



## Ch3a Sees a Makeover

By Casey Jao  
STAFF WRITER

For once, procrastination may have actually paid off. Upperclassmen who waited until now to take Ch3a have it easier than their peers. In response to student feedback, chemistry professors Mitchio Okumura and Doug Rees worked with graduate student Yoshie Narui over the summer to redesign the core freshman chemistry lab course Chem 3a.

Students complained chiefly that the old Ch3a was too time-consuming. Prelab and post-lab work inevitably took more than the one hour per week listed in the course catalog. Students in the new Ch3a spend three hours in lab per week, compared to five previously, and are graded almost entirely on their lab notebooks. They sit weekly for a one hour lecture on relevant chemistry concepts and lab procedures. And they no longer write formal lab reports.

"I'm glad I waited [to take

Ch3a] because the changes made to the course do a better job of teaching the student what's going on and instructing lab procedures. There are only three lab hours a week, and most sections aren't at 8am anymore," said Eric Stansifer, a senior taking Ch3a. Only one of the six sections has lab at 8am.

"[The revisions] have made Ch3a more friendly for non-chem majors," said Warren Cai, a junior ChemE major and one of the three undergraduate TA's for the course. On the other hand, he noted that students don't learn to write formal lab reports, which are required in more advanced lab classes like Ch3b.

The curriculum needed some revision to accommodate the reduced lab hours and to be more consistent with the intent of the course. Narui said that Ch3a was always intended to "cover general chemistry concepts and get students excited."

"We're trying to cut back on titrations...tedious things," said Narui, a course instructor and also a former Ch3a TA.

Students start out by extracting caffeine from pills of NoDoz, an alertness supplement. They then move on to Project Werner, the cobaltamine synthesis and characterization exercise from the old Ch3a. While the caffeine extraction has an organic flavor, Project Werner emphasizes inorganic, especially coordination chemistry, as well as synthesis technique. In the final weeks students borrow a page from Chem 3x and explore the properties of Rubippy, a ruthenium catalyst for water electrolysis and a component of next-generation solar cells.

Next term Ch3a will run in parallel with Ch3x, also a new course which began last spring. While both fulfill the core chemistry lab requirement, Ch3a emphasizes the chemistry while Ch3x leans more toward data analysis, according to Narui.

"We're still in a kind of flux," she said. She plans to solicit student feedback in a week or two.

"Overall I think it's a big improvement," said Cai.

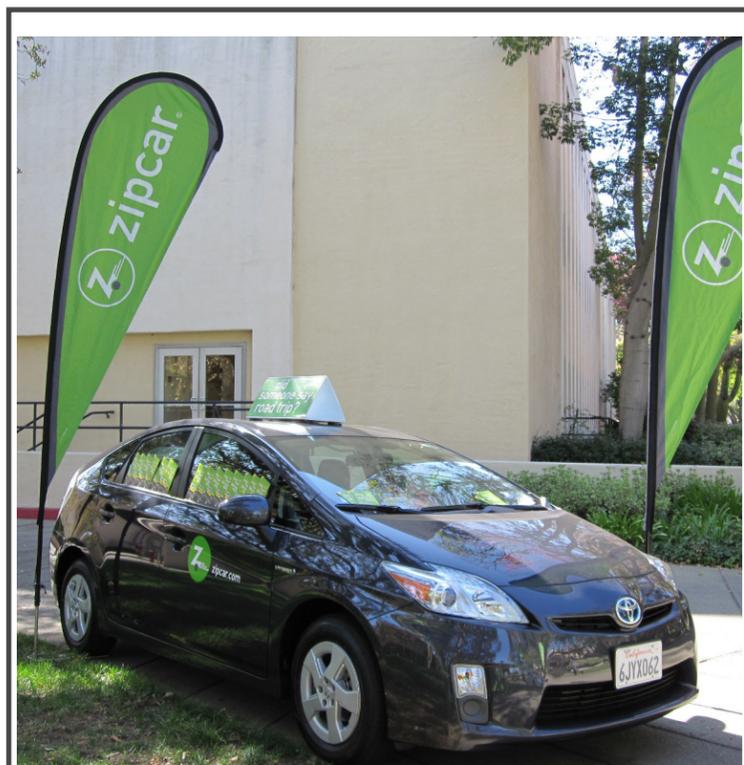


PHOTO BY TINA DING

Zipcars arrived on campus last week as part of an institute-wide sustainability initiative.

## A Solar Army Is On The Rise

To make "solar carpets," recruiting high school students to use Lego-Mindstorm scanning printers

By Tina Ding  
STAFF WRITER

A couple months ago, a fourth grader emailed Professor Harry Gray; she told him that she has watched his live streaming video of the Watson lecture. Then she asked him how she can join the solar army.

"Everyone wants to join the solar army," said Gray proudly.

The solar project, Powering the Planet, which begun at Caltech 3 years ago, is not a novel idea, but its recent progress towards a working prototype and recruiting a "solar army" of high school to undergraduate students will impact the face of science in research and secondary education.

The project, headed by Harry Gray, Arnold O. Beckman Professor of Chemistry, was approved for Phase II of \$20 million in September 2008. On this project, Caltech is currently collaborating with over 10 institutions, from MIT to an institution in Switzerland to make the final prototype. The prototype is a three component water splitting device made of earth abundant cheap materials that produces fuel in the form of H<sub>2</sub>.

On developing the photoanode side of the project, the group, partnered with Professor Bruce

Parkinson of University of Wyoming, is currently in search of an effective Earth abundant and cheap metal oxide that can work as a solid state water oxidation catalyst, a search that will include the efforts of "all the bright young people around the world," said Gray.

