



Caltech findings challenge earthquake models

KATIE NEITH
Caltech Today Writer

In an earthquake, ground motion is the result of waves emitted when the two sides of a fault move—or slip—rapidly past each other, with an average relative speed of about three feet per second. Not all fault segments move so quickly, however: some slip slowly, through a process called creep, and are considered to be “stable,” or not capable of hosting rapid earthquake-producing slip. One common hypothesis suggests that such creeping fault behavior is persistent over time, with currently stable segments acting as barriers to fast-slipping, shake-producing earthquake ruptures. But a new study by researchers at Caltech and the Japan Agency for Marine-Earth Science and Technology (JAMSTEC) shows that this might not be true.

“What we have found, based on laboratory data about rock behavior, is that such supposedly stable segments can behave differently when an earthquake rupture penetrates into them. Instead of arresting the rupture as expected, they can actually join in and hence make earthquakes much larger than anticipated,” says Nadia Lapusta, professor of mechanical engineering and geophysics at Caltech and coauthor of the study, published January 9 in the journal *Nature*.

She and her coauthor, Hiroyuki Noda, a scientist at JAMSTEC and previously a postdoctoral scholar at Caltech, hypothesize

that this is what occurred in the 2011 magnitude 9.0 Tohoku-Oki earthquake, which was unexpectedly large.

Fault slip, whether fast or slow, results from the interaction between the stresses acting on the fault and friction, or the fault’s resistance to slip. Both the local stress and the resistance to slip depend on a number of factors such as the behavior of fluids permeating the rocks in the earth’s crust. So, the research team formulated fault models that incorporate laboratory-based knowledge of complex friction laws and fluid behavior, and developed computational procedures that allow the scientists to simulate how those model faults will behave under stress.

In addition to reproducing a range of behaviors in one model, the team also assigned realistic fault properties to the model faults, based on previous laboratory experiments on rock materials from an actual fault zone—the site of the well-studied 1999 magnitude 7.6 Chi-Chi earthquake in Taiwan.

“In that experimental work, rock materials from boreholes cutting through two different parts of the fault were studied, and their properties were found to be conceptually different,” says Lapusta. “One of them had so-called velocity-weakening friction properties, characteristic of earthquake-producing fault segments, and the other one had velocity-strengthening friction, the kind that tends to produce stable creeping behavior under tectonic loading. However, these ‘stable’ samples were found to be much more susceptible to dynamic weakening

during rapid earthquake-type motions, due to shear heating.”

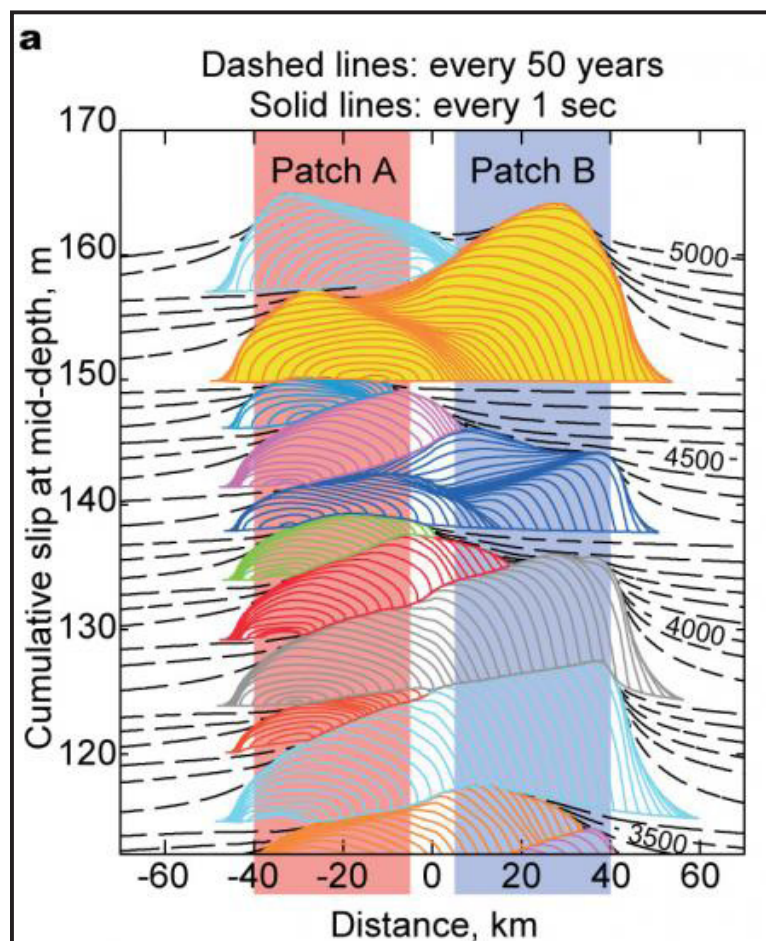
Lapusta and Noda used their modeling techniques to explore the consequences of having two fault segments with such lab-determined fault-property combinations. They found that the ostensibly stable area would indeed occasionally creep, and often stop seismic events, but not always. From time to time, dynamic rupture would penetrate that area in just the right way to activate dynamic weakening, resulting in massive slip.

“We find that the model qualitatively reproduces the behavior of the 2011 magnitude 9.0 Tohoku-Oki earthquake as well, with the largest slip occurring in a place that may have been creeping before the event,” says Lapusta.

If creeping segments can participate in large earthquakes, it would mean that much larger events than seismologists currently anticipate in many areas of the world are possible. That means, Lapusta says, that the seismic hazard in those areas may need to be reevaluated.

For example, a creeping segment separates the southern and northern parts of California’s San Andreas Fault. Seismic hazard assessments assume that this segment would stop an earthquake from propagating from one region to the other, limiting the scope of a San Andreas quake. However, the team’s findings imply that a much larger event may be possible than is now anticipated—one that might involve both the Los Angeles and San Francisco metropolitan areas.

