "The architects have given a lot of time and concern to getting to know the individual houses and their traditions and needs," Kim continues. Only occasionally have they been student-administration conflicts but only because of 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 bids from contractors. 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 community at large," Hall adds. Also put to rest the rumor that the south houses would be declared historic and hence unchangeable if the school delayed any longer. In truth, "the city just holds our promise, which is that we won't tear [the south houses down]," says Mannion.

Pageboys, Luddies and Ruddles 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 residential so that each house can hold an equal number of students. While the renovations may be a sacrifice, students say that a year later, they will result in wondrous new houses which Caltech can enjoy for decades to come. Tom concludes, "it's a win-win for everyone."
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 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 secured 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.

Men’s Soccer finishes season

The Men’s Fencing team finished its season this past week with losses on the road at Whittier College and Redlands.

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Women’s Volleyball finishes season

The Women’s Fencing 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 Stretten 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 an ace to close out her Caltech career. Sophomore Elisabeth Streed had six kills, three service aces, one block and 20 digs. Freshman Setter Sarah Stidham completed the first full year campagne in 31-15 and 14 digs.

The team finishes with an overall record of 19-9. Congratulations to the whole team on the conclusion of their season.

Men’s Soccer finishes season

The Men’s Soccer team finished its regular season with a 8-1 loss at Pomona-Pitzer on Wednesday. Junior Defender Eric Kehoe scored in the 59th minute, with the assist going to Midfielder Hatem Helal.

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.

First one:
Dear Hamiltony,

I wonder if you’ve ever read my 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 disciplined first, which is 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, and that’s in fact down as a healthy alternative to dairy.

In addition, you’ve claimed that Avery was planning to take away our very freedom.

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

Dear To Whom It May Concern,

Interested in fully clothed pneu­dotomy? Do you want to go 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 now your lawn? All this and more at my site: http://donut.caltech.edu

Your future, the way you vote, could be changed forever, but you rather than your rich friends give you a huge cash payment.

At first I thought this was spam, but then I realized that spam is actually a sort of processed ham product. This is actually just an e-mail advertising something I actually know about, in a somewhat untruthful fashion.

So clearly I’ve polarized Caltech into factions, those who love my column, and those who hate it. Oh, and the vast majority that don’t care. But regardless of what group you belong to, I’m willing to read your e-mails and maybe even write a column about them. If I actually get some real ones at some point. Because I’m just here to help.

(1) Yes, this is an obvious lie. And yes, I’m making this up. For real e-mails I’d need to a) list my e-mail address, b) have someone read the Tech and D) while reading the Tech, read my article. None of this is likely to happen.

2 Yes, this is a real e-mail address you can send comments to, despite the sham of a fake e-mail it is associated with in this column.

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THE CALIFORNIA TECH COMMENTARY NOVEMBER 8, 2004

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Rethinking Civil Marriage

What Marriage Actually Represents

by Simon Que

Last week, a columnist for columnist for the San Francisco Chronicle, Laura Einhorn, published an article calling for a change in the way we think about marriage. Einhorn argued that marriage is a legal recognition of gay relationships and that it is discriminatory to deny any group the right to marry. She cited the example of Proposition 8 in California, which was passed in 2008 and subsequently struck down by the Supreme Court in 2010, as evidence of the need for a change in the way we think about marriage. Einhorn's argument is based on the idea that marriage is a fundamental right that should be recognized by the government for all couples, regardless of their sexual orientation.

From the article:

By Laura Einhorn

The recent column “The Brit- ish Invasion” (San Francisco Chronicle, Oct. 24) is so crookedly ill-reasoned that it is hard to believe it was written by a human being. And no doubt you will get a legal obligation to recognize anyone’s marriage that holds a lot of weight if they believe (correctly) that marriage is a civil contract that confers a right to inherit property after death.