Parkinson over the last few years has developed a metal oxide printing device built from a common inkjet printer. He has also developed a laser scanning system capable of measuring potential photocurrent from these metal oxide materials build from an inexpensive Lego-Mindstorm kit. With the printing kit called SHaRK (Solar Hydrogen Activities Research Kit) well established, the next goal is to recruit large amounts of people to collectively investigate the million combinations of metal oxides.

The establishment of these Beta testing sites, where the printing and scanning kits have been distributed, has already begun, as over 10 undergraduate universities in the United States are currently collecting data for the Caltech solar research project.

Because of local interest and proximity, this summer, three Beta testing sites have been established at Polytechnic High School, John Muir High School, and Blair

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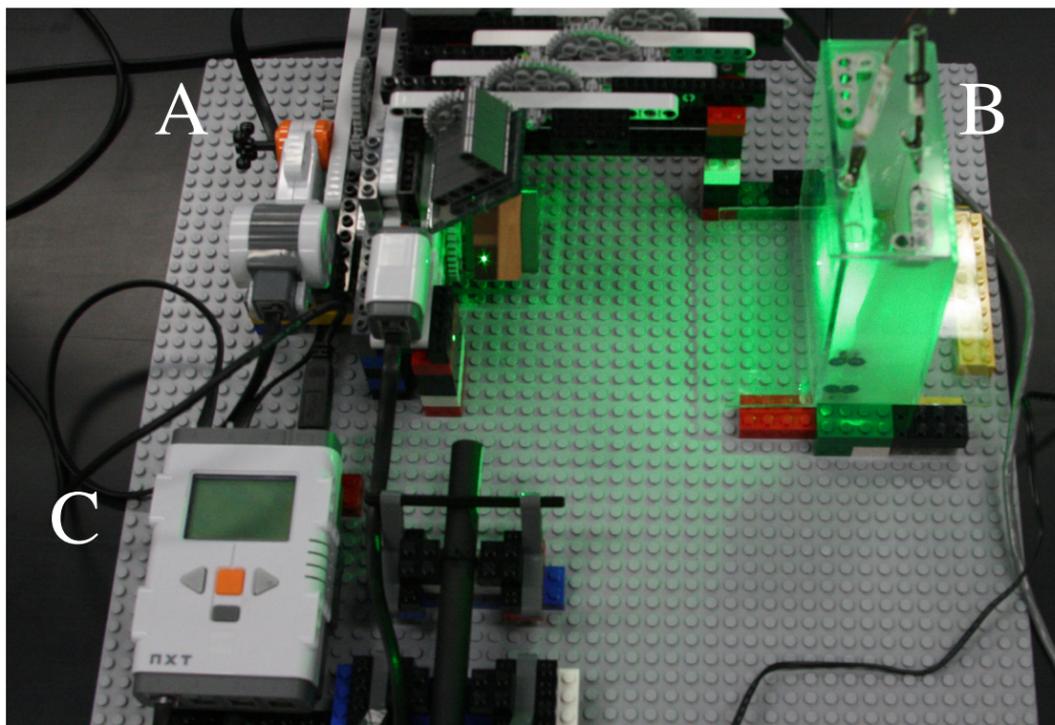
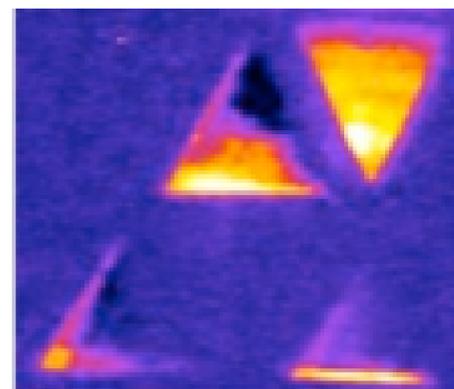


PHOTO BY TINA DING

Inkjet printers create metal-oxide triangular patterns (right) to sample possible combinations; finished patterns are tested by Lego Mindstorm kit (above) used for measuring current in response to laser light

- A - Lego Mindstorms motors used to operate gearboxes for a laser scanner
- B - Green Laser pointer mimics sunlight
- C - Water splitting activity measured as a function of laser position



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## Administrators: Talk to *The Tech*

By Chris Kennelly

EDITOR-IN-CHIEF

In the past weeks, I've gathered that a number of administrators seem to have forgotten that *The Tech* is a student-run newspaper with editorial processes far different than their own. A few have forgotten that we're not an official institute publication.

Consider official Caltech publications. They're well-made by full-time employees and distributed across campus and other interested persons. For these publications, an official line is obvious and easy to obtain.

In contrast, *The California Tech* is a far cheaper publication to this institute: It's funded entirely from ASCIT dues (per the ASCIT bylaws) and advertisements. Despite what an undergraduate might think; people actually read *The Tech*.

Based on the whispers I've heard, a number of officials have been rather displeased with this

newspaper. Instead of finding out complaints directly, I've heard them third-hand. The present approach of passive-aggression yields nothing for anyone.

If this paper has erred on matters of fact, let us know *directly* so a correction can be made. If this paper has erred on matters of opinion, write us anyways. Letters to the editor are taken from any member of the Caltech community and are published (subject to editorial discretion).

## Where Were the Bagels?

By Liz Decolvenaere

UNDERGRADUATE

Being a sophomore is difficult. You're living off campus for the first time. You're still enrolled in core, but without the pass-fail buffer. You have to cook your own meals for yourself – every night – often a first-time experience for many Techers! But worst of all (though, possibly a consequence of the third point) – you're hungry. Ever watch a group of starved tiger sharks descend on a bloodied calf carcass? It's not a pretty sight. Neither is a group of roving sophomores in search of free food – roaming from event to event, eating the leftovers of meetings, presentations, and conferences.

