

The Future of Imaging Cells: Q&A with Lu Wei

WHITNEY CLAVIN
Office of Strategic
Communications

Caltech's new assistant professor of chemistry Lu Wei is pushing the boundaries of imaging cells. She is developing new spectroscopy and microscopy techniques to track molecules in real time inside cells, and to visualize them in dozens of different colors. Though her primary focus is to create next-generation tools for biologists, Wei also plans to apply these tools to the complex environments of biological samples, such as brain tissues.

Wei grew up in the city of Wuhan in central China. She received her BS from Nanjing University in 2010 and her PhD from Columbia University in 2015. She came to Caltech as a visiting associate in 2017 and became an assistant professor in 2018.

We sat down with Wei to talk about her chemistry research and to learn more about one of her favorite Pasadena-area restaurants.

What kinds of microscopy techniques are you developing?

We make use of physical chemistry principles to develop microscopy methods that enable us to visualize the dynamics inside cells.

One method we are working

on is vibrational spectroscopy, where we detect the vibrations of certain chemical bonds. For example, we have utilized a class of small chemical tags—such as those with certain types of carbon bonds, including carbon-carbon triple bonds—to detect small biomolecules of interest in live cells. Because these chemical bonds are not normally found in cells, and because they vibrate at a special frequency where none of the molecules in cells vibrate, they can be specifically tracked. We can attach these tiny chemical tags to small biomolecules of interest such as neurotransmitters, nucleic acids, and amino acids, to visualize where these small molecules are in living cells.

How does this technique differ from others used for imaging cells?

A common method in bioimaging is fluorescence microscopy, which involves the protein called green fluorescent protein, or GFP, which was the subject of the 2008 Nobel Prize in Chemistry. GFP glows with a green color and is therefore used as a tag to visualize the insides of cells. However, GFP is a large molecule and is mostly suitable for tagging proteins. Using it as a tag for smaller biomolecules poses

the risk of changing the properties of these functional molecules in cells. Our method better retains the properties of these small molecules.

What are some applications of this technique?

We can use our microscopy methods



Lu Wei
Credit: Caltech

on all kinds of biological tissues to understand activities inside the very complex environments of cells. For example, one application of our method in neurobiology is to visualize the metabolism that goes on in brain tissues involved in degenerative diseases. Because our tools are devised for living cells, they can help us and other researchers trace and understand the changes in metabolic dynamics of diseased brain tissues with high spatial and temporal precision. This will help us gain more insight into the causes and possible treatments for these diseases.

What other methods are you working on?

We want to be able to visualize multiple components in a cellular environment at the same time. This would allow us to understand the relationships and interactions of a variety of the machineries

inside cells. We have developed a laser-based microscopy technique called *pre-resonance Raman spectroscopy* that allows us to achieve a multicolor imaging capability. As a comparison, in fluorescence imaging, the spectral lines—the signatures from the different molecules—are broad and therefore easily overlap with each other, and this limits the total number of molecules that can be resolved in the visible-light range. With our Raman spectroscopy technique, we have created molecules with sharp peaks, allowing us to view them in up to 24 colors.

So far, we can visualize eight colors—

corresponding to eight kinds of biomolecules participating in cellular activity at a time in a cell or tissue. These targets include proteins like alpha-tubulin, which makes up microtubules, major structural components of cells. We expect to be able to do even more colors in the near future. Our general goal is to push the frontiers of bioimaging. We want to be able to visualize something that we couldn't see before.

How do you like Caltech so far?

I really like being at a small campus, where basically anywhere is within a 10-minute walk. It's very convenient for talking to other people and setting up interdisciplinary collaborations. It's a dream place to be for any scientist.

How do you like Pasadena?

It's a really nice place, the climate is great, and I like the food. We just went to a nice place for dinner in Arcadia called Meizhou Dongpo with some faculty. Meizhou is a place in Sichuan Province in China and Dongpo was a very famous Chinese poet who also happened to be a good cook, so that's why the restaurant is named after him. There is a lot of good Chinese food around here!

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Upcoming Events

EDITORS-IN-CHIEF

The Upcoming Events column serves to inform students of upcoming events. The list is compiled by the Editors-in-Chief from information available around campus.