“Lapusta and Noda’s realistic earthquake fault models are critical to our understanding of earthquakes—knowledge that is essential to reducing the potential catastrophic consequences of



Numerical simulations illustrate that fault segments can move slowly and stably over long periods of time and later host large earthquakes. Dashed lines represent slow slip every 50 years along a cross-section of the fault, with the numbers indicating the simulated time in years. Earthquakes are shown by solid lines plotted every second. The area marked “Patch B” can both slip slowly and participate in large earthquakes.

- Nadia Lapusta

seismic hazards,” says Ares Rosakis, chair of Caltech’s division of engineering and applied science.

Now that they’ve been proven to qualitatively reproduce the behavior of the Tohoku-Oki quake, the models may be useful for exploring future earthquake scenarios in a given region, “including extreme events,” says Lapusta. Such realistic fault models, she adds, may also be used to study how earthquakes may be affected by additional factors such as man-made disturbances

resulting from geothermal energy harvesting and CO2 sequestration. “Creeping fault segments can turn from stable to destructive due to dynamic weakening” appears in the January 9 issue of the journal *Nature*. Funding for this research was provided by the National Science Foundation; the Southern California Earthquake Center; the Gordon and Betty Moore Foundation; and the Ministry of Education, Culture, Sports, Science and Technology in Japan.

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by *The Tech Eds*

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China economy growing	10% growth in last few months following last year’s slowdown	[NYT]
Hugo Chavez healthier	58 -year-old pres of Venezuela missed inauguration due infection	[CNN]
Pakistan minister sacked	92 killed in terrorist bombing, protesters oust province’s minister	[BBC]
Sri Lankan maid executed	2 appeals by SL pres to Saudi king unheeded after child dies from care	[CNN]
“Bus rape” in India	6 men arrested in Punjab region one month after gang rape in Delhi	[BBC]

Food with Mannion!

Do you like eating food?

How about free food at nice restaurants?

Ever want to tell the world exactly what you think of said food?

The Tech will be beginning a new column to chronicle the foodie experiences of new writers every other week... The Catch: They'll be going head-to-head with Tom Mannion who will be reviewing the same restaurant. If you have ever thought you were more of a gourmand than our resident master chef, now's your chance to prove it!

Email us for a spot on the list at tech@caltech.edu

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ASCIT Minutes

Minutes for January 9, 2012. Taken by Allika Walvekar

Officers present: Diego Caporale, Zach Rivkin and Matt Fu in lieu of Christian Rivas, Pushpa Neppala, Mario Zubia, Michelle Tang, Allika Walvekar, Puikui Cheng

Guests: Corwin Shiu, Connor Coley

Call to Order: 11:00 pm

President's Report (Diego):

Hope everyone enjoyed their winter break, and welcome back! We will be publishing the Big T dues change amendment in next week's Tech. The faculty board has chosen to allow three current Caltech classes to be run online, though the non-techers taking them will get no actual credit. This program is still in its infancy and so is mostly experimental. Most of my other meetings will start next week, so that is all I have for now. Enjoy your second term!

Officer's Reports:

V.P. of Academic Affairs (ARC Chair: Pushpa):

SFC preparation is going smoothly. The Honor Code Survey was released. Everyone should do their best to complete it for the most accurate results. There will be a professor of the month honoring three professors in January. The next SFL will be January 24th.

V.P. of Non-Academic Affairs (IHC Chair: Zach Rivkin, Matt Fu):

The IHC has not met yet and will update the BoD next week.

Director of Operations (Mario):

The Big T distribution and the Phone-a-thon will be happening later in the month. Mario will be working on cleaning parts of the SAC.

Treasurer (Puikui):

We had three club funding requests from LDSSA, the Veritas Event, and the Chinese New Year Event. The Chinese Club and the Veritas Event organizers will be coming to next week's meeting to discuss their funding requests. The LDSSA club was granted \$90.

Social Director (Michelle):

Michelle is planning a winter carnival and Be a Kid Again Day for this term. Ricketts Interhouse, Avery Interhouse, Dabney Interhouse, and Ruddock Interhouse will also happen this term.

Secretary (Allika):

Allika invited some of the committees to the future ASCIT meetings to check up on their progress. She also talked to DevTeam, and the Room Reservation System for the SAC is ready and will be pushed live soon.

Caltech Couture: Two Caltech personalities

NINA BUDAeva
Staff Writer

People can be pretty interesting sometimes. For some reason, we decide that if January 1 is always the first day of the new calendar year, this is a good day for a fresh start. “New Year, New You” is a common mantra heard all around the world. Instead of beginning something in November (or any other time), we will often put it off until January and make a special corresponding New Year’s resolution.

Even the wise and practical Techers sometimes succumb to this rigid habit. For instance, Chelsea came back to campus a new person. Just before break, I spotted her at the Macy’s on Lake Avenue, practically swallowing Lily’s wise words about makeup and soaking up the atmosphere of feminine attractiveness, elegance, and seduction. During her three weeks of break, she devoted most of her time to transforming herself into the heroine of that distant, intangible dream she always had as a little girl.

By the second week of break, the reason for her transformation became a vague memory. She no longer got butterflies in her stomach when she heard his name. Instead, Chelsea felt turned inside out with rosy anxiety every time she thought of all the makeup techniques she has yet to try and the fashion items she has yet to acquire and learn how to wear. Chelsea had great respect for her roommate Lily who painstakingly opened the world of femininity to her. “Physically being a female is not enough,” Lily told her. “No one knows who’s hiding under that t-shirt. You have to use clothing to your advantage: emphasize your feminine traits, hide your less

attractive traits ...” Lily’s words seemed written in gold to Chelsea. She realized that she was not a girl, but a girl. Not a “man-girl” who is only feminine by the biological definition, as Lily liked to call them, but a true girl.

