

Caltech alumnus among 2014 Nobel laureates

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All information about Eric Betzig is by Kathy Svitil, Associate Editor and Science Writer, from Caltech Media Relations. See the original article at <http://www.caltech.edu/content/alumnus-eric-betzig-wins-2014-nobel-prize-chemistry#sthash.BEEqP5Qt.dpuf>.

Eric Betzig (BS '83), a group leader at the Howard Hughes Medical Institute's Janelia Farm Research Campus in Ashburn, Virginia, has been awarded the 2014 Nobel Prize in Chemistry along with Stefan W. Hell of the Max Planck Institute for Biophysical Chemistry and William E. Moerner of Stanford University. The three were honored "for the development of super-resolved fluorescence microscopy," a method that allows for the creation of "super-images" with a resolution on the order of nanometers, or billionths of a meter. In essence, the work turns microscopy into "nanoscopy."

The technique developed by the trio overcomes the so-called Abbe diffraction limit, which describes a physical restriction on the sizes of the structures that can be resolved using optical microscopy, showing



Eric Betzig

-Photo Courtesy of Huntington Hughes Medical Institute/Image by Matt Staley

that, essentially, nothing smaller than one-half the wavelength of light, or about 0.2 microns, can be discerned by these scopes. The result of the Abbe limit is that only the larger structures within cells—organelles like mitochondria, for example—can be resolved and studied with regular microscopes but not individual proteins or even viruses. The restriction is akin to being able to observe the buildings that make up a city but not the city's inhabitants and their activities.

Betzig, building on earlier work by Hell and Moerner, found that it was possible to work around the Abbe limit to create very-high-resolution images of a sample, such as a

developing embryo, by using fluorescent proteins that glow when illuminated with a weak pulse of light. Each time the sample is illuminated, a different, sparsely distributed subpopulation of fluorescent proteins will light up and, because the glowing molecules are spaced farther apart than the Abbe diffraction limit, a standard microscope would be able to capture them. Still, each of the images produced in this way has relatively low resolution—that is, they are blurry.

Betzig, however realized that by superimposing many such images, he would be able to obtain a sharp super-image, in which nanoscale structures are clearly visible. The new technique was first described in a 2006 paper published in the journal *Science*.

After Caltech, Betzig, a physics major from Ruddock House, earned an MS (1985) and a PhD (1988) from Cornell University. He worked at AT&T Bell Laboratories until 1994, when he stepped away from academia and science to work for his father's machine tool company. Betzig returned to research in 2002 and joined Janelia in 2005.

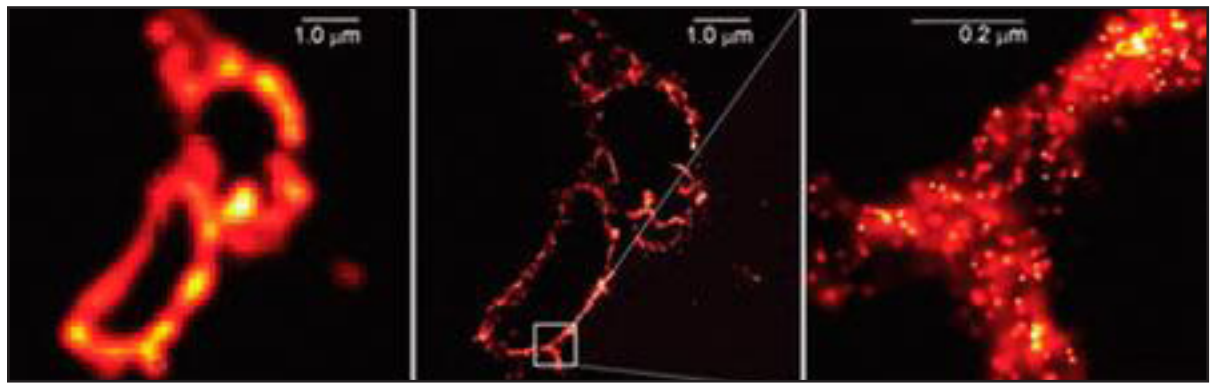
To date, 33 Caltech alumni and faculty have won a total of 34 Nobel

Prizes. Last year, alumnus Martin Karplus (PhD '54) also received the Chemistry Prize.

The first Caltech affiliate to win a Nobel Prize was Robert A. Millikan (1868-1953), who was awarded the Nobel Prize in Physics in 1923 "for his work on the elementary charge of electricity and on the photoelectric effect."

In 1936, Carl David Anderson (1905-1991) (BS '27, PhD '30) became the first Caltech alumnus to win a Nobel Prize. He won the Nobel Prize in Physics "for his discovery of the positron." Anderson shared the prize that year with Victor F. Hess, who discovered cosmic radiation.

Continued on page 2



The center image shows lysosome membranes and is one of the first ones taken by Betzig using single-molecule microscopy. To the left, the same image taken using conventional microscopy. To the right, the image of the membranes has been enlarged. Note the scale division of 0.2 micrometers, equivalent to Abbe's diffraction limit. The resolution is many times improved.

-Photo Courtesy of *Science* 313:1642-1645

Sean Solomon awarded National Medal of Science

CALTECH ALUMNI ASSOCIATION

Geophysicist Sean C. Solomon (BS '66) was named a recipient of the National Medal of Science by President Barack Obama on Friday.

A recipient of Caltech's Distinguished Alumni Award (2006), Solomon is the director of Columbia University's Lamont-Doherty Earth Observatory and principal investigator of NASA's mission to Mercury.

"These scholars and innovators have expanded our understanding of the world, made invaluable contributions to their fields, and helped improve countless lives," President Obama said in a statement. "Our nation has been enriched by their achievements, and by all the scientists and technologists across America dedicated to discovery, inquiry, and invention."

In a career spanning four decades, Solomon has served on numerous projects exploring Earth and Earth-like planets in the solar system, including the Magellan

mission to Venus, the Mars Global Surveyor mission, the GRAIL mission to the moon, and a number of ocean-bottom seismological explorations.

"The four inner planets of our solar system are nature's experiments in how a planet like Earth became the planet it is today, and they had four extraordinarily different outcomes," Solomon said in an interview with Columbia University in 2013. "To understand our own planet, we must understand how all Earth-like planets formed and evolved."

Prior to Lamont-Doherty, Solomon served for nearly two decades as director of the Carnegie Institution for Science's Department of Terrestrial



-Photo Courtesy of Caltech Alumni Association

Magnetism in Washington, D.C. When he departed in 2011, colleagues arranged to have a previously discovered asteroid

named after him: asteroid 25137 Seansolomon, which orbits the sun between Mars and Jupiter.