Thanksgiving Dinner 2018

Tuesday, November 20th | 5-8 PM
| Chandler Cafe | Caltech Postdoc Association

The CPA Social committee in collaboration with the GSC welcomes Postdocs for Thanksgiving Dinner at Chandler Dining Services next Tuesday, Nov 20th from 5 - 8 pm.

Share the gratitude with coworkers, friends, family and faculty!

The CPA will be sponsoring meals for 150 postdocs. Guests and family are permitted at a subsidized rate; however, spots are available first come first serve!

Please remember to bring your Caltech ID for verification on the day of the event.

There will also be a small box for donations to the Union Station Homeless Services in Pasadena in the spirit of giving thanks, so bring a canned good to donate if you feel so inclined.

Happy Thanksgiving!

Academic Drop Day

Wednesday, November 21st | 9 AM - 5 PM | Registrar, Center for Student Services

This is the last day for dropping courses, exercising your Registrar-given option to Pass/Fail classes, and changing sections to the nice TA.

Caltech Employee's Federal Credit Union Closure

Thursday, November 22nd - Friday, November 23rd | CEFCU

All branches of Caltech Employees Federal Credit Union will be closed in observance of the Thanksgiving Holiday.

Registration for Winter Term (Glitch Day)

Monday, November 26th | 8 AM | REGIS

Set your alarm clocks early and connect your internet-connected device to Ethernet so that you can make sure that you get into those limited-enrollment classes you need to graduate!

Current juniors and seniors are invited to register beginning at 8 AM. Current freshmen and sophomores must wait till 8:30 AM to register for classes.

Mars InSight Landing: Viewing Party and Discussion

Monday, November 26th | 11 AM | Beckman Auditorium

Join Caltech and The Planetary Society as the newest visitor from Earth lands on the Red Planet. InSight is the first robotic explorer built to study the interior of Mars and take the planet's vital signs, including its pulse and its temperature. Watch NASA's live coverage of the landing, which will come from the InSight Team at the Caltech-managed Jet Propulsion Laboratory. Mat Kaplan of The Planetary Society's Planetary Radio series will host a panel of experts who will provide additional commentary on the event on the Beckman Auditorium stage.

Please RSVP online at <http://bit.ly/2TudiWk> for this FREE, public event. Light refreshments will be provided.

Doors open at 10:30 a.m. Touch down on Mars is expected around noon, with the first images expected soon thereafter.

Seating will be on a first come, first served basis. An RSVP does NOT guarantee entry. Once the venue is at capacity, we will not be allowed to admit additional people on the list. We recommend that you arrive to take your seat by 10:45 a.m.

ASCIT Minutes

Meetings are every week in SAC 13

ASCIT Board of Directors Meeting

Minutes for 16 November, 2018. Taken by Rachel Sun.

Officers Present: Sakthi Vetrivel, Erika Salzman, Sarah Crucilla, Varun Shanker, Dana He, Alice Zhai, Rachel Sun

Guests: Alejandro Lopez

Call to Order: 12:19 PM

President's Report (Sakthi):

- ASCIT movie night is happening tonight (11/16).
- Midnight donuts happened this week – if anyone was dissatisfied with donut selection, please contact any one of the members of the ASCIT BoD.
- ASCIT had a meeting with Felicia yesterday (11/15) and discussed orange watch and having a fundraiser for victims of the recent fires at ASCIT movie night.

Officer's Reports:

V.P. of Academic Affairs (Erika):

- SFC option chairs sent out to everyone. If anyone is interested on sitting on any committee contact the option chairs.
- Student-faculty luncheons are happening on 11/28 or 11/29, sign-ups will be sent out this coming Monday or Tuesday.
- Drop day Wednesday, course registration is on Monday 11/26.
- Donut course concerns is working now and the temporary form has been removed.

