

Men's basketball breaks losing streak, wins twice

GOCALTECH.COM

PASADENA, Calif. — On Feb. 3, junior Kc Emezie hit the game-winning basket at the buzzer as the Caltech men's basketball team snapped a 55-game, four-year SCIAC losing streak with a 49-47 victory over the University of Redlands.

"It just feels great, and to win a close one — a tough one — is even better," Head Coach Dr. Oliver Eslinger said. "This means so much to so many people — our seniors, alumni, community, department and our really great fans and supporters who come out to every game and watch online. Our entire department has so much positive energy right now, with everyone working so hard and such a supportive administration. This is a true extended team win."

Caltech's last SCIAC win came on Feb. 22, 2011 in a season-ending 46-45 victory over 110 Freeway Rival Occidental College that broke the infamous NCAA-record 310-game losing streak dating back to 1985. The Beavers improve to 2-17 overall and 1-9 in SCIAC play, while Redlands drops to 5-14 (2-8).

On February 7, 2015, just days after shaking off a 55-game SCIAC losing streak, the Caltech men's basketball team accomplished something it had not in 44 years — winning two SCIAC games in one season — with a 92-77 victory over Whittier College on Saturday night.

"This one was down to the entire team's effort and execution," Head Coach Dr. Oliver Eslinger said. "There were a number of spectacular plays but all in all we just stuck to our game plan."

Sophomore Nasser Al-Rayes exploded for a 22-12-6-6 line and senior Andrew Hogue also flirted with a triple-double (14-12-6) as the Beavers made a statement with their first back-to-back SCIAC wins since the 1953-54 season, when they won three straight to claim the SCIAC Championship. Caltech also recorded consecutive victories



The men's basketball team defeated Whittier College 92-77 to earn its second SCIAC win this season.

Photo Courtesy of Michael L. Wong

in SCIAC play as recently as 1960-61, although there was a non-conference loss between them.

"It is hard to guess at what we are really capable of because this is such new territory," Eslinger said. "We envision where we want to be and go, but we are really just going to keep working and preparing like always."

Caltech outshot Whittier 52-38 percent from the field while hitting

a season-high 11 three-pointers at a season-best 44-percent clip and posting a phenomenal +18 rebound margin. The Beavers improve to 3-17 overall and 2-9 in the SCIAC, while Whittier drops to 12-8 (6-5).

The Poets jumped out to a 14-6 lead just over five minutes into play, with Al-Rayes scoring all six of the Beavers' points. Caltech turned up the heat with a three-pointer by sophomore Ricky Galliani (Menlo

Park, Calif. / Sacred Heart Prep) and an Al-Rayes layup to cut it back to a one-basket game. The Beavers still found themselves trailing 25-20 with 8:52 on the clock, but that is when the dam broke open.

Caltech scored the next 10 points in less than three minutes to surge ahead, 30-25. After a Whittier jumper made it a one-basket game, junior Kc Emezie extended the margin back to five, but the Poets kept pushing relentlessly. They hit consecutive layups to pull back within one point at 32-31 before Al-Rayes altered a shot on the defensive

end and Hogue drew a foul at the other, taking the lead back to three. Whittier tied things up at 34-34 on a Nick Demusis trey, but just as the Poets were threatening to make a trademark run to end the half, Caltech cranked things up a notch.

Hogue banked in a deep three-pointer as the shot clock expired on the next possession to give the