Lily took pride in her new student. At times she went out of her way to guide Chelsea. Her first hints to Chelsea that girls’ legs and armpits should be either shaven or waxed regularly, but definitely not left au naturel, were made purely out of social politeness. However, when she saw that Chelsea was falling for a guy and was desperate because she realized she had no power to get his attention, Lily stepped in. She had pity for Chelsea, watching her work extra hard on her sets

Lily was rather strict with Chelsea because she foresaw the traps laying in front of the novice. I’ve seen these traps too and am grateful that my mother guided me past them as early as late elementary school. When girls first start caring about their appearance, they almost inevitably overdo it. In terms of makeup, they get too excited about the novelty of makeup and try to make it as noticeable as possible. Oh, the age of eyes lined all-around by a four-millimeter-thick black line, cheeks caked in foundation, and over-plucked eyebrows! “That is sooo middle school!” Lily would exclaim.

As unexciting as it sounds, well-applied makeup does not stand out as makeup. Instead, it makes the

earnestly believed themselves to be very good, no longer reached out to him. They did not notice him slipping away. Eric spent hours in his room, blasting music. This music eventually became the best evidence of his existence.

When he came home for break, his parents finally sat him down and asked him what was wrong. They had contacted psychologists earlier, asking what his sudden changes of behavior could indicate. It became clear that Eric was not happy here and was falling into a depression. Although he kept up with his classes, he did not enjoy any single subject and did not feel connected to the students. He scorned the Houses, which he regarded as pathetic façades for some sort of lively social life. He disliked the seemingly unjustified pride that Techers slowly acquire about being Techers. He considered himself to be above the grudging work thrown at him and hated everyone who bent over problem sets and lab reports for hours on end.

In truth, he did not fit well into his House and did not reach out to other Houses, or even to off campus communities to find a group that he felt comfortable in. No one encouraged him to reach out, and although he thought he was independent he could not help himself and fell into the trap of loneliness. From this, he derived that nothing related to Caltech was enjoyable. He no longer looked forward to lectures, he stopped going to dinner, and he was not proud of being a Techer. Since Caltech is a technical institute, he decided that he had he needed more spiritual and humanistic food for

his soul. He did not want to spend time on difficult assignments. In short, Caltech was not for him and he was not for Caltech.

His parents also deduced that in his scornful solitude, Eric got into drugs and was driving himself into a vicious cycle. However, they did not bring this up with him for the sake of preserving the mutual trust and respect that the three of them silently had for each other. Instead, they opened up the opportunity for him to transfer to another school that he had gotten accepted to but had rejected in favor of Caltech. He would have to start the following school year, so in the meantime it was agreed that he would spend some time at home and then find a temporary job before going on a big trip with his parents in the summer. This year, Eric’s new year would come in September instead of January.

New year, new term, new hopes. Aside from the unfortunate case of Eric, most of the campus seems energetic and rested after coming back from break. Wary of the looming cloud of work about to come over our heads in a week, many take advantage of the lightly-loaded first week to get out, relax, and prepare for another term of Caltech. Chelsea, unpacking her suitcase, was sorting the new clothes and makeup that she got over break, happily anticipating the moment she would walk out of her room and shine.

At the bottom of her suitcase, she found her textbooks that she had promised herself she would read over break. With a sigh, she put them on her shelf, unopened during the whole duration of the Holidays. Somehow, she would have to find a way to combine her newfound strength with academics. This is where the true power of a girl like her lies.

“As unexciting as it sounds, well-applied makeup does not stand out as makeup. Instead, it makes the face stand out as a beautiful face.”

only so that she could stand out in recitation sections and study groups to be noticed by the guy.

The speed and eagerness with which Chelsea took Lily’s first round of advice was encouraging. One night before an Interhouse, Chelsea stood in front of their mirror, staring at her hair for a whole ten minutes before she finally asked, in a very roundabout way, if Lily could tell her how to do her hair. So, Lily sat her down, did her hair, her makeup, and gave her one of her own dresses to wear to the party.

face stand out as a beautiful face. Lining eyes all-around with black does not enhance the face. Instead, all that a person sees is two black circles shackling the eyes.

Lily’s good guidance created a new Chelsea. Besides Chelsea, a couple other Techers also changed dramatically over break. Eric, the guy who dyed his hair and whose recent behavior worried his parents, transferred to another school. Throughout the year, he became quieter and quieter, and started to back out of social activities. His friends, who

Caltech will host Poncho Sanchez Band

The Caltech Jazz Bands will host one of the biggest names in the world of Latin jazz right here on the Caltech campus. The Poncho Sanchez Band, with over 17 recordings and a Grammy Award to their credit, will be performing in Beckman Auditorium on Saturday, February 9, at 8 PM. Poncho Sanchez has performed with Cal Tjader, Mongo Santamaria, Hugh Masekela, and Tower of Power. Also appearing on the program will be Caltech’s own award winning jazz band and world famous vocalist Candi Sosa.

As in previous years, Caltech’s own Salsa Dance Club will perform a number with the Caltech Jazz Band. Rounding out the extraordinary talent performing that evening will be Latin percussionists Robertito Melendez and Ricardo “Tiki” Pasillas.

This concert is very popular, and the last few years filled Beckman Auditorium, so please get there early for a good seat. Tickets are \$5 for students and \$10 for general admission. So, for five dollars, you can walk over to Beckman and fully experience some of the best Latin jazz to be found anywhere in the world. The Caltech Ticket Office is open weekdays from noon to five PM. You can also call over there to reserve a ticket. Their phone number is: 626 395-4652.