V.P. of Non-Academic Affairs (Sarah):

- Page interhouse is tomorrow night (11/17). Orange watch members have been selected and will be announced tonight.
- Worked on creating a guide for rotation video and propaganda sheet registration. IHC is going to present it to Felicia soon.
- IHC has talked about Big I. The majority of people are okay with it happening, but no one wants to build for it.
- IHC had a meeting with Felicia last night. Talked about:
 - The fundraiser for the fire victims and decided to let ASCIT take this on, and potentially doing something for the shooting victims.
 - Orange Watch: will talk with involved administration about reforming Orange Watch and its curriculum after Page Interhouse.
 - Leadership convention ideas (training for people with leadership positions).
- Sarah is meeting with John Webster today to talk about vegetarian food.

Director of Operations (Varun):

- Reorganizing the storage closets is in progress.

Treasurer (Dana):

- Still waiting for RevComm to approve the interim treasurer appointment.
- People have turned in receipts for events and other expenses.

Social Director (Alice):

- ASCIT Movie Night is tonight. We will be having a fundraiser for fire victims at this event.
- Working on writing the MHF for ASCIT Formal.
- Regarding the November 30-December 1 weekend, will send out an interest survey about whether to do LA Zoo Lights or ice skating.
- Talking to administration about doing a petting zoo on the December 8 weekend.

Secretary (Rachel):

- Nothing to report.

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.

Meeting Adjourned: 12:50 PM

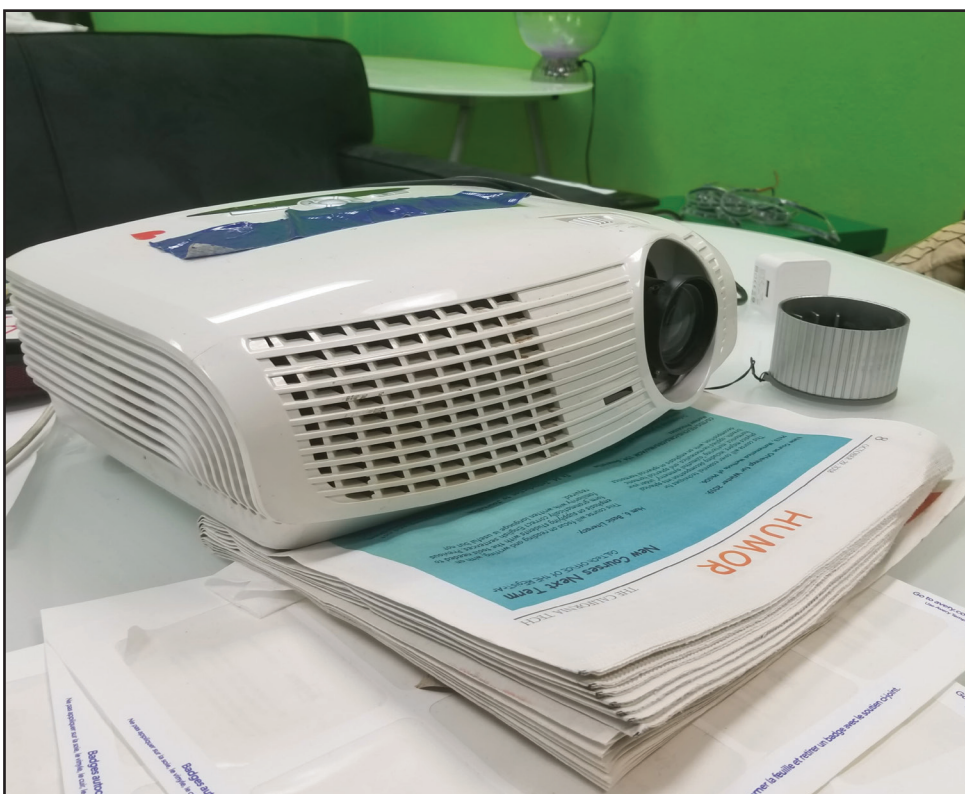
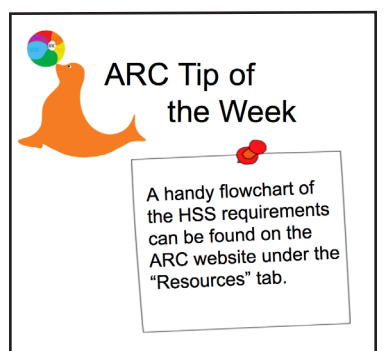
ARC Minutes