But there is one sure-fire source

of food available to not only sophomores, but, all of campus. Monday morning, between 8 and 9 AM, delivered fresh – Noah's Bagels. Soft, often warm, served with a variety of cream cheeses in characteristic brown paper bags, Noah's bagels can make even the most incomprehensible MaLa lectures go down just a bit easier. Bagels are a tiny toroidal wedges of heaven to many hungry sophomores, offering a small comfort before Ma2a.

But not today. On today, Monday October 19th, there were no bagels. ASCIT president, AKA DonutBitchAnthonyChong failed in his sacred duties as provider of breakfast foods. Starting at 8:40, students came out to the Olive Walk to find... nothing. And as of

1:42 PM, still, no bagels. Where is our breakfast? What happened to election campaign promises – “The president can start with executing his required duties: making sure we have a big T and donuts and bagels are delivered properly.”, from Chong's presidential bid article, in the January 26th edition of the 2009 Tech? Are these bagels merely another casualty of administration cutbacks? Is Anthony Chong redirecting valuable ASCIT bagel money towards his own twisted goals? Or perhaps, somewhere along the line, someone slept through their alarm and forgot to pick up the bagels?

Where are our bagels, Anthony Chong? Or must we suffer another week hungry?

## Intellectual Creativity.. Continued

By Brian Merlob

UNDERGRADUATE

What is learning? When you aced that history exam in high school, had you really learned the material or was it just rote memorization? And still today, do you just search through textbooks for equations, without understanding how they were conceptualized and proven, and what their significance is? Gifted students are amazing at memorizing and applying information without truly internalizing or comprehending it. So how should you learn? Learning science in particular requires three steps: addressing preconceptions, inquiry, and metacognition.

- **Addressing Preconceptions:** Which of the following three objects reflect light: a mirror, a shiny penny, a blanket. As a child (or 99% of America), you might choose only the first two, even though all objects reflect light – or at least all the objects you can see do. If these preconceptions aren't addressed, then students might hold two, perhaps contradictory, beliefs about a subject – one intuitive (but wrong), and one mathematically correct. A common preconception among young children is that heavy objects fall faster than their lighter counterparts. While the physics formula for constant-acceleration linear motion shows that gravity affects objects irrespective of their mass, showing elementary students this formula does not break them of their previous prejudices, whereas chucking objects out of a window does. As you can imagine, professors who spend 100% of class time lecturing are hard-pressed to relieve their students of their misconceptions (even if Feynman found a

way). Asking students to justify their intuitions by designing experiments, and then telling them what the results of that experiment would be, is a relatively effective way of addressing this issue.

- **Inquiry:** Which is better, to assign a reasonable amount of reading for next week's class or simply to ask that students understand the answer to some conceptual question? It's easier to assign the reading, because then the students are liable to know that information, but sometimes, what starts as one Wikipedia page turns into 2 hours of avid clicking. Obviously, reading to satiate an interest is more motivating than piquing curiosity is no easy job. However, it should be easier to do among students who profess to already be curious about what their learning – you just have to ask the right question. And the right question doesn't always have a correct answer. One the most essential and least emphasized aspect of science is imagination. “Imagination is everything. Imagination is more important than knowledge. For knowledge is limited to all we now know and understand, while imagination embraces the entire world, and all there ever will be to know and understand.” - Albert Einstein. I actually do remember the last problem set that asked me to imagine, but if I wasn't in such awesome classes, I probably wouldn't, and considering that this is the playground of math and science, I think that's a problem.

- **Metacognition:** Read the following: “If a serious literary critic were to write a favorable, full-

length review of *How Could I Tell Mother She Frightened My Boyfriends Away*, Grace Plumbuster's new story, his startled readers would assume that he had gone mad, or that Grace Plumbuster was his editor's wife.” If you had trouble reading straight through, then you're a good reader, because poor readers will generally tumble all the way through without comprehending the passage's meaning. Now imagine the same concept, but with science. It's important to ask at each stage, do I understand? Does this fit in with what I already understand? What might this also imply? To give another example, imagine inviting a chess master, a chess player and a novice to your House, and giving each 5 seconds to look at a chess board with pieces placed on it and then asking them to reconstruct the positions of those pieces on another board. Who does the best? It depends. If the pieces are placed randomly, then all will do about equally; if the pieces are arranged meaningfully, as if it was in the middle of a game, then the chess master will be able to place the most pieces correctly on the board (16, 8 and 4 respectively). So a large part of metacognition is self-monitoring, which is the individual student's job, but finding ways to accurately test metacognition is almost equally as important because it allows students to discover how much they really know.

As always, my ideas are far from perfect, but I've thought about them for a long time, so I'd love any commentary you'd be willing to give - email me anytime! (Merlob@caltech.edu)



By Perrin Considine

UNDERGRADUATE

As a member of the Caltech cross country team, I'm really excited to see coverage of our Saturday race in this past Tech issue. However, the caption of the photograph “Caltech runners race this last weekend” is misleading, because out of two the runners in the photograph: one of them has left the country this term, and the other has left the college completely. Also, the photo is from 2007.

**Corrections:**  
In the October 19th, 2009 issue, Rick Bischoff's last name was incorrectly spelled in our headline. We apologize for any confusion.

### The California Tech

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# Intellectual Ventures-CALTECH INVENTION COMPETITION

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## Deadline Extended!