"Sean Solomon is a pioneer in both Earth and Planetary Sciences, and a world leader in the discipline of geophysics," said John Grotzinger, chair of the Division of Geological and Planetary Sciences (GPS) and Fletcher Jones Professor of Geology at Caltech. "Being awarded the National Medal of Science is a celebration of his extraordinary career, which has been rich with exploration, extending from the structure of the Earth,

to the Moon, Mars, Venus, and Mercury. We are very proud of our alumnus from Caltech's Division of Geological and Planetary Sciences."

Solomon is a member of the National Academy of Sciences and the American Academy of Arts and Sciences and has received numerous other awards, among them the Geological Society of America's G.K. Gilbert Award and the American Geophysical Union's Harry H. Hess Medal.

The National Medal of Science was created in 1959 and is administered by the National Science Foundation. Awarded annually, the medal honors individuals who have done work of outstanding merit or have had a major impact in the fields of science and engineering. A committee of presidential appointees recommends medal candidates to the president based on their extraordinary knowledge in and contributions to chemistry, engineering, computing, mathematics, and the biological, behavioral/social, and physical sciences.

The new awardees will receive their medals in a ceremony at the White House, to be held later this year.

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Caltech Y Column

CALTECH Y

The Caltech Y Column serves to inform students of upcoming events and volunteer opportunities. The list is compiled by Neera Shah from information given by the Caltech Y and its student leaders.

Founded by students in 1916, the Y was organized to provide extracurricular activities planned and implemented by students as an opportunity to learn leadership skills and discover themselves. The mission of today's Y remains the same—to provide opportunities that will prepare students to become engaged, responsible citizens of the world. The Y seeks to broaden students' worldviews, raise social, ethical, and cultural awareness through teamwork, community engagement, activism, and leadership. More information about the Caltech Y and its programs can be found at <https://caltechy.org>. The office is located at 505 S. Wilson Avenue.

Ongoing and past programs hosted by the Y:

- Make-A-Difference Day: LA County Arboretum and Botanic Garden, Children's Hospital Los Angeles (Coachart), Eaton Canyon,
- Explore LA: Lakers game, Next to Normal musical, Norton Simon Museum trip

Upcoming Events:

1. Caltech Y - Washington DC Science Policy Trip

December 14 - 18 (five days)
Cost is only \$585 (with round trip flight to DC and back to LA) or \$350 (with one way flight to DC) - Space is limited.

Applications are available now at www.caltechY.org and due to the Caltech Y - by Tuesday, October 21st. Join us for an exploration into Science Policy on an exciting trip to the Nation's capitol. The five day trip includes flights, lodgings, and most meals; discussions with those who have played a role in setting and implementing science policy for the United States including: Academics, Lobbyists, Scientists, Politicians, and Caltech Alumni ... and of course the opportunity to see Washington, DC landmarks like the White House, the Memorials; Smithsonian Museums; the National Archives; and the Capitol. Don't miss this opportunity!

The Washington, DC Science Policy Trip is coordinated by the Caltech Y with generous

support from the George Housner Fund. Questions and applications may be directed to caltechy@caltech.edu

2. Adventure 101 - Great Hikes in the Greater LA Area

Tuesday | October 14th | 12:00 noon

Los Angeles has a vast array of great hiking - from the immediate San Gabriel Mountains or Griffith Park areas to the Santa Monica Mountains near the beach - there is a seemingly unending supply of hiking options. Come learn from student hikers some of the great venues you might want to explore

on your own. Space is limited and lunch is provided, so sign up is required. Location details will be included in the confirmation.

Use this link to sign up: https://docs.google.com/forms/d/1OFe1d33Q6sLoyJ8f6QLaiLMXPexaw7aQv56-x7NhSE8/viewform?usp=send_form

The Adventure 101 lunch series is designed to introduce opportunities and information that can help students expand their adventure repertoire. The Caltech Y offers many outdoor adventures, organized and led by Caltech students, and open to everyone from the novice to the seasoned enthusiast. The Y-Outdoors Committee is open to any student interested in helping to organize and lead outdoor adventures. If you are interested in joining the committee, contact caltechy@caltech.edu.

3a. Hathaway Sycamores

Every Thursday | 5:30-8:30pm | Highland Park

Volunteer at Hathaway-Sycamores, a group that supports local underprivileged but motivated high school students. There are a variety of ages and subjects being tutored. The service trip includes about an hour of travel time and 2 hours of tutoring. Transportation is included. For more info and to RSVP email Sherwood Richers at srichers@tapir.caltech.edu.

3b. Pasadena LEARNS

Every Friday | 3:00 - 5:00pm | Madison and Jackson Elementary School | Pasadena

Come volunteer at Madison and Jackson Elementary School! We are partnered with the Pasadena LEARNS program and work with their Science Olympiad team or do regular tutoring along with occasional hands-on science experiments. Transportation is provided. For more information and to RSVP, contact vkumar@caltech.edu

Ongoing Volunteer Events:

1. Pasadena Unified School District Tutors Needed

Pasadena High Schools have started after-school tutoring programs coordinated by teachers. Tutors are needed at each school to help out with the tutoring. This is a great way to work directly with teachers and students. Tutors may volunteer on any days for which they are available. High School tutoring/homework help hours are as follows:

- Blair High School M-F 3:20-4:30 (Math) contact Ronaldo Hunter at (626) 720-2578

- Marshall High School M-F 3:05-4:30 (All Subjects) contact Cati Acevedo at (626) 720-2587

- Muir High School M-Th 3:20-6:00 (All Subjects) contact Nicole Stephens (626) 720-2567

- Pasadena High School 3:20-6:00 (All Subjects) contact Arman Ter-Grigoryan at (626) 720-2589

If you have any questions feel free to contact the Caltech Y at caltechy@caltech.edu.

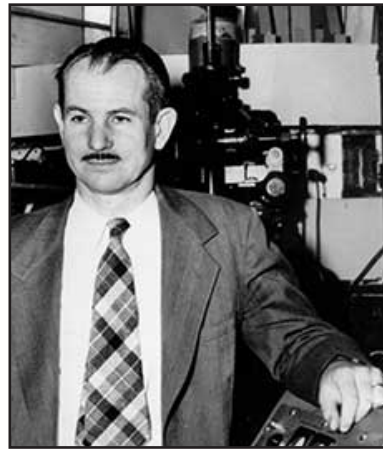
Caltech alumnus joins ranks of Techer Nobel laureates

Continued from page 1

Linus Carl Pauling (1901-1994) (PhD '25) is the only individual in history to win two unshared Nobel Prizes in different categories. He won the Nobel Prize in Chemistry in 1954 "for his research into the nature of the chemical bond and its application to the elucidation of the structure of complex substance." His second award was the Nobel Peace Prize in 1962 "for his opposition to weapons of mass destruction." His stated field was arms control and disarmament; he worked with other scientists to spread a message against the nuclear arms race. He played a key role in the Pugwash movement, which fought to reduce the role of nuclear arms in international politics. Interestingly, the



(From top left) Leo Rainwater (BS '39), David Baltimore, Howard Temin (PhD '60), and Renato Dulbecco all won Nobel Prizes in 1975.