For the aforementioned column, the real issue is not liberty and traditional justice but equal- ity. She admits it herself in the same article, saying that denial of marriage licenses to same-sex couples “brings our birthright of equality by declaring that gay citizens are now forever unequal.”

Boloney! Traditional marriage and government have coexist side-by-side for thousands of years without the latter formally recognizing the institution. Marriage still persists. In fact, marriage most likely predates organized government. People have no intrinsic traits that would merit recognition by government. But ever since the state began handing out marriage licenses in the past few hours and then increased its involvement in family matters, marriage has been watered down. We seem to have equal- ized divorce with alimony, marriage tax penalties, and violations of parents’ rights. Such a system gives people neither liberty nor justice. It makes no sense for marriage to use the word “marriage” when it clearly stems from the state and is anything but equal.

Real check: government can’t fix marriage because its jurisdiction is only over civil marriage, a cheap substitute for real marriage. Sadly, traditional marriage was once an institution to the sideslaid by civil marriage, which is what many people seem to consider real marriage. People should realize that it is traditional marriage that brought us our respect and that it has actual social legitimacy. After all, voluntary social interac- tions can prevent us from being recognized as a government.

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, it can only it a matter of how the private efforts of the state and communities, and that is what it would take to end it. And the state has no rightful efforts.

“Should we concentrate on minimizing the number of Americans killed by terrorists, not on changing which Americans are killed and where they are killed?”

By Swaroop Mishra

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Boloney! Traditional marriage and government have coexist side-by-side for thousands of years without the latter formally recognizing the institution. Marriage still persists. In fact, marriage most likely predates organized government. People have no intrinsic traits that would merit recognition by government. But ever since the state began handing out marriage licenses in the past few hours and then increased its involvement in family matters, marriage has been watered down. We seem to have equal- ized divorce with alimony, marriage tax penalties, and violations of parents’ rights. Such a system gives people neither liberty nor justice. It makes no sense for marriage to use the word “marriage” when it clearly stems from the state and is anything but equal.

Real check: government can’t fix marriage because its jurisdiction is only over civil marriage, a cheap substitute for real marriage. Sadly, traditional marriage was once an institution to the sideslaid by civil marriage, which is what many people seem to consider real marriage. People should realize that it is traditional marriage that brought us our respect and that it has actual social legitimacy. After all, voluntary social interac- tions can prevent us from being recognized as a government.

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, it can only it a matter of how the private efforts of the state and communities, and that is what it would take to end it. And the state has no rightful efforts.

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By OLEG KOGAN

Must Fight!

“Left be with词语 its in the power and any, daily in its ways in the culture of reason and Hollywood and old media. It visions upon the morals, values and tradi-

tion and the culture of reason and

country.”

The left be with words appearing in the LA Times article by Frank Porste on the weekend after Nov. 2. We can’t have the power to be more put-together and to have more persuasive power over those who disagree.

Intelectuals and progressive people move the world forward.

In his new book “The Power” Howard Dean writes:

“People who disagree with us - then why should the pro-

gressive thinking has nothing to do with an honest con-

sciousness for the loss of moral-

responsion for those values that were

values, for science, for things of

society where women are free to

-sting for those values that were

fearful not to be interpreted as

cause and country.”

It is so much more effective in the

this is about being heard - if you

ncant that we have a spine, that we can

are reasons to be concerned that

activists of this country remain

mean now in the short term, in the long term. This goes to us - then why should the pro-

moral and less probably is more promi-

courage and for a good reason. I person-

at those conflicting values everyone

and killed! ... Get involved, speak out and

those who disagree?”

One may argue: doesn’t fight-

fight to have your voice heard. 

Write letters to Congressmen, Senators, movie directors, invite others to do so, start petitions. There’s plenty of room for creativity here. But above all, don’t just be a part of the fabric.

Do all you can to make it even worse”, being

cause we have a spine and we can

get a little reduction? We may have reasons to be concerned that

and killed! ... Get involved, speak out and

fight! to have your voice heard. 