Professor Profile: The making of Mark Wise

ERIC ZHANG
Contributing Writer

One day, when he was 14 and attending middle school in Ontario, Canada, Mark Wise decided that his life was taking the wrong direction. Sitting in the middle of the bedroom he shared with his younger brother, hunched over his desk, he quietly pondered the state of things in his life. He was staying in a small two-bedroom apartment with his brother and mother, and the three of them had little money. Academics weren't looking too great, either: he had failed math and the rest of his grades were less than stellar. He was also socially awkward and unskilled athletically.

"Sh-t, I gotta do something. I gotta do something," he thought to himself. In that moment, he resolved to do something important with his life.

He has never looked back since.

The young boy who made this intrepid decision has married, raised two sons, and established himself as the John A. McCone Professor of High Energy Physics at Caltech. Leaning over a keyboard, his eyes glancing back and forth from the keys to the computer screen, Wise is in his office on the fourth floor of Lauritsen Laboratory. He is wearing a grey sweater and jeans and his black rimmed glasses are raised above his eyes. Behind him are rows of shelves, each neatly lined with filled binders and books about physics and finance. Each binder contains lecture notes from every class he has taught.

At 6' 1", Mark Wise can seem imposing. In person, he is anything but. Wise exudes the air of a man who is quietly busy and focused. He speaks in a soothing and soft tone, yet his voice is clear and sometimes firm.

These days, he plays the role of a researcher and instructor. His current work involves a quantity called the baryon number. Baryons are subatomic particles that comprise up most of the observable matter in the universe. This group includes the protons and neutrons that make up the nuclei of atoms. The baryon number of a physical system is a quantity that accounts for, in part, the number of baryons present. Unlike momentum or energy, the baryon number is not always conserved, that is, constant. However, the Standard Model in particle physics has not traditionally accounted for this lack of conservation. On the other hand, current propositions for a Grand Unified Theory—a physical theory that would unite many of the fundamental forces of nature—allow for this non-conservation.

Wise is looking to extend the Standard Model to be consistent with this expectation. He hopes to make predictions that can be confirmed by experimentation.

Wise also performs research in finance. He has published papers in the field relating to corporate bond risk, credit default swaps,



Professor Wise looks up from his desk, flanked by rows of books and binders filled with lecture notes.

— Eric Zhang

and monetary policy as well as consulted for the Pacific Investment Management Company (PIMCO). As an instructor, he is well liked among undergraduates. Wise has taught Physics 125, the advanced course in Quantum Mechanics for physics-related majors, for 3 years. Former students have praised his teaching.

According to Mohit Tiwari, a senior Math and Physics major who took Physics 125 last year, "Despite being at 10 am, they were the most enjoyable lectures I ever attended."

Others who have taken the course were also eager to mention his entertaining lectures. Wise is known to ask trivia questions in class about state geography and physics and to reward participation by throwing quarters and other coins to his students.

He is also a frequent joker in class. Giordon Stark, a Physics major who graduated in June, created the Twitter account @MarkWiseSays in 2011 to record some of Wise's most memorable quips. When Stark graduated, Adam Jermyn, a sophomore in physics, took over the role.

Some of the tweets from last year: "Look at this! No human being can read it. But I forgot you're superhuman Caltech students"; "It's your favorite equation! It's been burned into your soul by now...for those of you that have a soul"; and "In theoretical physics, you try to make everything so compact you can't tell what the symbols mean and then it's perfect for teaching."

Joshua Yoon, a senior Physics major, enjoyed the effect Wise's humor had on the class. "Knowing that you could miss out on a joke keeps you awake," he said.

Wise's teaching style can sometimes border on the comically eccentric. Jamie Tayar, a Caltech alumnus in astrophysics who graduated this year, recounted in an email one of her most vivid memories of the class: "This thing I remember most was him declaring [in class] that something or another was going to 'knock our socks off,' proceeding

to sit down in the front row, take his shoes off, throw his socks at the board, put his shoes back on, and continue lecturing."

As odd as Wise's teaching is, there is a deliberate purpose behind it. As he put it, "All Caltech students are very smart, they just don't realize it. I don't think we remind them enough, so they end up sad." He then went on to explain that the jokes are meant to relieve students' feelings of stress and keep them engaged. "The young people who come by here, they are the future of physics. You want them to feel good about themselves and learn physics."

Several students from last year, including Joanna Robaszewski, a senior in physics, saw Wise's attitude reflected in his interactions with students. "Although his accomplishments and demonstrations of expertise were impressive, he was friendly and approachable," she said in an email.

When he started out, Wise said he viewed teaching as a distraction because he was focused on research. In the first two years, he received a lot of complaints for teaching too much material too fast. Since then, he says he has learned to slow down. "I've gotten a lot better," he said. "I'm still not awesome, because I'm not a pedagogical thinker. When those types of people go through a problem, they go in a linear fashion, straight to a solution. I go around and around and around and I eventually hit the solution."

The Path to Professorship

What effect, one might wonder, did Wise's earlier years have on his career? "From [middle school] on, I worked really hard," he recalled. "I wanted to be good at science. By high school graduation, I was top or second in my class."

This feeling of determination was more than a simple wish. The summer before grade 10, Wise immersed himself in general science books and texts written by Issac Asimov to jump-start

his interest in the sciences. In his final year of high school he bought books on calculus-based math and self-studied. It helped that Ms. Felona, his high school physics teacher, and Mr. Ward, his high school chemistry teacher, inspired him. According to Wise, "they made their subjects interesting and opened me up to more advanced parts that weren't in the official curriculum."

During the summer after graduation, he worked at a company called Industrial Wire and Cable under the wing of an engineer from Japan. Their job was to measure the conductivity of the manufactured wire by using a crane to dip the stripped ends of a large spool of wire into an electrified pool of water, then measuring the flow of current through the wire. In moments of downtime, the Japanese engineer would pose challenging math and geometry problems for Wise to solve.