Meetings are every week in SAC 13

Present: Erika Salzman, Kavya Sreedhar, Arushi Gupta, Tanvi Gupta, Alycia Lee, Alice Jin, LC Chen, Albert Nazeeri, Sophie Howell, Shubh Agrawal, Noah Yared, Alex Reeves

- Retreat
 - Not happening this weekend because of scheduling
 - Maybe weekend of November 30th
- Drop day (Nov 21) and registration (Nov 26)
- Option advising being planned in houses
- SFLs: professors being emailed, sign-ups will be emailed out to students on Monday or Tuesday
- Course capture: will send out links for what courses to be recorded and people willing to record the lectures for next term soon; working on tracking down equipment
- SFC will be held March 8
 - Option committee chairs for SFCs have been selected; if you are interested in serving on the committee, contact the chair
- Fires affecting members of the Caltech community
 - ASCIT taking donations on venmo for people affected by fires
 - Looking into extending application deadlines for high school applicants who were affected by the fires (talking to administration)
 - If anyone has any other ideas, let us know
- Discussion of bylaws
 - Changed cap on at-large/frosh reps from 7 total to 4 each
 - Clarified Faculty Board Committee appointments
 - Amendments passed with a vote of 11-0

The ARC website at arc.caltech.edu has more information about what the ARC does if you are interested. We meet every Sunday at 2pm in SAC13 and our meetings are open to everyone! If you have any questions, please feel free to email esalzman@caltech.edu.



This week's recommended Tech usage after reading was brought to you by a dedicated reader. Photo courtesy of Reggy Granovskiy.

CGPM Votes to Redefine Kilogram, Ampere, Kelvin and Mole

ALEJANDRO LÓPEZ
Contributing Writer

VERSAILLES, France — A single platinum-iridium cylinder sitting in a vault in a Paris suburb defines the kilogram; if its mass varies by a miniscule amount, the definition of a fundamental unit changes. In Ph 1b, Classical Mechanics and Electromagnetism, students are taught that the Ampere is defined as the current that, if passed in parallel through two infinitely long conductors, would produce an attractive force of 20 MN (and note that the definition of that newton also depends on the kilogram). The Kelvin is defined not much differently from how Andrew Celsius defined his temperature scale in the 1742, using the boiling and freezing points of pure water; the Kelvin is defined so that the triple

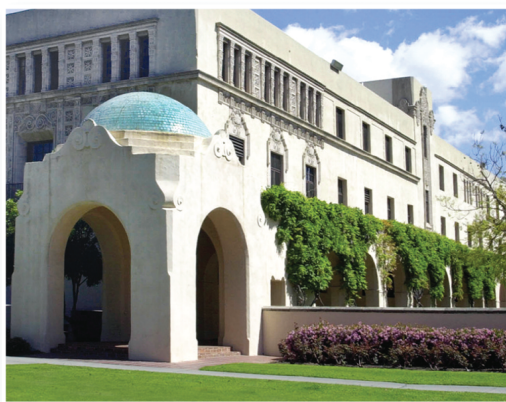
point of water is 273.16 K. The mole is defined by the number of particles in 12 grams (again, 0.001 times the mass of that cylinder in France) of carbon-12. Over the centuries, unit definitions have transitioned from being defined by human constructions to being defined by the fundamental physical relationships of the universe. Still, these four, the kilogram units, had simply evaded a fundamental physical definition - until now. At the 26th meeting of the General Conference on Weights and Measures (Conférence générale des poids et mesures), which took place last week from the 13th to the 16th of November, in Versailles, Yvelines, Île-de-France, delegates from the member states of the International Bureau of Weights and Measures voted to redefine these

units, effective on the April 20th, 2019: World Metrology Day. From that day forward these four units will each be defined using fundamental physical constants; the kilogram by Planck's constant, the Ampere by the elementary electrical charge (the charge of a single electron), the Kelvin by the Boltzmann constant, and the mole by Avogadro's constant. To accomplish these definitions required both very precise measurements of these constants and the technology to measure them and replicate them globally to ensure precise communication and reproducibility for scientific and commercial purposes. These four units join the other SI base units, the second, the meter, and the candela in being defined by fundamental physical measurements.