Linus Pauling won a Nobel Prize in Chemistry in 1954 and the Nobel Peace Prize in 1962.

Pugwash Conferences on Science and World Affairs was awarded its own Nobel Peace Prize in 1995 for its efforts to reduce and eliminate the role of nuclear arms in international politics.

Four Caltech affiliates/alumni were recipients of a Nobel Prize in 1975, which is currently the most to be honored in the same year. Leo James Rainwater (1917-1986)

(BS'39) won the Nobel Prize in Physics in 1975 (with Aage Niels Bohr and Ben Roy Mottelson) "for the discovery of the connection between collective motion and particle motion in atomic nuclei and the development of the theory of the structure of the atomic nucleus based on this connection." David Baltimore, Howard M. Temin (PhD '60), and Renato Dulbecco shared the Nobel Prize in Physiology or Medicine "for their discoveries concerning the interaction between tumor viruses and the genetic material of the cell."



(From top) Robert Millikan and Carl Anderson won the Nobel Prize in Physics in 1923 and 1936, respectively.

-Photos Courtesy of California Institute of Technology

The other 2014 awardees are: Isamu Akasaki, Hiroshi Amano, and Shuji Nakamura in Physics "for the invention of efficient blue light-emitting diodes which has enabled bright and energy-saving white light sources"; John O'Keefe, May-Britt Moser and Edvard I. Moser in Physiology or Medicine "for their discoveries of cells that constitute a positioning system in the brain";

News briefs from around the globe

Need to know <100 words about the world this week

Youngest Nobel Peace Prize winner named

17-year old Malala Yousafzai shared the honor with Kailash Satyarthi [BBC]

Money donated to Gaza

5.4 billion dollars pledged by international donors; half is for reconstruction [ABC]

Voter ID laws rejected

2 US courts struck down voter ID laws in Texas and Wisconsin [BBC]

Russian troops pulled back

17.6k soldiers stationed near Ukrainian border ordered to return to bases [BBC]

Arrests made during protests

17 arrested during St. Louis protests of recent police shootings [ABC]

Venezuela ordered to pay Exxon

1.6 billion dollars demanded in compensation for expropriated assets [BBC]

Cyclone Hudhud prompts evacuations

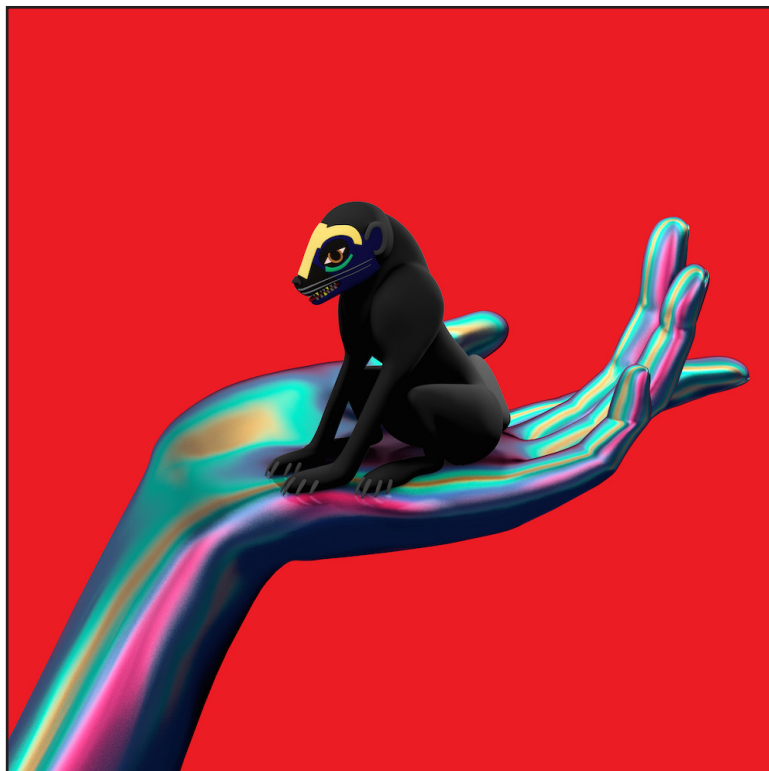
350k on east Indian coast evacuated due to severe storm, winds up to 130 mph [BBC]

SBTRKT's new album features big names, lands short

NAILEN MATSCHKE
Contributing Writer

The release of a sophomore album is usually an event packed with anticipation, as all of the questions raised by an even marginally successful debut get the sort of long-form, self-aware answers that the EPs and live work that often occupy the interim cannot fully deliver. After the universal acclaim of SBTRKT's 2011 self-titled release and with little to tide over listeners besides an underwhelming EP and a live album, the question of whether the producer's collaboration-dependent formula of mixing the range of styles that have accumulated in the wake of dubstep can continue to result in interesting yet accessible music has been ripe for an answer.

Wonder Where We Land, released Oct. 7, has at face value quite a bit of potential;



<http://theyoungturks.co.uk/>

building on the tested construction of its predecessor, it offers more variety and more features of some of the brightest stars across the spectrum of popular music from Ezra Koenig to A\$AP Ferg, and given that three years is generally a fair amount of time to produce an album, SBTRKT seems to have all of the necessary equipment for producing a worthy follow-up to his self-titled LP. However, as many artists have done before, SBTRKT seems to fall for the old trap of trying to do too much and not doing much of it particularly well, and although it is in many ways an iterative improvement, *Wonder Where We Land* feels as though SBTRKT has placed emphasis on evolving the wrong aspects of his style.

The first song on the album, after the 30-second intro track, is "Wonder Where We Land," a slow-burning mix of a subdued and sparse beat, some sluggish sustained bass notes, and then mostly vocal samples from stalwart S a m p h a . Already, it's illustrative of one of my biggest issues with the album: while nothing on its own is poorly made or a bad idea from the outset, for the most part the music lacks any real focus or novel ideas. I've already heard plenty of Sampha's vocals thanks to SBTRKT's previous work,

and it's not like distorted, droning bass notes are anything new (see Shlohmo, Salem, Burial, etc.), so I'm not sure what the goal of a track like this is.