He then went to study at the University of Toronto in 1972. Freshman year, Wise took math, chemistry, physics, and biology. He eventually chose to major in physics. "I didn't really like bio," he remembered. "I was well prepared for chemistry, so I found it really easy. Physics was challenging, but I was good at it, so I decided to do that."

The following year, Wise went around talking to professors at the university, looking for research or work. It so happened that Lynn Trainor, a professor in physics, was writing a book and looking for a student helper. The two of them hit it off and began working together. In 1979, the book "From Physical Concept to Mathematical Structure: Introduction to Theoretical Physics," for which Wise was listed as a coauthor, would later be published.

In 1976, Wise graduated from Toronto with a Bachelor of Science but decided to stay for a Master's. He had applied to Caltech, MIT, Stanford, Cornell, and Princeton for graduate school in physics, but did not get accepted into any.

"At the time, I figured that if I couldn't get into the best places, I should do something else," he said, sighing. "Looking back, it probably wasn't the best attitude to take." In the end, his persistence paid off. After another year at Toronto, he applied again and was accepted to Stanford and MIT. He chose Stanford. Some time after, he asked a member of the Stanford admissions committee why he was admitted the second time; it turned out that the committee member personally knew one of the professors who wrote Wise a recommendation.

After three years at Stanford under the tutelage of physicist Fred Gilman, he graduated with a Ph.D. in physics in 1980, obtained a postdoc at Harvard as a junior fellow, and then, in 1982, arrived at Caltech as an Assistant Professor. Two years later he was promoted to Associate Professor, and a year after that, to full Professor. In 1992, he obtained his current title.

Looking Back, Looking Forward

Wise points to an undergraduate class he attended in Statistical Mechanics as the reason he is a physics professor today. The professor of the class was Nathan Isgur, who had fled the U.S. as an objector to the Vietnam War and obtained an assistant professorship in the University of Toronto physics department. Wise was captivated by Isgur's teaching and by the subject matter.

"Something struck me as special about trying to find out the laws of physics," he recollected. "I was sure of what I wanted to study by second year, probably because of Isgur."

The two of them soon struck up a collaborative relationship, one that would continue until Isgur's death in 2001. In 1990, more than a decade after Wise's undergrad years, the two would jointly publish highly influential work in particle physics. They predicted the existence of measurable quantities called form factors that would characterize the weak decay of certain heavy particles, a prediction that would later be confirmed by experiment. For this work, they received the J.J. Sakurai prize in Theoretical Particle Physics in 2001.

For a 59-year-old academic well established in his field, what does the future hold? Retirement? Wise said that he has considered the question lately. For him, retirement means just doing research he enjoys without the administrative responsibilities of a professor. "I can't financially afford to yet. Otherwise, I would just do what I like to do — physics."

For future generations of physics majors, the fact that Wise will still be around means they can anticipate some more years of his quirky antics.

Wise also says he isn't done with teaching. "I want to finish the class [Physics 125] thinking I did a good job. That hasn't happened yet."



Caltech Library

Classes


The Library offers a number of instructional sessions on using databases and other licensed resources.

In December we're offering:

Endnote for Beginners	December 5	2:00pm
Chemical Structure Searching / Physical Property Data	December 17	2:00pm
Patents	December 18	2:00pm
Crystallographic Databases	December 19	2:00pm

Please visit <http://library.caltech.edu/learning/> to register.

All of the classes take place in the Sherman Fairchild Library multimedia conference room.



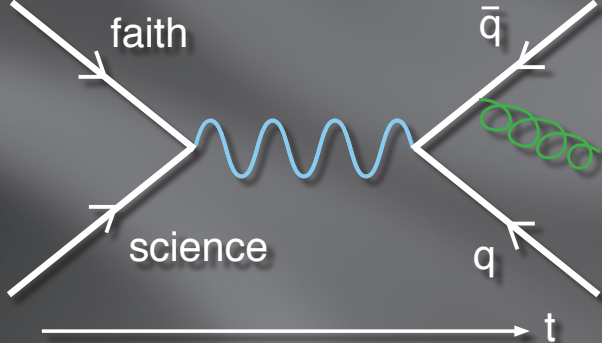

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 (section B5 on campus map)

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Countdown to SFC: Update number two

PUSHPA NEPPALA ARC Chair

Given the upcoming Student Faculty Conference (SFC), the ARC and the Tech established a column updating the student body on ongoing discussions surrounding curriculum changes. Approximately every month up until the SFC, updates from the option committees (comprised of both students and faculty) will be published here. Please feel free to email Pushpa Neppala (pneppala@caltech.edu) or the contact person listed alongside the option.

ACM (Michael Zhang, zhang.michael.y@gmail.com)

- Survey sent out during winter break
- CS 1 major requirement
- Standardization of upper level classes for quality control and to reduce overlap
- Update course catalogs to make them more useful

Astrophysics (Gregory Simonian, gsimonia@caltech.edu)

- Ph 3 requirement lifted. Any set of three labs will be satisfy lab requirement.
- Survey sent out

Applied Physics (Alexander Mouschovias, atm@caltech.edu)

- Will try to offer APh pizza class for frosh starting next year, and have option teas to increase enrollment

-Reworking APh 9

-Expanding classes to take for E10 and E11 requirements.

-Exploring changes to APh17 requirement, may include requiring Ph12c

-Incorporating parts of APh 109 to APh 77

-Changing catalog suggested class schedule to make it useful

Business Economics and Management (Misha Raffiee, mraffiee@caltech.edu)

-The BEM survey was sent out and is open until Monday, January 21.