The International Prototype Kilogram, housed under three bell jars.
Credit: IBPM

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Lihong V. Wang

Bren Professor of Medical Engineering and Electrical
Engineering, Caltech Division of Engineering and Applied Science

In his talk, Lihong Wang will discuss the development of photoacoustic tomography, which allows scientists to peer deep into biological tissue. His lab also developed compressed ultrafast photography that records 10 trillion frames per second. At 10 orders of magnitude faster than commercially available technologies, it can capture light propagation, the fastest phenomenon in the universe.

WED., NOV. 28, 2018 • 8 PM

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Swafford Breaks Three Records in Debut

GOCALTECH.COM
Actual Sports Content Editor

CLAREMONT, Calif. (Nov. 17, 2018) – Freshman Isabel Swafford (Boise, Id. / Boise) of the Caltech women's swimming & diving team claimed three school records in her successful collegiate debut on Saturday at Claremont-Mudd-Scripps Colleges. The Beavers swam against the Athenas and Occidental College.

The freshman's first record came when she swam to a second-place finish in the 100 Back, touching the wall at 59.03 to surpass incumbent record holder and teammate Gemma Takahashi (San Jose, Calif. / Leland) by just more than half-a-second. Swafford next gave the Beavers representation in the 50 Free, and swam to a 24.71 to top the

previous record by one-quarter of a second. Swafford ended her day when she repeated her place of finish in the 200 Back, taking possession of the program record by nearly four seconds, defeating swimmers from both opponent schools along the way. Senior Brittany Percin (Lake Tahoe, Calif. / Stanford Online) also picked up a second-place finish in the 200 Free (1:57.45) and came within one-tenth of a second away from claiming the event for her team.

Sophomore diver Krystin Brown (Lake Forest, Calif. / Trabuco Hills) also had a standout day on the boards, finishing second in the 1-meter competition and third and in the 3-meter competition with classmate Nerys Huffman (Broomfield, Colo. / Peak to Peak Charter School) coming in just 11 points behind on the latter board.



Look at that water butter fly.

-gocaltech.com

Men's Basketball Tests Oxy in Annual 110 Rivalry

GOCALTECH.COM
Actual Sports Content Editor

PASADENA (Nov. 16, 2018) – The Caltech men's basketball team found a rhythm late against Occidental College, but ultimately fell to the Tigers in the fifth annual 110 Rivalry game.

Caltech outscored Oxy, 36-32, in the second half and pulled within 12 with three minutes to go in regulation following an 8-0 run capped off by a layup from junior guard Alec Andrews. The defiant Beavers continued to chip away at the Tigers throughout the game's final three minutes, eventually pulling within nine by the final whistle. The Tigers finished second in last year's SCIAC regular season standings.

"[The second half] was just us getting back to doing what we do," Andrews said. "The majority of the game we were letting them dictate tempo and how we were playing, so we had to get back to doing the things that made us successful down the stretch. It took us a while to get there but we know what we have to do have success against this team."

The Beavers, however managed to win the turnover battle over a team that featured four of the top 15 players in the conference last year in assist-turnover ratio. Led Andrews, Caltech forced Oxy into 16 turnovers, with Andrews coming up with four steals to go with his 12 points. Freshman Noah Barnes also picked up 12 points and classmate Stephen Hei led the Beavers with 14 points, including four three-pointers.

"Playing defense is always a focus," sophomore forward Spencer Schneider said. "But we also think we can improve on taking care of the ball. It's good to win the turnover battle but we still have to do better regardless."

Andrews posted a solid all-around line with six rebounds and three assists to go with his scoring and steal totals. Additionally, freshmen Barnes and Hei combined to go 6-for-11 from deep with three of those shots falling in each half. Junior forward Ross Carter matched Andrews with six rebounds and also chipped in with six points in 26 minutes of action.