Thankfully, the next couple of songs make up for the relatively slow start with some really cool moments. The first, "Lantern," is a short two-minute piece centered around a repeated energetic chorus of arpeggiated synths, building up through a distant-sounding rendition of the theme that undergoes a cacophonous transition to a hard-hitting beat, which eventually gives way to a harp interlude that brings the synths back with some unexpected cello backing before finishing off with a chopped-up rendition of the song's main "melody." Next is "Higher," which has cool instrumentals but is held back by an uninteresting rap performance from Raury, whose monotone and rapid-fire verses give the sound a nice subdued texture but end up making most of the song forgettable, except the hook with its escalating vocals and tremolo synths.

Songs like "Higher" would make great singles, as their catchy hooks manage to overcome their general repetitiveness. In fact, the album's problem is not that it lacks single-quality material, but that its several memorable songs are notably incoherent, and are separated by what feels like quite a bit of filler.

It's interesting that the first single released from the album was "New Dorp. New York," one of the most unusual tracks on the album for its Ezra Koenig feature, eclectic, rock-influenced instrumentals, and pounding bass. While it might be a little predictable, it's still amongst the tracks that have most stuck with me. Overall, though, I think my favorite might be "Look Away," the second-longest track on the album, with its unconventional and off-kilter percussion, glissando-happy synths, and a chilling vocal delivery by Caroline Polachek, aided by tastefully-used Auto-tune to wispily float over the chorus.

Unlike other tracks featuring guests, "Look Away" feels as though SBTRKT is the driving force behind the composition, demonstrating his production skills with tightly-arranged and unusual samples that mix well with a song whose underlying beat is continually changing. Many of the other collaborations, on the other hand, feel as though SBTRKT might as well just be producing music for the featured artist, rather than using them to aid in realizing what is largely his own artistic vision.

This is amplified by somewhat disappointing performances by the featured artists, such as the vanilla and unremarkable vocals of Denai Moore on "The Light," or A\$AP Ferg's verses on "Voices In My Head," which despite Ferg's best efforts have a hard time getting over the reality that he's simply not that great a rapper, especially when removed from his element as he is here with SBTRKT's production. On the other hand, it often seems like SBTRKT does not put much effort into giving each track much to support the vocals, content to stick to a single pattern for the instrumentals on songs such as "Gon Stay" or "Temporary View" (both featuring Sampha) or even on "Everybody Knows," which barely has any vocal samples. Despite some interesting choices of who to work with for this album, the tracks they appear on (which compose most of the album) are pretty weak for what they could be.

Sophomore albums are always a gamble, and even though *Wonder Where We Land* is certainly enjoyable to listen to with some unforgettable moments, I ultimately feel that it is nowhere near as memorable as *SBTRKT*. Luckily, there is still plenty of time for SBTRKT to redeem himself. I hope that this album serves as an even more valuable learning experience than its predecessor. With a firmer approach to the music's direction and focus, and some songwriting practice, I feel SBTRKT has the potential to make something special out of his sound.

Some books shouldn't be adapted for the big screen

MONICA ENLOW
Editor-in-Chief

WARNING: This article contains spoilers.

I was told when I went to see this movie that it was an adaptation of a book series. I was also told that the book series was reasonably okay. This film should have been left behind, but was not. That's the TL;DR of this movie.

Left Behind starts out by introducing us to all the characters. First, we meet the angsty blonde girl. She's in college and she just wishes her family would get their stuff together. Then there's Chad Michael Murray's character. His beautiful face doesn't go unnoticed by our blonde; neither does his scripted fame as an investigative journalist. The writers of this movie don't forget to remind you that he is a famous investigative journalist. But the most important character introduced in the first five minutes is a womanizing Nicholas Cage. Viewers will get to see Nick Cage as a pilot seduce a flight attendant. She is also blonde and looks about as old as the first blonde girl, who is actually Nick Cage's daughter.

As I mentioned before, Nick Cage is a pilot. This movie starts in an airport where the angsty blonde meets Chad Michael Murray and confronts an evangelical Christian woman. The fun at the airport doesn't end there, though. She also confronts Nick Cage, her womanizing father, and drags Chad Michael Murray into her family's craziness using her feminine wiles. In case that wasn't enough of an exciting plot, because we are at

the airport, and we know Nick Cage is a pilot and Chad Michael Murray is an investigative journalist, we know that a plane is taking off and that there will be snakes on this plane. It's one of the oldest setups in the book.

Then there's the aesthetic of the movie. The number of pointless scenes built into this movie is too many. A full 45 seconds of Extra Number 1 struggling with his luggage? Thirty seconds of Random Family 1 trying to herd their children? Countless scenes of miscellaneous extras running around like chickens with their heads chopped off? I don't think the editors of this movie grasped that you don't have to include all of the B roll footage in the final product.

Past those gems, there's the stereotypical suspense-building music. Viewers will also have their stereotypical suspense-building music come to a shocking conclusion when a phone rings. This will more than likely be a call from Chad Michael Murray, investigative journalist, or Nick Cage, womanizing pilot. Nothing legitimately exciting happens to break the suspense building music. In the one scene where the angsty blonde encounters a burglar being shot out of a jewelry store, that would have been an appropriate instance to break the music. Instead the music selection is overwhelmingly orchestral. I was focused on how soothing the music was because it seemed so out of place. Another scene viewers will appreciate is the scene with the gas tank explosion. If a very cheesy scene of a girl running away from an exploding gas tank isn't your style, though, this movie can

certainly provide you with more. Did you say you wanted a cartoonish scene where the plane crashes out of the air and comes inches away from hitting a strategically placed flammable gas container? Well, you got it!

The camera work also might make you nauseated. It is very evident that camera stabilizers were not in the budget of this high quality production. You can very obviously tell which shots were filmed from a helicopter, and which shots were filmed by the guy on a ladder.

Lastly, there's the aggressively Christian element of this movie. I am Catholic. I completely support people on whatever their religious beliefs happen to be or not be. *Left Behind* made me feel inadequate in my religious zeal. The premise of the movie is that all the non-believers who don't have god in their hearts and don't abide by the words of the Bible are left behind while the children and believers are taken to heaven. In general, I can't promote this movie purely because of its view on religion. The scene that I dislike the most is when a passenger in first class (who looks Middle Eastern) suggests to the first class passengers that they should all pray about the weird occurrence that took place. He said that the passengers should pray to any God they believe in. In my humble opinion, he appeared to be a stout believer of a God of his choice. This god, however, was not the god that Christians believe in, so despite

his religious devotion, he was not saved. A movie in 2014 that actively displays distaste for other religions is not okay. It's just not.