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### IHC MEETING - MINUTES OCTOBER 22, 2009

**Present:** Max, Sly, David, Pallavi, Robbie, Paul, Benji

**Absent:** Tim, Daryl, Nick

**Guests:** Dan Thai, Chris Hallacy, John Forbes

**Prefrosh Weekend 2010** - A portion of the IHC met with Erica O'Neale, Geoff Blake, and Ray Prado. The consensus as of now is that students will arrive on Thursday and

check-out from Admissions on Saturday. In coordination with Admissions, however, houses and Student Affairs will sponsor and publicize optional events for all of Saturday. Prefrosh will also be told they can spend the optional Saturday night with their hosts. A schedule from the students needs to be put together soon so Admissions can publicize it.

Additionally, there will be a one-day preview during another

weekend, on a Friday, that Admissions will work with students on to make exciting for the prefrosh who can only make this one-day event. This has been put in place to ensure that the prefrosh who cannot make it to PFW will have another option.

**Murals** - The presidents of the houses have given a list of murals that they agree should be painted over or fixed up to housing, who has been, and will continue, to paint over the

indicated ones. While there is currently a moratorium on murals, further discussions with Housing regarding the mural policy and making sure it is enforced will lead to a resolution soon. The IHC agrees that the policy should be consistent with all murals (they should all be checked).

**House Dues** - House Dues lists need to be in; the presidents are going to take care of them soon

so the houses can get money. After Tom Mannion takes care of first term this year, he'll fix the mess that happened during first term last year.

Max - fsqolacqzrr [sic]

Minutes by Pallavi

### ASCIT BOARD OF DIRECTORS MEETING - MINUTES OCTOBER 19, 2009

**Officers Present:** Anthony Chong, Andrey Poletayev, Pallavi Gunalan, Maral Mazrooei, Michael Maseda, Laura Conwill, Nadia Iqbal  
**Officers Absent:** None

**Guests:** Chris Hallacy, Brian Merlob

Call to order: 12:15 PM

**President's Report:**

*The California Tech is obligated, under the ASCIT Bylaws, to publish the minutes of the Board of Directors. The BoD minutes are published as-received (including any errors) and without further abridgment. For unabridged versions of the minutes, consult Laura Conwill, ASCIT Secretary.*

*The Editors include minutes from IHC meetings, excerpts from the ARC's meetings, and other announcements voluntarily as a service to the community.*

- **Alumni interaction:** This morning, Anthony received an email from the alumni fund director asking about alumni involvement in rotation. However, we should think about ways in general to involve alumni
- **Invention competition:** Intellectual Ventures is offering \$35,000 to [sic]

**Officer Reports:**

- **V.P. of Academic Affairs (ARC Chair):** In the past week, Andrey and the ARC ran a meeting, had a student-faculty lunch, and looked at some course complaints. They are trying to get profs to employ shorter-term

feedback mechanisms. Tonight, the ARC will hold a long-term planning meeting. They are looking into redesigning Moodle and putting Clue back into action.

- **V.P. of Nonacademic Affairs (IHC Chair):** Meetings will be on Thursdays. The next one will be in Dabney.
- **Treasurer:** Maral reviewed the ASCIT Formal budget from last year with Lorrie. It turns out did not actually run too far over budget. There is a conflict with Dabney's BoD dinner visit next Wednesday; we will switch it to Thursday.
- **Social Director:** Meeting

with Tom Mannion today about concert.

- **Other:** Chris Hallacy is here! Yay! Anthony says: use your staff members. We will not be using a photocopier service in SAC 15.

**Meeting adjourned:** 12:31 PM

Submitted by Laura Conwill  
ASCIT Secretary

## CHĀM KOREAN BISTRO

by Andrew Freddo and Dannah Almasco

Grade:  
C+Walking Time:  
20 minutesGo here to...  
get a different take on Korean  
cuisine close to home.Contact Info:  
(626) 792-2474  
[www.chamkoreanbistro.com](http://www.chamkoreanbistro.com)Price Range:  
\$\$

On Cordova Avenue right off of Lake, Chām Korean Bistro recently opened with a novel take on Korean food. The atmosphere is bright and modern, and the staff was extremely helpful in explaining the different options to us. We split two entrées: the Ssam Garden Platter (\$5 + \$6 for meat) and the California Bibimbap (\$10).

For the Ssam Garden Platter, which essentially was a glorified lettuce wrap, we had a choice of different meats that it could be served with. We selected the bulgogi, which is thinly sliced beef marinated and sautéed with onions. The platter came out with all the materials for making your own lettuce wraps, including the leaves, pickled radish, and spicy noodles. You definitely have to make the wraps quickly, though, because the sizzling platter with the bulgogi quickly cooled off! Sometimes, also, there were bones in the beef, so be careful. At first, there was too little lettuce, but we were able to get some more when we ran out.

We decided to get the California Bibimbap with spicy BBQ pork. Though all the flavors were fresh and good on their own, this combination was strange. It felt like a cross between a salad because of all the vegetables and an entrée with the pork and rice, though did not really accomplish either goal. Mixing all the ingredients together, as we were instructed, really diluted the individual flavors of the dish, and it may have been better to eat each item separately. It simply was missing something to connect everything together.

Overall, Chām is a trendy place to try Korean cuisine close to campus. Though the staff is helpful, they may be a bit overzealous in their assistance. The prices are a bit high for students, and do not go expecting Korean BBQ. Also, if you're especially hungry and want to fill yourself up, head over to Souplantation instead!



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Walk, or send [tech@caltech.edu](mailto:tech@caltech.edu)  
an email if you're interested in  
being a part of the Tech.