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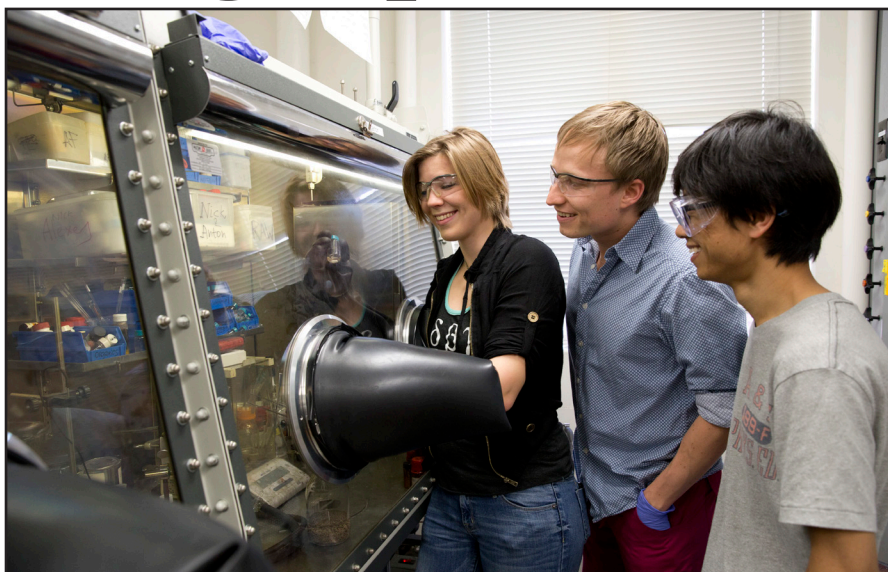
Trio challenges precious metal paradigm

LORI DAJOSE
Contributing Writer

A team of Caltech scientists and students has discovered a groundbreaking new method of synthesizing carbon-silicon bonds—a method that is easier, cleaner, and a thousand times cheaper than the current state-of-the-art. The Tech sat down with graduate student Anton Toutov and undergrad Kerry Betz, members of the Grubbs lab; and postdoc Wen-Bo "Boger" Liu, a member of the Stoltz lab; to hear the story of how they pursued a seemingly improbable reaction to make a cutting-edge achievement in chemistry.

Lori Dajose: First of all, let's talk about why your new method is so revolutionary to chemistry.

Kerry Betz: Well, carbon-hydrogen (C-H) bond silylation — replacing a hydrogen atom with a silicon group in a molecule — is normally pretty challenging. You have to use these expensive, rare, and sometimes dangerous metals like platinum, palladium, and iridium, as catalysts. But our reaction uses potassium tert-butoxide as the catalyst. Potassium



(From left) Kerry Betz ('15), Anton Toutov, and Wen-Bo "Boger" Liu advanced the field of chemistry with their paper detailing the use of postassium as a catalyst.

Photo Courtesy of Allison Maker

is naturally abundant, making our compound safe and inexpensive — no more need for those precious metals.

Boger Liu: Additionally, replacing a carbon-hydrogen bond with a carbon-silicon bond is really crucial in making important molecules called organosilanes, chemical building blocks valuable in manufacturing basically everything from new medicines to new functional materials, like next-generation liquid crystals for LCD screens. The idea of making

organosilanes catalytically without precious metals seemed so naive and lofty — it was unprecedented. This "precious metal paradigm" was like an axiom in chemistry that few scientists had attempted to challenge.

LD: What inspired you to challenge it?

Anton Toutov: Two and a half years ago, I noticed organosilanes occurring as unexpected byproducts from my unrelated experiments with biofuels. It was

kind of random, but this really provided the crucial proof-of-principle that we didn't need to use crazy expensive precious metal catalysts for the carbon-silicon reaction to occur. I just decided to run with it.

LD: And you started looking for people to run with you.

KB: Yes. Around the same time that Anton's project was gaining momentum, I was looking for summer research. I met with several potential mentors, him included.

He was just so incredibly excited and animated talking about it, and I thought, "Wow, he seems like a really fun guy to work with!" I was relatively new to this type of chemistry, so I didn't have the same bias that more experienced researchers had with regards to this precious metals paradigm.

LD: Boger, you teamed up with Kerry and Anton a few months later. What inspired you to join?

BL: Well, one of the key components of the reaction involves

breaking a carbon-hydrogen bond in a heteroarene and replacing it with a carbon-silicon bond. I had done some research on the first half of that process — methods for breaking C-H bonds. Anton and I would have coffee every Saturday, and one day he showed me how he had been using a potassium catalyst for this reaction. I couldn't believe it. I knew this would change the entire field of C-H silylation chemistry. It was natural for me to get on board with him.