If you want a really good movie to make fun of one day, go and watch this movie. My advice is to wait until it starts playing at the Academy on Colorado, because it was not worth a \$10 movie ticket. The way the movie ended also gives strong hints to a sequel. Don't provide this production crew with sufficient funding for it. I give this movie a 0.7/10



http://www.impawards.com/2014/left_behind_ver3.html

NASA Commercial Crew Transport Capability narrows choice

CASEY HANDMER
Contributing Writer

spaceplane, as well as the new Virgin Galactic rocket motor. The

but had experience and resources. SpaceX had asked the least to

impressive) RD-180 rocket on its first stage. ULA has admitted that they have a limited supply of engines and uncertain capability to build copies themselves. Recently they contracted Blue Origin, Jeff Bezos's private rocket company, to build a replacement engine (the BE-4) powered by methane and oxygen.

When a really good rocket can get 3% of its launch mass into orbit, the last thing you want is a spacecraft which comes with substantial weight penalties for features of limited utility. While the shuttle could land on a runway, there were only a few runways long enough in the whole world, requiring precise targeting and good weather. In contrast, the Russian workhorse Soyuz capsule can land anywhere (it had once famously landed on a frozen lake).

Starting in 2009, NASA began a process of selecting private companies to provide astronaut transport capabilities to low Earth orbit. Coinciding with the retirement of the space shuttle, the program is intended to maintain US crewed space capability, reduce dependence on the Russian space agency, cut costs, promote innovation, and allow NASA to focus on crewed deep space exploration, should they ever receive a mandate to do so.

Despite a substantial under-provision of funds from Congress, the program has proceeded, with yearly reviews (designed in collaboration with the key players), to assess ongoing performance and keep the program focused. The biggest prize by far in this program is the development of the spacecraft, and by the beginning of 2014, three main contenders were still in play.

Boeing, the giant of US aerospace, has a long history of building rockets and space systems, including the Atlas V launch vehicle with United Launch Alliance. With tens of thousands of spare engineers and a deep understanding of the bid process, they proposed the CST-100, a very conservative capsule design based on proven technology.

SpaceX, the startup space company based in Hawthorne, has managed



develop a futuristic capsule design, to be launched on their own Falcon 9 rocket. Sierra Nevada had also proposed a relatively cheap development for the Dream Chaser, but would have to launch it with ULA (and hence Boeing's) Atlas V rocket.

On Sept. 16, NASA announced that SpaceX and Boeing would proceed, while Sierra Nevada would not receive further funding. In response, Sierra Nevada pledged to continue development with internal funds, cooked up a version of the Dream Chaser which could launch from the Stratolaunch plane, and filed

a formal protest, citing similar progress to Boeing but a lower cost. The result of the protest will be determined by January, but the result was anticipated fairly widely.

NASA is leery about space plane designs, after the experience with the shuttle. The promise of a cheaper, reusable rocket was belied by the reality. The shuttle, for all its benefits, was also a technological nightmare, extremely expensive, not particularly safe, and spent a very large proportion of its overall power lifting wings, wheels, brakes, and empty space into orbit.

On Saturday, Aviation Week obtained and published a copy of NASA's report on the decision. This report states, in part, "[We] consider SNC's design to be the lowest level of maturity, with significantly more technical work and critical design decisions to accomplish. The proposal did not thoroughly address these design challenges and trades. [The proposal] has more schedule uncertainty. For example, some of the testing planned after the crewed flight could be required before the crewed flight, and the impact of this movement will greatly stress the schedule."

The Dream Chaser looks great and promises a lot, but it is clear from this quotation that large aspects of the design are still to be hashed out. Given that uncertainty, it is not surprising that NASA chose to exclude them from the final stage of the program.

(From top) The Dragon V2, CST-100, and Dream Chaser designs were submitted for review.

Photos Courtesy of Wikimedia Commons

to bend the CCTCap process around their own development of the Dragon V2 capsule, a design with significantly more capability than called for during the process. With incredible design and manufacturing innovation, SpaceX is making waves in every part of the launch business, including their high-profile argument with ULA over sharing the military satellite launch business.

Sierra Nevada Corporation, a smaller and private aerospace electronics and systems company, had branched out into the launch business with the development of the Dream Chaser lifting body

Dream Chaser is designed to launch atop the Atlas V, then re-enter and land on a regular runway, whereas SpaceX and Boeing's capsules are designed to land with parachutes and/or rockets on land. All are designed to carry up to 7 people and to be reusable.

The latest decision on capsule development was expected by September 2014. NASA was widely expected to pick two of the three designs to proceed, based on progress and assessments of future risk.

At this point it was anybody's race. Boeing had asked the most to develop the least capable capsule,

complexity, the Atlas V is not presently rated for human flight. Rating the Atlas V is a complex program that Boeing understandably would be charging contractor rates for if its CST-100 capsule was not selected. If that wasn't enough, the Atlas V uses the Russian built (and thoroughly

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Company	Boeing	SpaceX	Sierra Nevada Corp.
Spacecraft	CST-100	Dragon V2	Dream Chaser
Bid	\$4.2b	\$2.6b	\$3.3b
Gross mass to LEO	20,000 lbs	16,600 lbs	25,000 lbs
Milestone goals	17/20	13/17	8/13

JD is Feisty in goal, awarded SCIAC Weekly Honor

GOCALTECH.COM
Actual Sports Content Editor

PASADENA, Calif. – Caltech sophomore goalkeeper, John David Feist, has been named the SCIAC Male Co-Athlete of the Week. The weekly award is voted on by each of the conferences nine athletic departments.

Feist has been instrumental in Caltech's competitiveness all season long. His 66 saves lead the SCIAC, and he helped the Beavers earn three straight first half shutouts against conference foes (La Verne: 5 SOG, 3 saves; Pomona-Pitzer: 7 SOG, 6 saves; Chapman 10 SOG, 9 saves).

"It's a great honor to be selected as athlete of the week," Feist said, "and I am very happy to perform for my team."

The matches with the Leopards and Sagehens were narrow losses, 2-1 and 1-0, respectively. At

Chapman this past Saturday, JD came up big when he stopped a penalty kick, a save that eventually allowed Caltech to earn its first point in conference with a 1-1 tie.

"JD has been terrific all season long," said head coach Rolo Uribe, "and the recent games prove how much better we are as a team from last year."

Feist's performances have been remarkable considering the number of shots the Beavers have defended. His 13 saves at CMS are a season-high, and heading into Monday's game, Caltech had given up 17 fewer goals in comparison to this time last year.

Feist was active and noteworthy against Cal Lutheran and Redlands earlier in the season. On a weekly basis, save after save, he continues to keep the Beavers in games.