## *Paranormal Activity* ... not so paranormal, after all.

by Julianne Gould and Esther Shyu

The trailer for Paramount's highly successful new horror flick "Paranormal Activity" has fewer scenes from the actual movie than from a terrified test audience screaming, hiding their faces, and generally being terrified out of their minds. "Paranormal Activity" is one of the scariest movies of all time," the preview warns. "The entire auditorium was freaked out of their minds...people were physically shaken." Rumor (or at least Wikipedia) has it that producer Steven Spielberg was so scared by "Paranormal Activity" that he thought his DVD was haunted, and that test audience members started walking out of screenings because they were too disturbed to keep watching. In face of all these crazy claims, we were pretty skeptical about just how scary this movie could be. Compared to Asian horror classics like "The Grudge" and American gore flicks like "The Texas Chainsaw Massacre," could "Paranormal Activity" really live up to so much hype?

The premise of the film is pretty straightforward. Typical young boyfriend and typical (well, mostly) young girlfriend move in together. Girlfriend neglects to warn boyfriend that she has had an evil demon following her since she was eight years old. Curiosity piqued, the very brave (or very stupid) boyfriend starts recording everything with his new camera, hoping to obtain proof that "paranormal activities" are really going on. The resulting film is a documentary-styled, day-to-day account of the couple's experiences, including visits from a psychic, creepy night time escapades, and the boyfriend's eventual attempts to instigate the demon.

Ultimately, your mileage will probably vary on "Paranormal Activity." If you're watching for dramatic pop-out scenes or lots of demonic confrontations and gore, prepare to be sorely disappointed. In fact, unless you are terrified by slamming doors, the sounds of footsteps, and the nausea-inducing shakiness of a handheld camera, you might actually run the risk of falling asleep. In order to retain its "home movie" feel, the film mostly consists of the couple's mundane everyday experiences eating breakfast, surfing the web, and chilling around the house with some occasional bickering. In truth, the only thing that kept us awake during the slow-placed first half was suspense generated from the movie's excessive advertising hype. In the end, said hype proved more anticlimactic than anything else — the titular "paranormal activities" were featured only in small chunks, largely towards the end, of the 1 hour and 40 minute long movie, and, even then, were nowhere near as terrifying as we had been led to expect.

To others, however, the more realistic, understated atmosphere of the movie might be a welcome change from over-the-top horror clichés. "Paranormal Activity" is definitely not your typical slasher flick, and its appeal to realism and highly relatable events might very well hit home for some viewers. After all, while most of us haven't ventured into cursed Japanese mansions or been stalked by crazed serial killers, who hasn't heard creepy noises in the middle of the night? We do have to admit that we haven't gone to bed yet, and if we feel a sudden breeze or hear ominous creaking in the living room, we might not be able to sleep. But then we could probably get more work done.

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## *Where the Wild Things are* "clumsy... bizarre... surreal"

by Faith Shuker-Haines

There are movies that you go to because you think you'll like them, and there are movies that you go to see because you're just so damn curious that it's worth your \$10.50 and 3 hours just to see what it's all about. I wasn't sure I'd like *Where the Wild Things Are*, mostly because I was worried that the monsters, when translated to film, would be too silly, that there would be "comic relief" sidekick characters with lines that sounded like they were written by a bored 45-year-old man, that the movie would resort to "antics" when the story was lacking. But I had to see it anyway, because if I had to trust a director to turn a ten-sentence book (really, it's ten sentences long) into a three-dimensional full-length movie, it would be Spike Jonze.

My fears came true a little bit, but I didn't mind the "antics" as much as I thought I would, mostly because of the unbelievably well-constructed opening. We see Max (Max Records, a surprisingly non-shitty child actor), a nine-year old with anger problems who would probably be stuffed full of Ritalin if his mother (Catherine Keener) weren't so patient. But

the movie does a good job of showing Max at school, in his yard, in his blanket fort, and drawing us into that whole wide-eyed boyhood thing. So when Max gets mad at his mother and runs away to the land of the Wild Things, we're sort of invested in their wildness, their silliness, and even their scariness. Yes, the slapstick was there, but

**"... visually, the movie is without par. The sets, the lighting, the monsters, the scenery, are so beautiful it's almost surreal."**

by the time it arrives, the movie is sort of bouncing along in this childlike state, and it seems natural.

The Wild Things are played by giant puppets with various famous people providing voices, and it's easy to see why Max falls in love with them. They are frightening, they are powerful, and they have fun smashing things. Each monster is supposed to represent a different part of Max's psyche or a different person in his life, and the anal-

ogy gets a little heavy-handed at times, which brings the movie down. In what I'm only assuming was an attempt to make the movie deeper, the clumsy symbolism sucks the joy out of most of the second half. And some scenes are so bizarre and inexplicable (one monster hits birds out of the sky with stones and insists they are her friends Bob and Terry) that you wonder how they made it past the cutting-room floor.

But visually, the movie is without par. The sets, the lighting, the monsters, the scenery, are so beautiful it's almost surreal. The music was a Juno-style indie soundtrack that was alternately fun and out-of-place.

I think a little bit of old-fashioned John Williams would have added some much-needed majesty. I think, in general, what disappointed me was the lack of majesty, the lack of awe and wonder that one should feel in an encounter with these creatures. But maybe that just means they got it right, because a real kid wouldn't feel any of that sort of shit, and what the movie does perfectly is capture what it's like to be a kid.