AT: I had worked on the problem alone for some time and solved it to an appreciable degree, and then I knew I could use some really talented and passionate people to help improve the reaction further, and broaden its scope. When Kerry and Boger joined the project, it just took off.

BL: Originally, we began by applying the method to a class of molecules called heterocycles, biologically important scaffolds present everywhere in nature. When it became unbelievably clear that it was really working, we each branched out to apply the method to different classes of molecules.

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ASCIT Minutes

ASCIT Board of Directors Meeting

Minutes for 6 February 2015. Taken by Sean McKenna.

Officers Present: Cat Jamshidi, Nima Badizadegan, Connor Rosen, Patrick Nikong, Sean McKenna

Guests: Daniel Kong

Call to Order: 8:06 pm

President's Report (Cat):

- Faculty Board meeting will take place next Monday. On the agenda: honor code committee report, undergraduate education and the house system, library hours.

Officer's Reports:

- **V.P. of Academic Affairs (ARC Chair: Nima):**
 - Student Faculty Conference is happening on February 12th. Nima will send out a list of session times. Classes should be canceled.
 - Formal announcements about ACM 95 changes will be made soon.
 - The library is open for midterms!
 - Remember that the ARC runs "take a prof to lunch!"
- **V.P. of Non-Academic Affairs (IHC Chair: Connor):**
 - The IHC has almost turned over. Still waiting on two new presidents.
 - House funding/budget policy has been finalized.
- **Interim Director of Operations (Sean):**
 - DevTeam wants to get rid of the Caltech server for Donut and get it hosted on Amazon. Cost would be similar. DK will talk to the IMSS in a couple weeks. Goal for implementation by the end of term. BOD members approve of these changes.
- **Treasurer (Patrick):**
 - Working on streamlining budget PTA's
- **Social Director (Annie):**
 - Absent
- **Secretary (Sean):**
 - Anneila Meeting will happen next week

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 meeting will take place on **February 13th at 8pm in SAC 15.**

Meeting Adjourned: 8:23

YOU ARE NEVER ALONE.

REMINDER FROM
THE COUNSELING CENTER:

Meditation Mob
(drop-in mindfulness
meditation group)

meets every Tuesday
Bottom floor of Winnett
from 12:00-12:50 pm

Men's basketball continues to score

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Beavers a lead they would never relinquish. Al-Rayes added a layup on a quick spin move in the post and tipped in another with 33 seconds left, but Whittier did not hold the ball for the final shot and allowed the Beavers to counter in the final seconds, with Emezie hitting the fast break layup to put Caltech up 43-34 at halftime.

"It wasn't a single moment where we pulled ahead so much as we had several minutes of terrific defense and we just kept scoring," Eslinger said. "And we are certainly a team that can do that."

Caltech was not about to let up coming out of the break. Al-Rayes blocked the Poets' first look and Emezie and senior Bryan Joel soon made it a 14-point game at 48-34 with 18:24 on the clock. Joel kept the hot hand, nailing two more threes preceding Galliani's second for a game-high 21-point lead at 14:51.

The Poets trimmed the deficit back to 14, but the Beavers kept firing, immediately going back ahead by 21 with 12:00 remaining. Whittier made yet another push over the next three minutes, trimming the margin to 13 at 69-56, but Al-Rayes was in the zone and rattled off the next six points himself to keep Caltech well ahead.

Whittier made its final charge with an eight-point flurry to threaten to bring the margin down to single digits, but Galliani put a stop to the rally with a dagger three-pointer at the 4:35 mark, forcing the Poets to foul the rest of the way. They would cut the deficit as low as 12 with 1:58 left to play, but the Beavers held firm to post the 15-point victory.