-In the process of hiring 3 new faculty to revitalize BEM research and guide option growth

-New core changes: Ma 3 and possibly Ma 2 will be required

-Revival of the BEM club

-Updating elective requirement list to remove courses no longer offered and discussing replacements (such as E102)

Biology (Stephanie Kwan, skwan@caltech.edu)

-Increasing number of seminar classes

-Possibly increasing variety of biology classes offered (e.g. adding microbiology, bioinformatics, zoology classes, etc.)

-Revival of BUSAC

Bioengineering (Malvika Verma, mverma@caltech.edu)

-BioE luncheon on Thursday, January 17 in Blacker House

-Second-year classes: Diff Equations and Prob/Stats required; Waves, Quantum, Stat Mech required

-Should second-year physics classes be through the physics department or chemistry department? Chemistry courses will be more biologically relevant but not as theoretical and general

-Work with new Biology and Bioengineering Club

-Survey will be sent out late

January based on feedback from the luncheon

Chemistry (Luis Navarro, lnavarro@caltech.edu)

-In the process of compiling a survey with the general ideas from the last Tech Bulletin

-Will send out survey soon to Chem majors. Please fill it out!

Chemical Engineering (Sabrina Sun, ssun@caltech.edu)

-Survey results are in

-Committee is meeting this week to plan out changes/improvements

Computer Science (Mike Yurko, m@caltech.edu)

-Final survey will be sent out before break so that students will have time to complete it before second term

-Ma3 (old Ma2b) will likely be required, but still much discussion about other classes formerly part of core

-Looking at ways to make it easier for students to connect with

potential advisors for CS 80s and 81s during the year

Engineering and Applied Sciences (Matthew Voss, stericinterference@gmail.com)

-For class of 2018, Material Science, Environmental Science, and Computation and Neural Systems will appear in the undergrad admissions forms, for prefrosh to check off as their potential majors

-Survey sent out

Electrical Engineering (Jomya Lei, jlei@caltech.edu)

-Asking professors to create various suggested schedules that prioritize certain classes before others based on interests.

The current requirements stay the same, but the order may change.

For example, if you are more interested in information theory, ACM116/EE160 would be moved to sophomore year and other classes may be moved to junior year.

In another path, you might take 5x sophomore year, 119/114 junior/senior year (although 119/114 would be suggested advanced classes). Hopefully will decrease sophomore year workload.

-Looking to see if any classes can add in/change to a PCB-making or a team based project class

-Survey results are out at <http://tinyurl.com/SFCEE2013SurRes1>

-Notes are always available at <http://tinyurl.com/SFCEE2013>

Geological and Planetary Sciences (Annie Ritch, aritch@caltech.edu)

-Potentially allowing all GPS majors the option to have research for credit as an elective

-Looking into possibilities of improving scientific writing class and increasing opportunities for scientific writing in some classes

Mechanical Engineering (Sebastián Rojas Mata, srojas@caltech.edu)

-Survey sent out, and now compiling results

Physics (Valère Lambert, vlambert@caltech.edu)

-Proposal of allowing Ph 5 and APh 9 to substitute Ph 3 requirement, as well as reworking Ph 3 course structuring

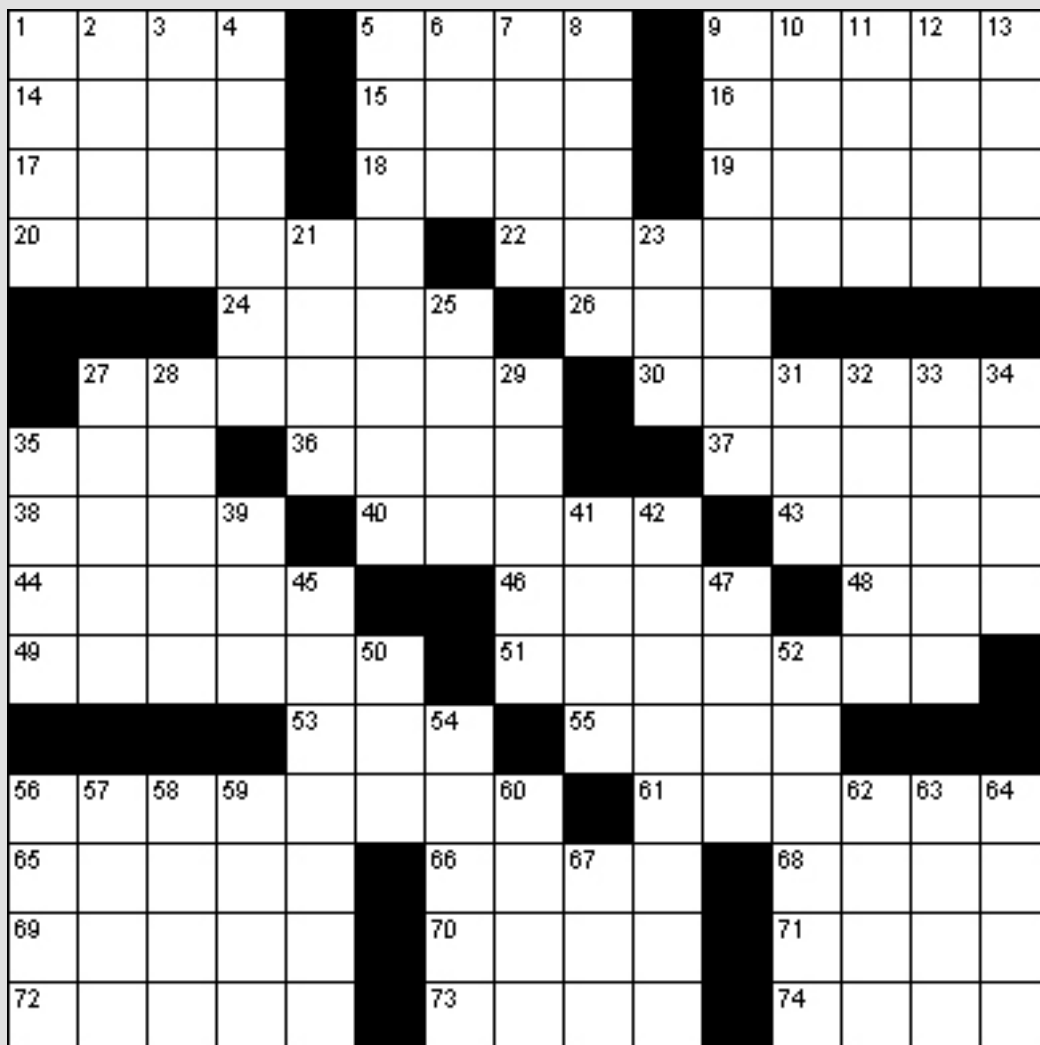
-Will look at finding undergraduates to review and edit Ph 3 manual