## SOLAR ARMY, FROM PAGE 1

High School. Jillian Dempsey, a graduate student in the Gray lab that leads this Pasadena high schools initiative, introduced this project to the schools by presenting to high school students during lunchtime and afterschool. The program allows about 4 high school students from each school, selected by each school's own method, to work with 2-3 Caltech students on learning and utilizing the SHaRK device. Besides Dempsey, Caltech students in the program are undergraduate student Carolyn Valdez, and graduate students Joseph Beardslee, Suzanne Golisz Leslie O'Leary, James McKone, Bryce Sadtler, and Elizabeth Santori.

Furthermore, a curriculum will be built around the kit to include teaching materials such as books and manuals that explain the redox chemistry and metal stability behind the printing device. Throughout the year, the high school students will work with their teachers and the Caltech students. They will have the opportunity to meet with students from other high schools, and visit the Caltech labs to see more of the research. All this will lead up to the SHaRK conference in May when they will meet with all the students in the SHaRK project and present their results.

This is one of Harry's grand visions, to see the science infiltrate to the high school level, where students can participate in research right in their chemistry classes. "This is actual research," said Siddharth Dasgupta, Managing Director of NSF Center for Chemical Innovation (CCI). "We don't know the answers, Harry doesn't know the answers, when some people find something exciting and interesting, that's actually open-ended research they're doing."

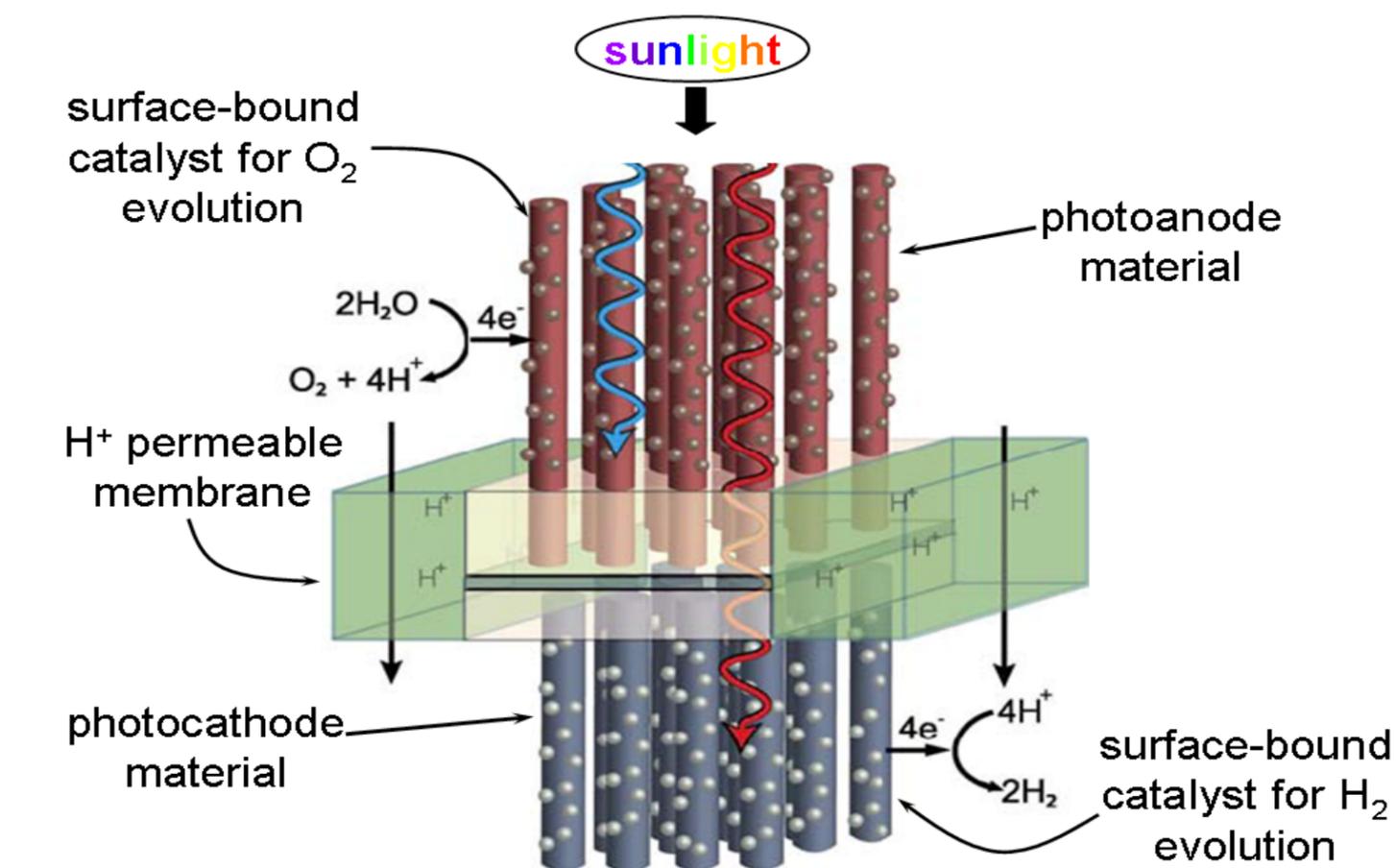
The Institute for Chemical Education (ICE), a foundation whose goal is to create new materials for teaching and learning, is currently working with the solar army to reduce the cost of the SHaRK kits. Gray in the meantime will apply for a separate NSF grant to allow for the establishment of an additional 30 to 40 more Beta sites at high schools around the country in the next year. "At that point, one would envision that the Institute for Chemical Education would be making and selling these kits at a much reduced cost and any high school in the country can just go buy from ICE when needed," said Siddharth.

## Building the Army

"We love to help high school chemistry teachers make their class more exciting and interesting," said Gray. Science is often not presented in the most exciting manner in public high schools, where the 'labs' are rundown and the material is crudely presented. The solar printing device will be a way for students to see the implications of science and its power in the future of our society.