"Whittier is a high-pace team, which leads to a lot of possessions, so I never felt like it was over until the horn went," Eslinger said. "I knew

we were in a good spot when they started to foul us. We had command of the game and we had a couple timeouts left."

Al-Rayes notched a quartet of career highs in the dominant performance, scoring a game-high 22 points on 10-of-19 shooting and completing his fourth double-double with 12 rebounds while adding six assists and matching Tuesday's six blocks. Hogue scored 14 points, hitting 2-of-3 treys and 8-of-9 free throws, and grabbed 12 rebounds while dishing out six assists. Joel chipped in 15 points on 5-of-9 shooting from beyond the arc and added eight rebounds and five assists, with Emezie (7-of-14) and Galliani (3-of-6 long range) netting 15



Members of the men's team rejoice in their victory over Redlands. -gocaltech.com

and 13 points, respectively. Sophomore David LeBaron contributed seven points and three rebounds in 21 minutes coming off the bench.

"These two wins are big for us, big for our Caltech community and big for the department," Eslinger said. "Still, we want to stay even-keeled and continue to progress."

Eslinger and the Beavers will look to keep their streak going on Thursday, Feb. 12 against Claremont-Mudd-Scripps Colleges (14-5, 7-3) at the Pomona-Pitzer Rains Center.

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The Tech is published weekly except during vacation and examination periods by the Associated Students of the California Institute of Technology, Inc. The opinions expressed herein are strictly those of the authors and advertisers.

Letters and submissions are welcome; e-mail submissions to tech@caltech.edu as plain-text attachments, including the author's name, by Friday of the week before publication. *The Tech* does accept anonymous contributions under special circumstances. The editors reserve the right to edit and abridge all submissions for any reason. All written work remains property of its author.

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Undergrad #3 gives behind-the-scenes look at *The PhD Movie 2*

MICHAEL L. WONG
Contributing Writer

Long shadows stretched across Beckman Lawn as a youthful woman with cropped raven hair took the wrinkled hands of an elderly Asian gentleman. “Jump with me,” she said. To my astonishment, the two began hopping like bunnies. At first, it was just the woman, her ivory smile radiating enthusiasm at an unreceptive vessel. “You’re excited!” she insisted with vigor. Before long, the man began bouncing, too, as if raw energy had been passed through their connected arms. But the scene was utterly odd — what a pair! It was like watching a red-hot Ferrari jump-start a crumbling pickup. The two were hopping ferociously now. Up-down-up-down-up-down-up ... “You’re having fun!” the lady screamed. And all of a sudden, the beaten truck roared back to life.

Satisfied, Iram Parveen Bilal, director of *The PhD Movie 2: Still in Grad School*, returned to her post behind the camera. On her monitor was the freshly galvanized figure of Tony Chu, who was playing the part of Professor Chu. “Late in the day, he gets a little tired,” Bilal explained to the first

assistant director. “He just needs a little reminder to have fun.”

“Action!” Bilal said.

That was my signal. I began strolling down the west sidewalk of Beckman Lawn.

I looked ridiculous. I had aviator goggles on my head and a sock monkey in my hand. A bike chain hung from my neck like a formal tie on top of my gray button-down shirt. These were the hallmarks of Undergrad #3. The chain, in particular, had become my identity on set. “Did you escape from the lab?” a fellow actor had quipped. I don’t know what I did, but Bilal informed me that I was modeled after an actual undergrad who went to Caltech decades ago. They don’t make ‘em like they used to, I guess.

My route took me right behind Chu, who was clad in ceremonial academic regalia. He was grinning wildly, arms hoisted, thumbs pointed to the heavens. Orange ribbons rained down all around us. It was graduation day —

“Cut,” snapped Bilal. “Back to one!”

—though it felt more like Groundhog Day.