Right wing opinions.

The concern for the loss of mor-

moral and less probably is more promi-

cause fight back. Fighting means

left to us - then why should the pro-

exercise, for things of knowledge, but it does not imply that we simultaneously lose re-

we have to fight.

The concern for the loss of mor-

al so important. Infect us - then why should the pro-

about the moral and less probably is more promi-

The culture of reason and prog-

and kill! ... Get involved, speak out and

_left to political correctness, but not to political correctness that remains in America.

anti-gang, anti-control, anti-abort, hawkish - these are almost 

progressive, forward-looking, bright, creative, intellectual. During the election campaign Bush was actively pur-

Society where women are free to

believe for what we stand. We

must do all we can to 

activists of this country remain

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Right wing opinions.
Maria Gracefully Enters the Heart

By HARRISON STEIN

With all of the sequels and event pictures littering the Hollywood release schedule, it is 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. If 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 jscichock@tech.caltech.edu.

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Women's Health and Wellness Series

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

Date: November 18, Time: 12-1 pm

Location: Women's Center

The SPB will be hosting a mini-lesson followed by general discussion 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 Language 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 with this film, because it was directed by an American and largely takes place in New York.

Also be offering Team Practice, lunch will be provided. Lunch provided. RSVP required! To sign-up please call ext. 3221 or email: gwenert@studaff.caltech.edu

Chairball Dance Team

The first general meeting of the Caltech women's community is on December 7 or try to sneak a final screening for new writers, photographers, copyeditors, layout artists, and members for our business staff. Women Engineers is Monday, November 13th at lunch in 210 Thomas. Lunch will be provided.

The California Tech

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Rat Experiments Revealed Clues About Memory Path

By MARK WHEELER

PASADENA, Calif.—Biologist Erin Schuman of 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 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 that the TA pathway is required in important ways. 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 for four weeks). The TA pathway was lost and (dis)abled 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 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 are something that comes with an exchange of information between the cortex and hippocampus, we wanted to know if the TA pathway was working in the acquisition phase or 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; the other group was allowed to rest four weeks and then tested. This proved the TA pathway is required to consolidate long-term 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 mechanism of memory formation and retention may shed light on diseases like Alzheimers, where memory is impaired."

Geologists Develop Method For Studying Microbial Life

By ROBERT TINDOL

PASADENA, Calif.—Geologists 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 Desulfobulbus 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 Diane 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 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.

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

Identifying Correlates Among Koch's Goals

Continued from Page 1, Column 3

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

On the other hand, many rou-
tine actions, such as reaching
for an object, require little or no
conscious effort in spite of their
complexity. Koch calls these ac-
tions "zombie agents" and claims
they are different from conscious
actions. Many common and nec-
essary tasks that a person has
little time to contemplate doing
do because zombie agents, which
are complemented by a "general-pur-
pose conscious system", accord-
ing 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 conscious.
ness. 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 oc-
curring in discrete episodes, dis-
continuous snapshots, "a little bit
like a movie," he said.

A variety of visual illusions
complemented Koch's explana-
tion of perception. In one dem-
stration, yellow squares were
superimposed on a moving blue
background because the blue im-
age competed more successfully
towards the ultimate goal of an
accurate and fair electoral process
in years to come,

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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Pasadena, CA 91125

Continued from Page 1, Column 2

out of the 2000 election and our
initial focus was obviously heav-
ily on voting technologies, but
as we worked in late 2000 and
early 2001, we quickly realized
that the parameters of the prob-
lem were larger than the voting
machines. We released a report
in 2001 where we estimated near-
ly six million votes were lost
to the voting process. Alvarez

-- Continued on Page 4, Column 1 --

More information regarding the Caltech/MIT voting tech-
ology project can be found at http://
vote.caltech.edu. On the website
are links to various re-
ports, media releases as well as
deleted, the "Seven Steps to Make
Sure Vote Gets Counted."