-Redefining the substitute of an Experimental Thesis for Ph 77 to allow research with substantial data analysis to be deemed as sufficiently experimental

-Emphasis will be added in the catalog towards encouraging students to petition for Physics credit for courses outside of Ph/Ay/APh as the faculty are liberal in assigning credit

-Potentially increases the number of units of Ph 20/21/22 allowed to satisfy 90 elective unit requirement to encourage enrollment

Today's Puzzle: Crossword



[<http://www.puzzlechoice.com/>]

Across

1. Fight
5. Item of clothing
9. Accolade
14. Large American feline
15. Ancient alphabet character
16. Small boat
17. Overt
18. Golfclub
19. Small thin pancake
20. Bicycle for two
22. Just married
24. Leave out
26. Beverage
27. Course of study
30. Wood for use as building material
35. Tool for punching small holes
36. Edible root
37. Elk
38. Examination by word of mouth
40. Tether
43. Lowest male singing voice
44. Not active
46. Look for
48. Was seated
49. Arid region
51. Three people considered as one
53. Assist
55. Worry excessively
56. Hatter
61. Cumbersome
65. Ignoramus
66. Sport
68. Molten volcanic rock
69. Speed of a musical composition
70. Meat and vegetable stew
71. Part of a list
72. Diminish gradually
73. Swarm
74. Walking stick

Down

1. Catch sight of
2. Insect in the inactive stage of development
3. Concludes a prayer
4. Depending on chance
5. Felon
6. Belonging to us
7. In a little while
8. Religious doctrine
9. Enthusiastic approval
10. Openly distrustful
11. Afresh
12. Lasso
13. Notable achievement
21. Give off
23. Rainy
25. Counterweight used to calculate net weight
27. Short-legged omnivorous animals
28. Fairies
29. Cook with dry heat
31. Disorderly crowd
32. Brag
33. Composition
34. Remainder
35. Keen
39. Have an existence
41. Person bound to the land in Medieval times
42. Something in the family for generations
45. Disloyal or treacherous person
47. Leg joint
50. Metallic element
52. Typeface slanting to the right
54. Terminus
56. Fingerless glove
57. Notion
58. Hobble
59. Run easily
60. Actor's part
62. Information
63. Divisible by two
64. Make reference to
67. Prevarication

*Caltech Public Events is now hiring student ushers.
\$15 per hour to work concerts, performances, lectures,
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*To apply email Adam Jacobo (ajacobo@caltech.edu)
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Caltech women's basketball team suffers heartbreaking overtime loss, sports editor makes title really long to fill up blank spaces Turtle.

AMOL KAMAT
Sports Editor

The Caltech women's basketball team took on the Whittier Poets on Saturday night. Following a big loss to Occidental on January 10th, the Beavers were looking to prove their worth and came out swinging, shutting out Whittier for the first three minutes while scoring seven, themselves. But, the explosive Poets would not be caged, putting up five unanswered points in about a minute. The Beavers clung to their lead until the nine minute mark when Alex Coon of Whittier snuck in a layup, making the score 17-16 in favor of the Poets. In typical fashion, however, Caltech's Stephanie Wong stepped up to the plate (A baseball reference in a basketball article?! What?! That's the kind of hard-hitting journalism that is really lacking in our modern culture) and hit a three-pointer to win back the lead. Said lead would change hands several more times in the first-half, but the Beavers were able to head into the locker room up 28-27.

The second-half saw a more determined Poets team take the floor, but the feisty Beavers kept pace with them. Despite losing the lead early in the half and rarely earning it back, the Beavers never allowed the deficit to exceed five points. With three minutes remaining, the Poets were up 47-42 and thought they could relax. Wrong! Sarah Wright made the game 45-47 with a free throw and a jumper before Stephanie Wong tied it up with a jumper of her own. Both teams had a shot at winning with a few seconds remaining,

but neither could take advantage and we headed into a five-minute overtime.

Once again, the teams traded leads, with the Beavers going up early and the Poets leading late. Tied at 54 with one minute remaining, the Poets hit a free throw to take the lead. Caltech had a golden opportunity to steal the game, but a missed jumper and a foul sealed their fate. Whittier hit both free throws to make the game 57-54, and the Beavers failed to hit a three, ending the game in heartbreak.

Despite the loss, this was one of the more entertaining games I have seen at Caltech in a while, and it was quite apparent how hard the team worked throughout the game. Now, those who know me know that I never blame anything on the referees. Ever. Just accept that for now. But these refs made some horrible calls against both teams. Normally, these things even themselves out (new SCIAM motto?), but late "calls" in this game really put the Beavers at a disadvantage, in my humble and completely unbiased opinion (New Tech motto?). Fouls that weren't fouls, outs that were clearly called on the wrong team, and jump balls when they have no idea what to call are unacceptable. I'm not saying I could do better, but I was once called the greatest kickball umpire of all time by my elementary school friends, so you be the judge.