"Coach Nick has been a tremendous help as our goalkeeper coach," Feist added. "The coaching

staff in general has been really good as well. I have been extremely motivated this entire season by how well the team is playing and extra motivation is the fight in our team and will to play 90 minutes of good soccer."

As Coach Uribe continued to praise JD for his leadership on and off the field, he mentioned his versatility: "If we had more depth, he could play in the field as a striker."

It's a particularly special occasion considering nobody from Caltech soccer has been named athlete of the week in six years. The last Beaver to earn the weekly award was Tyler Volkoff in 2008. "It's cool to be recognized," said Feist. "Our success has been the backbone and JD in goal," added Uribe.



There are lots of good things about this particular article: 1) a student athlete is doing really well and SCIAC appreciates that; 2) the article came with this title; 3) the file name for this picture is feisty.png.

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Always struggling for original content



The file name for this picture is hulk.png. I, myself, would have named it for_sparta.png.

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It's the third week of school and I'm already running out of wit for these captions. Get excited for third term.

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Scoreboard

Women's Volleyball

Tues. Oct. 7 vs. Occidental - L, 3-0

Sat. Oct. 11 vs.

Mills College - L, 3-1

Sat. Oct. 11 vs.

Mills College - W, 3-2

Men's Soccer

Mon. Oct. 6 vs. Whittier - L, 6-0

Sat. Oct. 11 vs. Occidental - L, 1-0

Upcoming Games

Women's Volleyball

Tues. Oct. 14 @ 7:30p - CMS

Fri. Oct. 17 @ 7:30p - Redlands

Sat. Oct. 18 @ 7:30p - Chapman

Men's Water Polo

Wed. Oct. 22 @ 5p - La Verne

Wed. Oct. 22 @ 7p - Chaffey College

Men's Soccer

Wed. Oct. 15 @ 4p - Redlands

Sat. Oct 18 @ 7p - Cal Lutheran

Wed. Oct. 22 @ 4p - Chapman



I believe this picture is funnier if you cut out the most important part of soccer.

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Amarise Little jumps up for a little "NOT IN MY HOUSE."

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ASCIT Minutes

ASCIT Board of Directors Meeting

Minutes for 5 October 2014. Taken by Sean McKenna

Officers Present: Catherine Jamshidi, Connie Hsueh, Patrick Nikong, Annie Chen, Sean McKenna

Guests: Margaret Lee, Elliot Simon

Call to Order: 9:11 pm

President's Report (Cat):

- ASCIT's End of Rotation Party / Movie Night went very well.
- All-Campus Barbeque / Sports Recognition Day is being planned by Tom Mannion and the SAAC to recognize student athletes. Tentative date is November 15th.

Officer's Reports:

- **V.P. of Academic Affairs (ARC Chair: Nima):**
 - (Nima sent this information to the BoD *in absentia*)
 - ARC Frosh Representative signups are posted in the RF Arches and will be taken down on Monday, October 13th. Arc reps will be giving talks to the frosh in their houses about the ARC and its many academic resources
 - The Student-Faculty Conference is scheduled for February 13, 2015. Most of the committee chairs have been selected.
 - Nima is in contact with the new Vice Provost cindy Weinstein to discuss relevant collaboration between the ARC and the Vice Provost's office.
- **V.P. of Non-Academic Affairs (IHC Chair: Connor):**
 - (Margaret spoke on behalf of Connor)
 - Department of Student Affairs wants to be able to audit house dues money, so all houses may have their budget reporting requirements changed slightly this year.
- **Director of Operations (Connie):**
 - Club Fair is happening on Thursday, October 9th. Club Funding is happening on Sunday, October 26th. Applications will be due on Monday, October 20th.
- **Treasurer (Patrick):**
 - Patrick is working through reimbursements, as usual, and will be working with Cat soon to set the ASCIT budget for 2014-2015, including club funding.
- **Social Director (Annie):**
 - Annie is working on setting up her Executive Social Committee, setting up a timeline for Big I, and doing preliminary planning for ASCIT Formal.
 - Annie is looking for signups for her ASCIT Social Team
- **Secretary (Sean):**
 - Sean will be scheduling club pitches for Club Funding on the 26th after clubs submit the appropriate application information by the 20th.

If anyone has any questions or concerns about a section of the minutes please email the appropriate officer. We are happy to answer any questions. The next BoD meeting will take place on October 12th at 9pm in SAC 15.

Meeting Adjourned: 9:58 pm

NOMINATE YOUR FAVORITE PROFESSOR FOR THE FEYNMAN TEACHING PRIZE!!!

Here's your chance to nominate your favorite professor for the 2014-15 Richard P. Feynman Prize for Excellence in Teaching! You have from now until January 5, 2015 to submit your nomination package to the Provost's Office to honor a professor who demonstrates, in the broadest sense, unusual ability, creativity, and innovation in undergraduate and graduate classroom or laboratory teaching.

The Feynman Prize is made possible through the generosity of Ione and Robert E. Paradise, with additional contributions from an anonymous local couple. Nominations for the Feynman Teaching Prize are welcome from faculty, students, postdoctoral scholars, staff, and alumni.

All professorial faculty of the Institute are eligible. The prize consists of a cash award of \$3,500, matched by an equivalent raise in the annual salary of the awardee. A letter of nomination and detailed supporting material, including, but not limited to, a curriculum vitae, course syllabus or description, and supporting recommendation letters

should be emailed to kkerbs@caltech.edu or directed to the Feynman Prize Selection Committee, Office of the Provost, Mail Code 206-31, at the California Institute of Technology, Pasadena, California, 91125. Nomination packages are due by January 5, 2015.

Additional information including guidelines for the prize and FAQ may be found at <http://provost.caltech.edu/FeynmanTeachingPrize>. Further information can also be obtained from Karen Kerbs (626-395-6039; kkerbs@caltech.edu) in the Provost's Office.

Presidential Inauguration

On October 24th, the Provost has declared an institute holiday to celebrate the inauguration of Caltech's 9th President Dr. Thomas F. Rosenbaum. The inauguration ceremony will begin streaming at 2 pm and there will be an all-campus reception to follow.



Dr. Rosenbaum and his wife, Dr. Katherine Faber, Simon Ramo Professor of Materials Science, have joined the Caltech Family and we wish them all the best!

The California Tech

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The advertising deadline is 5 PM Friday; all advertising should be submitted electronically or as camera-ready art, but *The Tech* can also do simple typesetting and arrangement. All advertising inquiries should be directed to the business manager at tech@caltech.edu. For subscription information, please send mail to "Subscriptions."