"They're not out there alone doing something irrelevant. Some kid in some place in the middle of nowhere may find a metal oxide that's better than what we ever found," said Gray. "The student can then contact real researchers at colleges, where their metal combination can be tested."

Currently, the army consists of approximately 100 post-



Three component, water-splitting device, prototype design for the solar carpet

docs, graduate students, and undergraduate students around the world. The Gordon Conference, organized last February by Dempsey and Jim Maiolo, a graduate student in Nate Lewis's

from young high school students in the coming years. "When we have our annual retreats, we will have some of these kids from high school and colleges come, and give them prizes for their

true as any high school teacher can simply buy the SHaRK kit and undergo training before bringing back this research to their classrooms.

## The Path to a Working Prototype in 5 years

"We are scaling up a device that is wireless, like a solar carpet that can be rolled out," said Gray. The designed prototype is a three-component device: a photocathode made of silicon microwires that reduce water to H<sub>2</sub> using a catalyst attached to the wire surface, a photoanode made of metal oxide that oxidizes water to O<sub>2</sub> using a different catalyst, and a membrane assembly that connects the two sides and allows for the rapid flow of electrons and protons to drive water splitting reactions at the two ends. The net effect is of a cell that absorbs sunlight and converts water into H<sub>2</sub> and O<sub>2</sub>.

The Powering the Planet effort

"We love to help high school chemistry teachers make their class more exciting and interesting... They're not out there alone doing something irrelevant. Some kid in some place in the middle of nowhere may find a metal oxide that's better than what we ever found. The student can then contact real researchers at colleges, where their metal combination can be tested." -- Harry Gray

lab, is a solar fuel research seminar that brings together the CCI solar. And in the vision of Gray, the conference will have participation

achievement in metal oxide that year," said Gray.

If the NSF funding approves, Gray will see his vision come

at Caltech succeeded in winning the NSF Center for Chemical Innovation funding for Phase II in August 2009, outcompeting rival groups at UC Irvine and Columbia. Phase I was started as a Caltech-MIT initiative 3 years ago, under the labs of Harry Gray, Nate Lewis, Bruce Brunshwig, and Jay Winkler. Supporting fund comes from the NSF grant, British Petroleum, and Stanford University.

"Substantial progress has been made on the photocathode side of the device," said Bruce Brunshwig, Member of Beckman Institute and Director of MMRC, an investigator of the CCI solar project in the Lewis group. "We have learned how to make Silicon nanorods, and make a carpet out of them."

Groups at MIT and Caltech have made progress on the development of a catalyst to reduce protons to hydrogen. However, work on the membrane connector has barely been touched; new graduate students are starting to investigate that component. "There are a lot of important issues to overcome," said Brunshwig, "You cannot say we're on the fifth inning of the ballgame. That's too linear."

Phase II allows a 5 year time period during which the solar army will put together of the individual components of the devices. "In 5 years, if we have components built working at some level, we will declare victory," said Gray. The 5 years after that will be dedicated to increasing the efficiency of each component and the overall device. Thus, the project will span the next 10 years.

The project's completion will demand the efforts of the solar army at rise, from the professors at universities to students using SHaRK kits at your local high school. Professor Gray is putting his faith in the students of the army, "We believe our solar army will find better catalysts for water reduction than any known today."