Stephanie Wong led the Beavers with 16 points, followed closely by Sarah Wright with 14. Both the men and women's teams travel to La Verne this week for more SCIAM play.



I GOT THE BALLLLLLL!!!!!!!!!!!!

- Amol Kamat

Weekly Scoreboard

*Men's Basketball
vs. Whittier
L, 76-66 Final*

*Women's Basketball
vs. Whittier
L, 57-54 Final - OT*

*Women's Basketball
at Occidental
L, 78-37 Final*

*Men's Basketball
at Occidental
L, 78-71 Final*

Upcoming Games

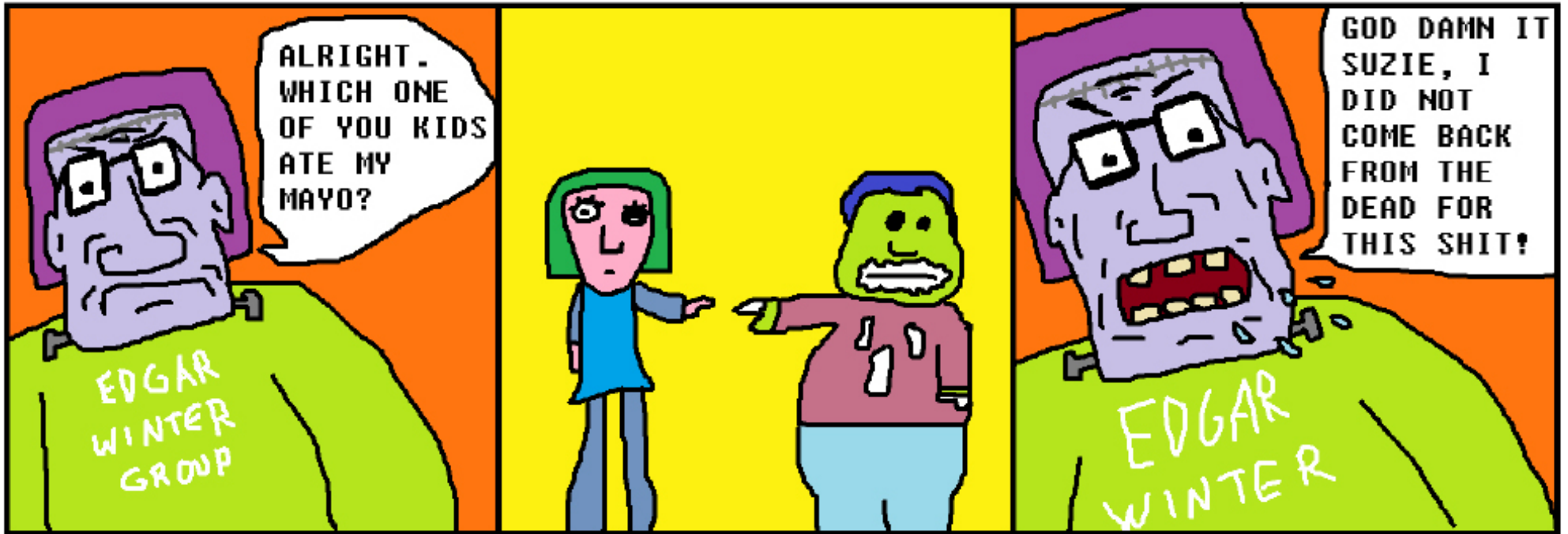
*January 16, 2013
Men's Basketball
at La Verne
7:30 PM*

*January 17, 2013
Women's Basketball
at La Verne
7:30 PM*

*January 19, 2013
Men's Swimming and Diving
at La Verne
10:30 a.m.*

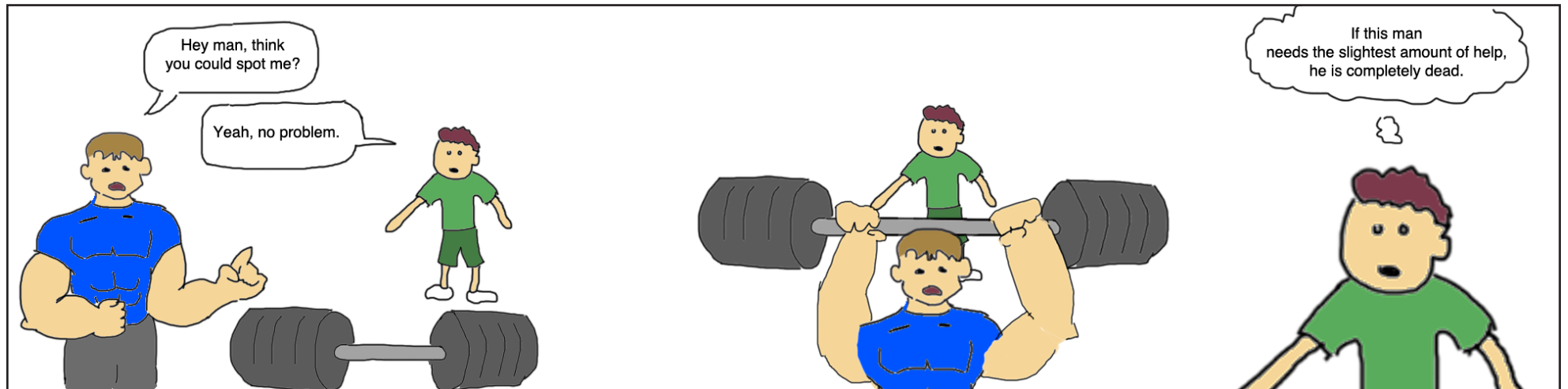
FRANKENDAD RETURNS

BY STEFF RUNCIN



Acquired Taste

by Dr. Z



*For more photos,
videos, and archives
of previous issues,
check out the Tech
website!*

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