Announcement from the Counseling Center: MEDITATION MOB STARTS TUES. OCT. 14

Do you have trouble paying attention to what you're doing because you're already thinking about what's coming next? Want to feel less overwhelmed when you have strong emotions? Want to improve your concentration? Come learn some more about mindfulness meditation – it's just about being fully present in the moment and being aware of your thoughts, emotions, and experiences without getting caught up in them.

The Meditation Mob is a weekly drop-in mindfulness meditation group facilitated by Lee Coleman from the Counseling Center. In the group, we'll talk about mindfulness meditation from a secular, evidence-based perspective, and will practice the tools you need to get to know yourself better. We'll meet from 12:00 until 12:50 on Tuesdays, starting on October 14th. We'll meet on the bottom floor of Winnett in the side room where the Wired computer store used to be. Come as you are, and we'll be done in time for you to get to your 1:00 class. All grads and undergrads are welcome. For more information, you can mail the facilitator at meditate@caltech.edu. See you there!

Get Fit with Brad/Chad

BRAD CHATTERGOON
Contributing Writer

Fitness Myths Part 2

Hey Techers. Add day is this week, so if you've been deciding between taking that quantum physics course and Intro to Basket Weaving... take the Basket Weaving class. Trust me, you'll be happier. Also a big shout out to fellow Pageboy Nico Salzetta who put up a heroic fight as the last standing Pageboy in the Page-Ruddock dodge ball game. Let's continue with Fitness Myths!

which does not equate to strength. The leg muscles, quadriceps and hamstrings are the two largest muscle groups on your body. Not only do they add considerably to your metabolism but they also form a big part of your functional strength. In my opinion the most functional strength exercise that one can do is a deadlift (pictured), an exercise that makes use of the legs and lower back. These muscles deserve special strength attention and give rise to the infamous "leg day."

4.) "More gym time is better," or "Exercising every day is the best way to lose fat." Your



Photo Courtesy of Brad Chattergoon

1.) "Carbs are the enemy." Carbs are an important macro nutrient group, the other two being fats and proteins. Carbs often get a bad rap because they are associated with sugar and spice and everything nice... much like the Power Puff girls. The truth about carbs though is that they are the body's preferred energy source, so carbs are about when you eat them. Without them you can find yourself lethargic.

2.) "Running will make you fit." According to Charles Poliquin, "Humans are meant to either sprint or walk long distances." Running is a sport but as a general fitness activity it can be damaging to the joints, especially if proper form is not maintained. In the words of Diane Lee, "You don't run to get fit, you need to be fit to run."

3.) Relatedly, "I run for legs." A common misconception is that running is a substitute for dedicated leg strength training. Running is an endurance activity,

body is not a machine. It needs time to recover from training, especially after tough sessions. Additionally, a tough session is measured not by the number of hours that you spent at the gym but rather by the intensity of your workouts. For example, taking rest periods of 10 minutes between sets to chat with all of your friends is probably not going to lead to any kind of intensity. Intensity can be increased by decreasing rest times, and incorporating certain training strategies like super setting (the practice of doing two exercises back to back before a rest period).

There you have it, a total of 8 fitness myths spread across two articles. You should be ready to get into training core now. As one of my friends once told me, "six packs are made in the kitchen, not the gym." So for next week we'll be looking at nutrition basics!

Brad/Chad

Crossword

1	2	3	4		5	6	7		8	9	10	11		
12				13		14			15					
16						17			18					
19					20			21	22					
			23			24								
25	26	27		28		29			30		31	32	33	34
35			36		37			38		39				
40					41				42		43			
44				45		46					47			
48					49		50			51		52		
				53		54			55		56			
57	58	59	60					61				62	63	64
65						66	67			68				
69						70				71				
72						73					74			

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Across

- 1. Percussion instrument
- 5. Mariner
- 8. Retail outlet
- 12. Approximately
- 14. In the past
- 15. Ambit
- 16. Measuring instrument
- 17. Guided
- 18. Jury
- 19. Something very ugly and offensive
- 21. Distinguished
- 23. Digit
- 24. Bellow
- 25. Part of a circle
- 28. Heap
- 30. Violent denunciation
- 35. Reflect deeply on a subject
- 37. A small cut
- 39. Claw
- 40. Supplication
- 41. Creep
- 43. Not any

Down

- 2. Comply
- 3. Short letter
- 4. Invitee
- 5. Story
- 6. Mature
- 7. Exhibition of cowboy skills
- 8. Make a wide sweeping search
- 9. Make perfect or complete
- 10. Overt
- 11. Animal hide
- 13. Cavalry unit
- 15. Supernatural being
- 20. Used to control a horse
- 22. Floor covering
- 24. Acknowledgement of payment
- 25. Copious
- 26. Measuring stick
- 27. Accurately stated or described
- 29. Part of a chain
- 31. South African currency

Across

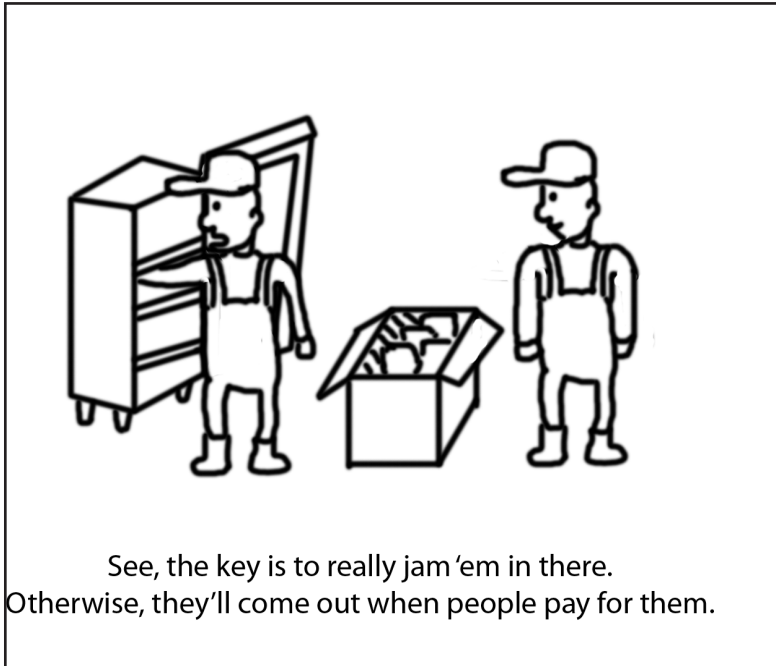
- 32. Distant in manner
- 33. Benefactor
- 34. Foe
- 36. Molten volcanic rock
- 38. Hardy cabbage
- 42. Jack in a deck of cards
- 45. Machine
- 49. Female deer
- 51. Immature form before metamorphosis
- 54. Useful or valuable quality
- 56. Warble
- 57. Exchange
- 58. Languish
- 59. Slight competitive advantage
- 60. Cubicle
- 61. Novice
- 62. 9th letter of the Greek alphabet
- 63. Defect
- 64. Thread
- 67. In favor of