From Jan. 9 to Feb. 1, a professional movie crew buzzed around Caltech’s campus filming

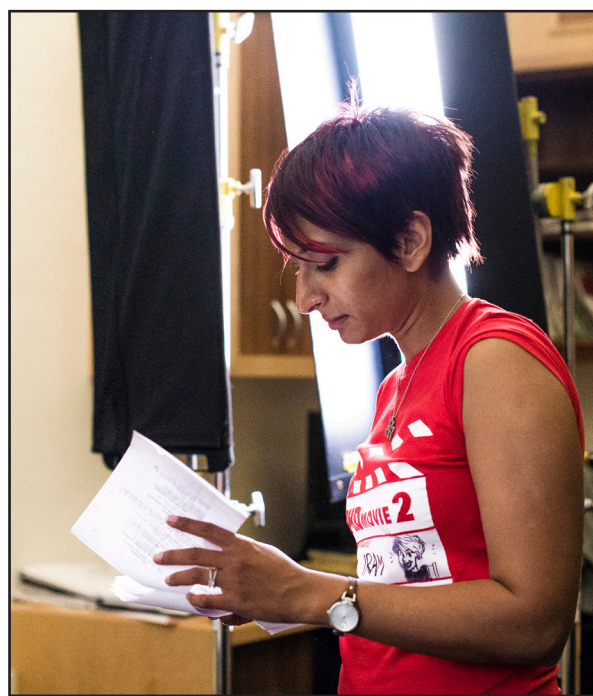
The PhD Movie 2. Like its predecessor, the film was based on the popular comic strip, *Piled Higher and Deeper* — better known as *PhD Comics*.

Jorge Cham, a soft-spoken but highly creative Chinese Panamanian, launched *PhD Comics* in 1997 while earning his doctorate in mechanical engineering at Stanford. As a newspaper and web comic about life in academia from the perspective of graduate students, the strip has been published in over 50 newspapers and five anthologies, and attracts nearly 70 million annual views online. When Cham, who resides in Southern California, decided to make a feature film based on *PhD Comics*, he solicited the aid of Theater Arts at Caltech (TACIT).

The first *PhD Movie*, released in 2011, was produced entirely by members of the Caltech community. For the sequel, Cham was able to raise enough money via a Kickstarter campaign to bring in professional Hollywood personnel.

Nevertheless, *Still in Grad School* features the same principal cast as the original *PhD Movie*, starring numerous Caltech-affiliated people. The lead actors are Alexandra Lockwood (Ph.D. ’14) and Raj Katti (B.S. ’14), who play Cecilia and Winston, respectively. Crystal Dilworth, now communications coordinator for the division of physics, mathematics, and astronomy, reprises her role as Tajel. Zachary Abbott, Caltech IMSS systems administrator, portrays the hard-nosed Professor Smith. Additionally, dozens of Caltech community members worked behind the scenes as PAs, volunteered as extras, and auditioned for a handful of small roles.

In a brilliant move, Cham persuaded Bilal — an upstart international filmmaker and alumna (B.S. ’04) of Caltech’s



Caltech alumna Iram Parveen Bilal ('04) is the director of *The PhD Movie 2*.

out of the dying day. Throughout the shoot, Bilal’s attention to detail blew me away. *Her necklace is crooked. The hand grip isn’t supposed to be on the desk yet. The dissertation was folded in his lap before.* I would sit there in awe as Bilal and her crewmen argued over the position of the camera with respect to characters’ eyelines or whatnot — specifics of cinematography that I didn’t even know existed.

It also amazed me how she could make things up on the spot. One night, I got a text message asking me to return to set for an unscripted appearance of Undergrad #3. The scene was office hours, and my character didn’t understand the homework.

Bilal sat down next to me. “Let me see you cry.”

“I don’t think I can do that,” I said.

She looked at me as if the fate world depended on my fake tears.

“Try.”

I gave it a whirl.

“Stop. Make the energy come from the top, then crash down,” Bilal said.

I don’t know why, but those instructions made sense to me. I bawled like a baby.

“Great, just do that again,” Bilal said.

Gulp.

“Ready camera!” she said.

It may not go on my CV, but being a part of *The PhD Movie 2* was one of my proudest accomplishments at Caltech — even if it means I go down in history as the chained-up, aviator-goggle-wearing, uncontrollably sobbing undergrad.