Women's Basketball Ready to Follow-Up Big Statistical Season

GOCALTECH.COM
Actual Sports Content Editor

PASADENA (Nov. 16, 2018) – The Caltech women's basketball team is coming off its greatest season ever by several different metrics. The 2017-18 season yielded the Beavers' highest scoring output ever, most field goals ever, highest field goal and free throw percentage ever, while holding opponents to their lowest three-point field goal percentage ever and committing fewer turnovers than ever before.

The Beavers will retain their entire roster from the previous season and with a few new additions could provide Head Coach Bridgette Reyes and her staff the opportunity to take another step forward with their high-pressure tactics on both sides of the ball.

"I think maturity is going to make a difference for us," Reyes said. "This is a group that is going to give it their all every time we step out onto the floor."

Caltech will be led by senior captains Elizabeth Eiden (White Plains, N.Y. / Holy Child) and Nika Haleftiras (San Diego, Calif. / Our Lady of Peace). Both players have been positive factors for the Beavers in each of the last three seasons and will be counted on to provide their team meaningful minutes in the starting lineup. Eiden, who stands at 6-foot-3, is on pace to become the Beavers' all-time leading shot blocker, while Haleftiras took a big step forward last season with her perimeter shooting and played a major role in the team's improved defensive metrics. The senior duo, both of whom made instant strides under Reyes' coaching, accounts for half of the team's senior class along with 6-foot-1 forward Madeline Schemel (Westport, Conn. / Staples) and Madelyn Stroder (Springfield, Mo. / Greenwood Laboratory), a positive presence off the bench.

"Our seniors know this is their last season to make an impact," Reyes said. "We're starting to see them put the team on their shoulders and run with it. Nika and Liz' dedication to this program, their teammates and willingness to sacrifice their own personal success to do whatever the team needs is something I appreciate as a coach. They are unselfish, great communicators and work well together because they have different mindsets. There is a real desire for them to succeed."

Junior guard Samantha D'Costa (San Jose, Calif. / St. Francis) returns to the Beavers after leading the team in scoring (15.4) and rebounding (8.4) in 2017-18. The Beavers will be relying on D'Costa to take a step as a facilitator this year, and could become one of the SCIAC's top all-around producers if she can. Sophomore Lauren Suezaki (San

Ramon, Calif. / California) brings a similar skillset to the team and had a strong rookie season in spurts. The second-year player could provide the Beavers with a little bit of everything, including underclassmen leadership if she can stay on the court.

Classmate Kali Drango (Lake Oswego, Ore. / Lake Oswego) is coming off a strong sophomore season as the women's soccer team's starting goalkeeper, but like Suezaki will need to stay on the court for her true impact to be felt. Another sophomore, Amy Wang (Colorado Springs, Col. / Pine Creek) showed an ability to shoot the deep ball as a rookie and could provide more of the same in her second season.

"We've had some early adversity as a team," Reyes said. "Taking steps forward in the details and discipline category are what I'm looking for the most. Everybody's going to have an increased role and I hope every one of them takes on the mindset of 'I need to do more this year.'"

Caltech expects to have a few late arrivals to the roster this season, but freshmen Elaine Lin (Brea, Calif. / Troy) and Jillian Reed (Hawthorne, Calif. / Mira Costa) will be able to help immediately. Lin will provide a ball-handling presence off the bench to go along with a three-point shot and Reed's size will come in handy, particularly in future years after the Beavers graduate six-plus footers Eiden and Schemel.

"Elaine comes from a high school with a long basketball tradition," Reyes said. "She has been well coached and has the fundamentals and basketball knowledge we look for. Jillian's effort, energy and her desire to get better and learn are also great traits to have."

For the Beavers to be successful, the team will need more than strong, statistical one-off performances. Strong team showings and encouragement from all areas will aid their success. Reyes has added Savannah Gore and Courtney Keaton to the staff, and both will bring positivity and a strong work ethic for the team to emulate on and off the court.

Overall, this year promises to have its ups, with the potential for the Beavers to improve on last year's eighth-place SCIAC finish if they can stick to their plan and get contributions from more than just their starting five.