Sudoku

	3				2		5	
9				5		8		6
		7	1					
4								5
		2	9		3		1	
	7			4		9		
				8		3		
2		1						
					5		7	

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Acquired Taste



Dr. Z Answers to previous Sudoku

7	6	9	5	8	1	2	3	4
2	5	8	4	3	9	7	6	1
3	1	4	7	2	6	5	8	9
6	7	1	2	5	4	8	9	3
9	2	5	3	1	8	6	4	7
4	8	3	9	6	7	1	2	5
8	9	7	1	4	2	3	5	6
5	4	2	6	7	3	9	1	8
1	3	6	8	9	5	4	7	2

Answers to previous crossword

S	P	I	C	E		C	O	T		G	L	A	D	
T	I	T	A	N		A	W	E		G	R	A	C	E
I	N	E	R	T		G	E	M		L	I	T	H	E
R	E	M	O	R	S	E		P	I	O	N	E	E	R
			L	A	W		C	O	M	B				
C	A	N		P	I	T	H		P	A	N	A	M	A
O	V	A	L		N	E	E	D		L	E	V	E	L
R	E	D	O		E	E	R	I	E		S	A	L	E
P	R	I	S	M		M	I	L	L		T	I	E	R
S	T	R	E	A	K		S	L	A	B		L	E	T
						D	I	S	H		T	A	B	
V	I	B	R	A	N	T		R	E	L	A	P	S	E
I	D	I	O	M		O	D	E		S	T	E	E	D
L	E	A	S	E		L	E	E		A	H	E	A	D
E	A	S	E			E	N	D		M	E	R	R	Y

-puzzlechoice.com



Gigi Anotello

They're all fine majors: A guide for the undeclared

LORI DAJOSE
Contributing Writer

So, you've decided to come to the prestigious STEM university, Cal Poly— I mean, Caltech. One of the inevitable questions you'll get when you proudly announce to someone that you're attending Caltech — other than, "Pomona or San Luis Obispo?" — is, "What are you studying?"

There are probably many of you who have no idea what you want to do, and there are others who are probably mega excited about their plans to triple major in ChemE, Astrophysics, and English.

Regardless of which category you fall into, at some point you realize that, outside of Caltech, the rest of the world maybe (at best) lukewarmly informed about your passions for measuring gravitational waves from the sound of a first order phase transition.* In order to alleviate any potential surprises, I've helpfully compiled a short list of common misconceptions I've run into regarding some areas of study.

Physics: "Oh my god, that must be just like in The Big Bang Theory!"

Computer Science: "Hey, can you fix my computer?"

Math: "Wow. What's 2394802 divided by 53?"

Astronomy / Cosmology: "That's so cool — you can read my palm and do my makeup simultaneously!" (this actually happened)

ESE: "So.. do you believe in global warming?"

Biology: "So.. do you believe in evolution?"

BEM: Dolla dolla bill y'all!!

And finally, from infinite personal experiences, the gem that is Planetary Science: "..What's that?"

But, disregard my sweeping generalizations about the general public, and major in whatever gets you most excited.

*Yes, I just used the first result for "gravitational waves" on Google Scholar to write that. No, I do not know what it means.

Another Caltech administrator announces his departure

TIM SINCLAIR
Contributing Writer

Undergraduate Dean John O. Dabiri has been getting all the attention recently, especially after his Saturday morning email announcing his upcoming move to Stanford after just becoming the newest Dean on campus this past June. Another Caltech administrator has announced they are leaving their post here for greener pastures this week as well, but you won't hear their name around the undergraduate houses. Caltech's Head Stablemaster, Jim Dorsey, is leaving for MIT at the end of this academic year.

For the last 18 years, Dorsey has worked with the Caltech Pony Express, the heart of the Caltech Mail Distribution System. "I started because of my love for animals," Dorsey wrote in an email he sent only to Caltech administrators, staff, and the members of Horseplay, a relatively unknown Caltech club. "Unfortunately, Caltech students just don't share the passion for horses that burns within me." While Dorsey chose not to give us any details about his offer from MIT, he says it's not about the money. "The Caltech community does not realize that they have a piece of history here," Dorsey told us in his first full interview after the announcement, referencing the Caltech Pony Express.

In fact, a recent campus poll found that while 23% of undergraduate students hold a positive opinion on Caltech's unique mail system compared to 11% who held a negative opinion, 65% of undergrads didn't even know how their mail is delivered every day (the

remaining 1% of respondents neighed back at the interviewer). "Maybe that's why the textbook I ordered arrived a little chewed-up," a student we polled commented. Once a major point of interest for tour groups on campus, the Caltech Pony Express has been shrinking nearly every year since 1995, the year Dorsey first got a job at Caltech. That year, after numerous concerns that PETA might try to cause problems for anyone using animal test subjects in labs on campus, the Pony Express was cut back as well to avoid possible issues. Specifically, that was the last year that a Caltech horse gave birth on campus. Ginger, 18, was the product of that birth and now she, along with her 19-year-old brother, Biscuit, are the last remaining horses in Caltech's stables. Ginger and Biscuit's mother, Sweet-Tart, died tragically in a Ditch-Day related accident last year, when a group of mechanical engineers competed to out-tie each other in a competition of knotting the best lasso as part of Wild West: The Stack. Unfortunately one of the participating students had taken Mag: Knot Theory, and their misunderstanding of a key lemma resulted in Sweet-Tart's passing.

"Sweet-Tart was my pride and joy," wrote Dorsey in his email. "She was the most faithful and best mount I've had the pleasure of knowing. She was so experienced, even a student who'd never thought of spending time with an animal like her could ride her without it getting awkward." While this may cause many people around Caltech to chalk up Dorsey's departure as a

heart-broken animal lover putting down the reins, there is a disturbing trend of Caltech administrators leaving for other institutions. Not two years earlier, previous Caltech President Jean-Lou Chameau moved from Caltech to King Abdullah University of Science and Technology in Saudi Arabia, a country in which adult women must have a male relative as their legal guardian, and a single male witness is counted the same as two female witnesses in a court of law.

Will Caltech figure out what is making their leaders jump ship to known humans rights violators, like Saudi Arabia, not to mention MIT? This is the question facing our Institution as it moves to become a more recognizable name in the 21st century. As for now, administrators are just slipping away, one horse-handler at a time.

The Iterated Manifold is a weekly column by Timothy Sinclair, who thanks Andrew Montequin for first informing him of Dorsey's announcement.

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