Photo Courtesy of Michael L. Wong



Alexandra Lockwood (left) plays Cecilia in *The PhD Movie 2*, based on the comics by Jorge Cham (right).

Photo Courtesy of Michael L. Wong

Students prove that potassium salts outperform precious metals as catalysts

Continued from page 1

AT: We were each working in our own direction, simultaneously pushing the project forward on several different fronts. Kerry was making molecules that have never been made before, discovering interesting subtleties about the reaction, and developing some sophisticated hypotheses. She’s now a completely independent research chemist, and a leading world authority on Earth-abundant metal catalysis, working on extending this method to other molecules. I’m so proud of her. And Boger, he is such an amazing talent. He helped me to optimize the reaction to an excellent level, synthesized a large amount of new molecules using our method, and helped me to develop several new methods based on our general concept. He has also been working on elucidating the mechanism of the reaction, which is currently a big

mystery that nobody in the world seems to understand! All in all, I had just the best team imaginable with which I could bring my C-H silylation reaction to life.

LD: Your method isn’t just a new way of synthesizing organosilanes — it’s also a better way than the existing state-of-the-art. Tell me about that.

BL: First of all, we found that the reaction could actually occur under pretty mild conditions. We’re talking room-temperature here — the lowest temperatures this reaction has ever occurred at. In addition, there were no harmful or dangerous byproducts, just hydrogen gas — which is valuable itself!

KB: The method is really environmentally friendly. Using precious metals produces toxic metal waste that has to be filtered out from your desired products — our method has no such drawbacks. On top of being green, it is thousands of times cheaper than using precious metal catalysts. And if being clean

and cheap wasn’t enough, it is also pretty easy. This is the kind of thing that could probably be taught in an introductory freshman lab, like Ch 003A. It’s shocking how it just blows away this precious-metal paradigm that has been around for almost a century.

LD: Your paper was recently accepted and published in *Nature*. What was it like for you to be published in such a prestigious journal?

BL: Well, we got the acceptance email on my birthday. It was a fantastic present.

KB: My birthday was a few days before we got our paper accepted, so it

was like a birthday present for me too. I was actually having a really bad day. Then I got a card from Anton saying, “Happy birthday ... oh and by the way, congratulations on your publication acceptance into *Nature*.” It has been so amazing; I’ve been able to help this project come from an uncertain, possibly controversial beginning, to an unprecedented and publishable conclusion.

AT: Yes, and it’s really just the beginning. There’s so much to come, and we are the pioneering lab for this research. Our hope is that this discovery will change the way that people think about chemistry, and about the logic of chemical synthesis in particular.

The full paper was published in Nature on Feb. 5, titled “Silylation of C-H bonds in aromatic heterocycles by an Earth-abundant catalyst.”



Kerry Betz is an undergraduate student in the Grubbs lab and published a paper in *Nature* with Anton Toutov and Wen-Bo “Boger” Liu.