Map of colleges and high schools participating in SHaRK

## Upcoming Games

**October 27, 2009**  
**Women's Volleyball**  
**at Redlands**  
**7:30 PM**

**October 28, 2009**  
**Men's Soccer**  
**vs. Whittier**  
**4:00 PM**

**October 28, 2009**  
**Men's Water Polo**  
**vs. Whittier**  
**4:00 PM**

**October 30, 2009**  
**Women's Volleyball**  
**vs. Pomona-Pitzer**  
**7:30 PM**

**October 31, 2009**  
**Cross Country**  
**at SCIAC Finals@ Prado Park, Chino**  
**9:00 am**

**October 31, 2009**  
**Men's Soccer**  
**at Claremont-M-S**  
**11:00 AM**

**October 31, 2009**  
**Men's Water Polo**  
**at Redlands**  
**11:00 AM**

**November 3, 2009**  
**Men's Soccer**  
**vs. La Sierra**  
**2:00 PM**

**November 3, 2009**  
**Women's Volleyball**  
**vs. Cal Lutheran**  
**7:30 PM**

**November 4, 2009**  
**Men's Water Polo**  
**vs. Cal Lutheran**  
**4:00 PM**



## The Weekly Scoreboard

**October 15**

**Men's Soccer vs. Cal-Lutheran L (3-1)**

**October 16**

**Women's Volleyball vs. West Coast Baptist L (3-0)**

**October 17**

**Men's Soccer vs Redlands L (9-0)**

**Men's Water Polo vs. Pomona-Pitzer L (19-8)**

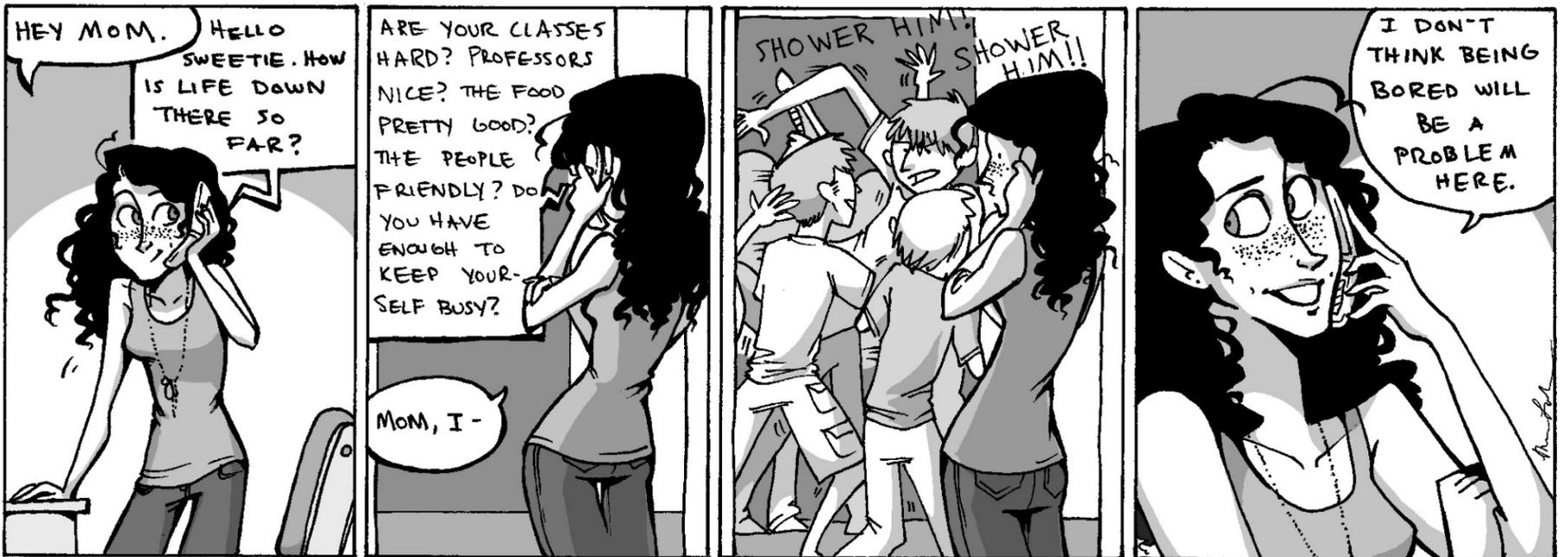
**Women's Volleyball vs. Multnomah Bible W(3-0)**

## Men's Soccer Team Beats Oxy 2-1

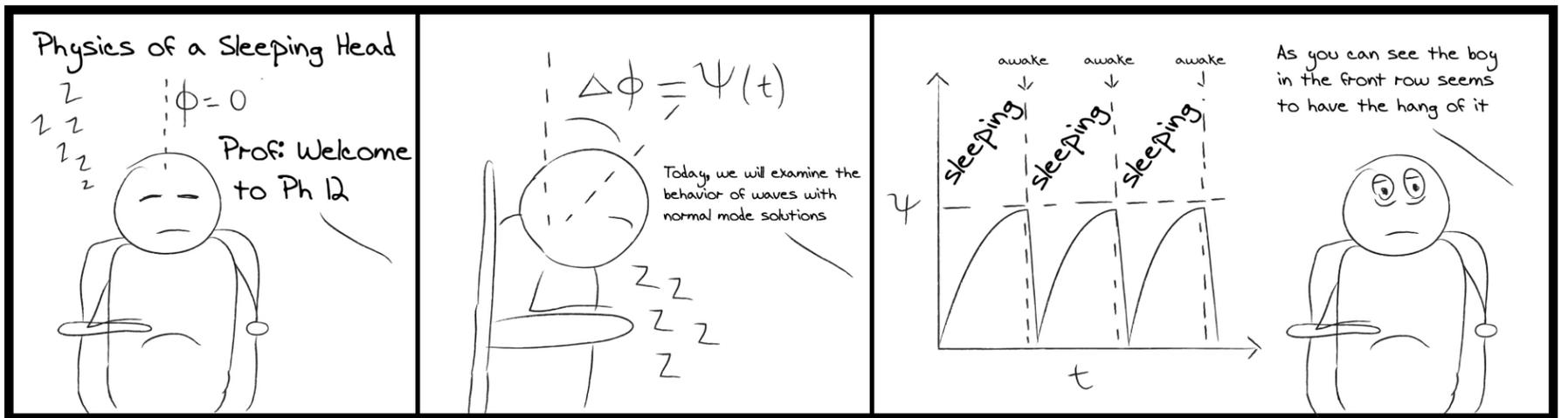


## APPLES AND ORANGES

BY REBECCA LAWLER



Caltech: Abandon All Hope by Joshua Hardenbrook



## Billboard 100 PRESENTS:

NERD ~ PDA

- Jay-Z: I GOT 99 PROBLEMS, BUT AN INITIAL VALUE PROBLEM AINT 1
- Rich-Boy: THROW SOME  $\frac{d}{dt}$ 'S ON THAT B\*\*\*\*
- The Fray: HOW TO SAVE A LIFE TO "N/"
- Soulja Boy: YOUUUU!  $\vec{r} \times \vec{F}$ , THAT SOUJA BOY!
- 50 Cent: NOT A LOT BABY GIRL, JUST AN  $E > 0$
- Katy Perry: I'VE NEVER KISSED A GIRL (BUT I PLAN TO)
- Plain White T's: HEY THERE DELILAH (I WATCH YOU WHILE YOU'RE SLEEPING)
- Five for Fighting: IF I ONLY HAD 1E2 YEARS
- Blink-182: cout<<"Whats my age again?"<< endl; cin>> age;
- Kelly Clarkson: {MY LIFE? - {U} WOULD SUCK

AND SO MUCH MORE!

BY: JOSHUA HARDENBROOK

XKCD By Randall Monroe



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