Photo Courtesy of Allison Maker

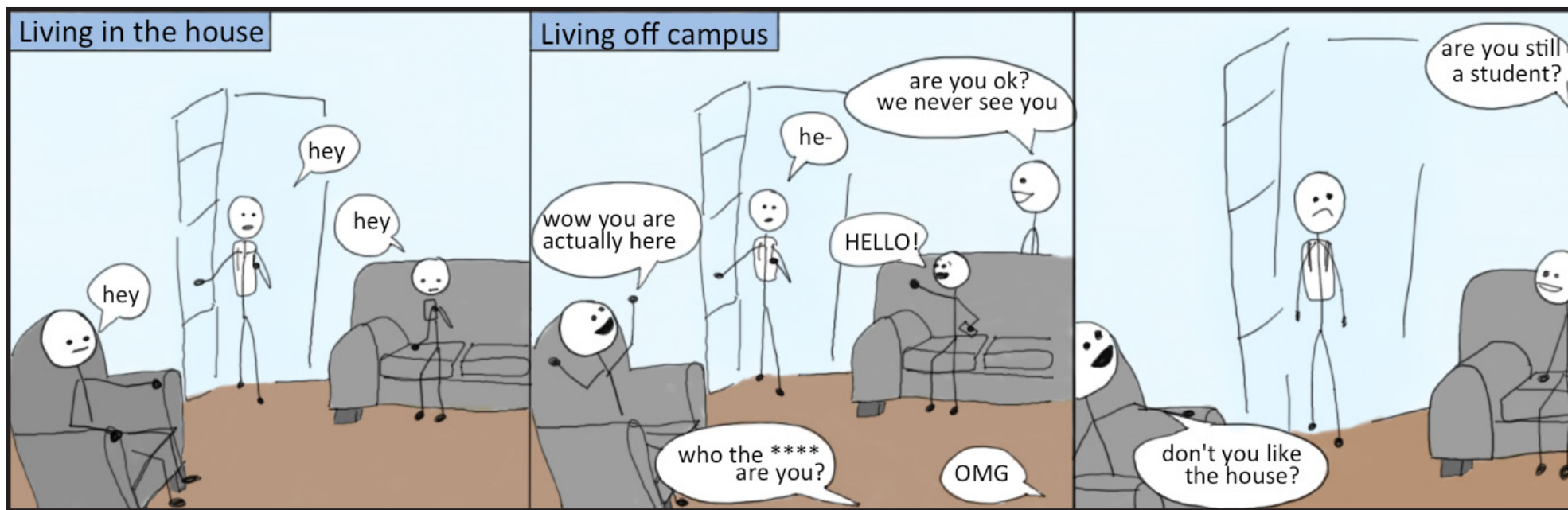
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Acquired Taste

Dr. Z

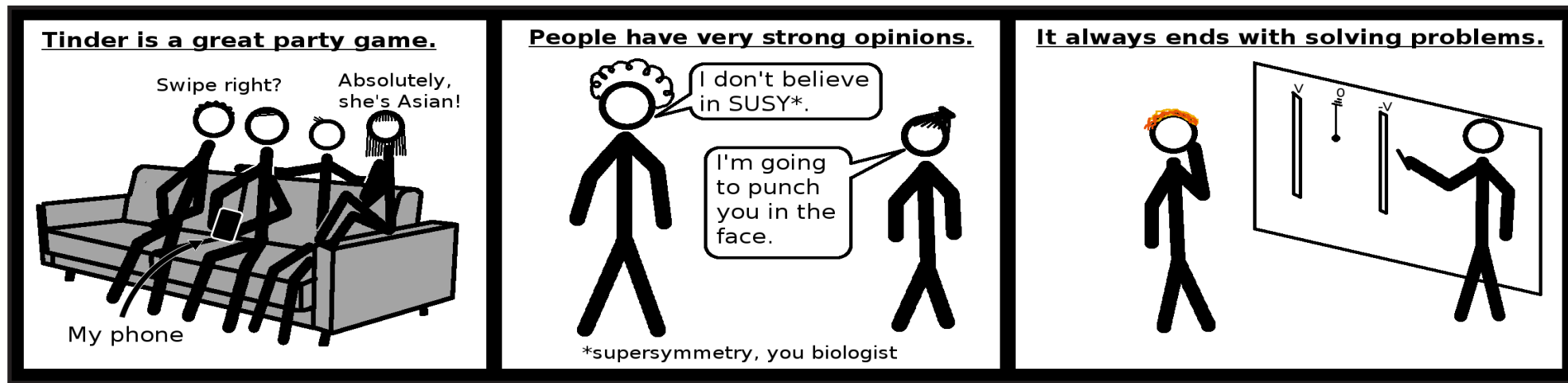


Rochelle Weber



"What happens when you reach a critical concentration of physicists at a party?"

Georgio Kraggman



Answers to previous crossword

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Courtesy of Zach Rivkin ('14)

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