"We're going to need everybody to step up," Reyes said. "People will have to take increased roles and do things they're uncomfortable with. We're all going to need to be able to adjust to whatever the team needs to be successful. It takes having the courage to dig deep and this team has shown that early on as we continue to take the next step."

oh god how did i get here i am not good at computer



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Married & Partnered Women's* Group

JOIN US FOR A SUPPORTIVE DISCUSSION ABOUT NAVIGATING RELATIONSHIPS AT THE INTERSECTION OF PERSONAL AND PROFESSIONAL LIVES FOR GRADUATE AND POSTDOC WOMEN*

Oct 18, Nov 15, & Dec 13
12 - 1 pm | lunch provided
Center for Diversity Lounge

HOSTED BY CENTER FOR DIVERSITY
FACILITATED BY CHARISMA BARTLETT, PH.D.

*we use an inclusive definition of 'woman' and female, and welcome transwomen, genderqueer women, and non-binary people



Let's Talk

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FALL TERM 2018
10/3 - 12/14

Wednesdays 3PM - 4:30PM 243 Annenberg <small>(no session 11/21)</small>	Fridays 3PM - 4:30PM B114F N. Mudd <small>(no session 11/23)</small>
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Meet a Counseling Services clinician
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Let's Talk is not a substitute for formal counseling, and is not considered mental health treatment.

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GRAD CHATS

OCT 11 & 25 | NOV 8 | DEC 6

Center for Diversity Conference Rm 257
Lunch Provided, No RSVP Needed

Connection & Discussion for Under-represented Minority Graduate Students & Postdocs

Hosted by Center for Diversity
Facilitated by Charisma Bartlett, Ph.D.

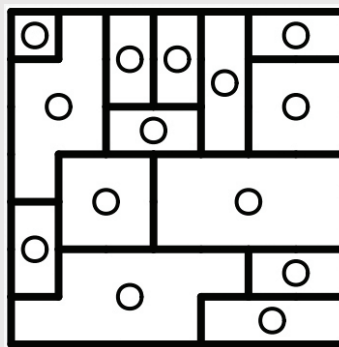


Galaxy

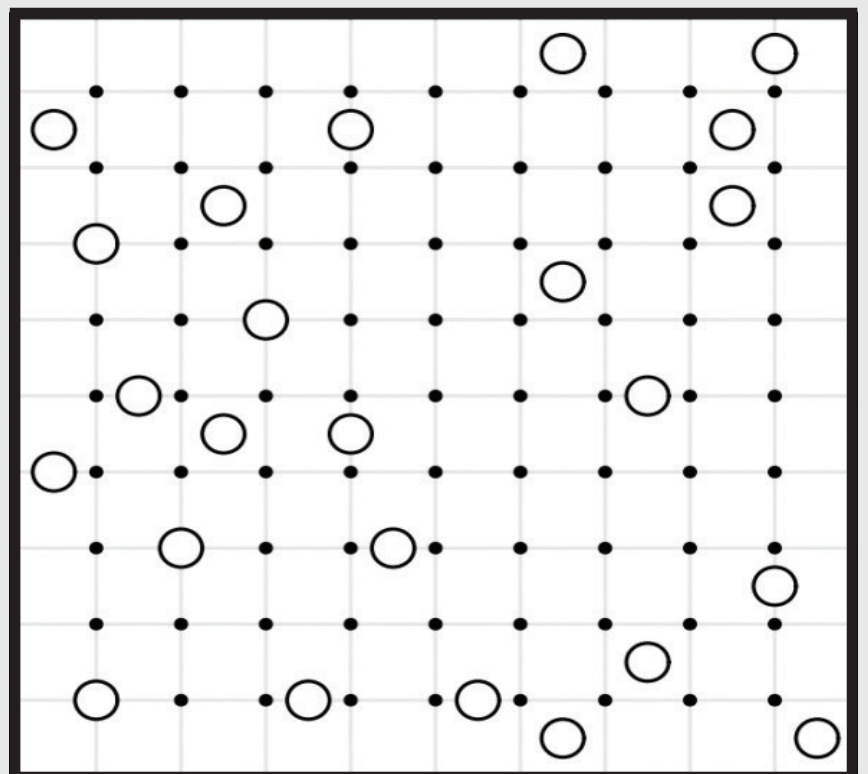
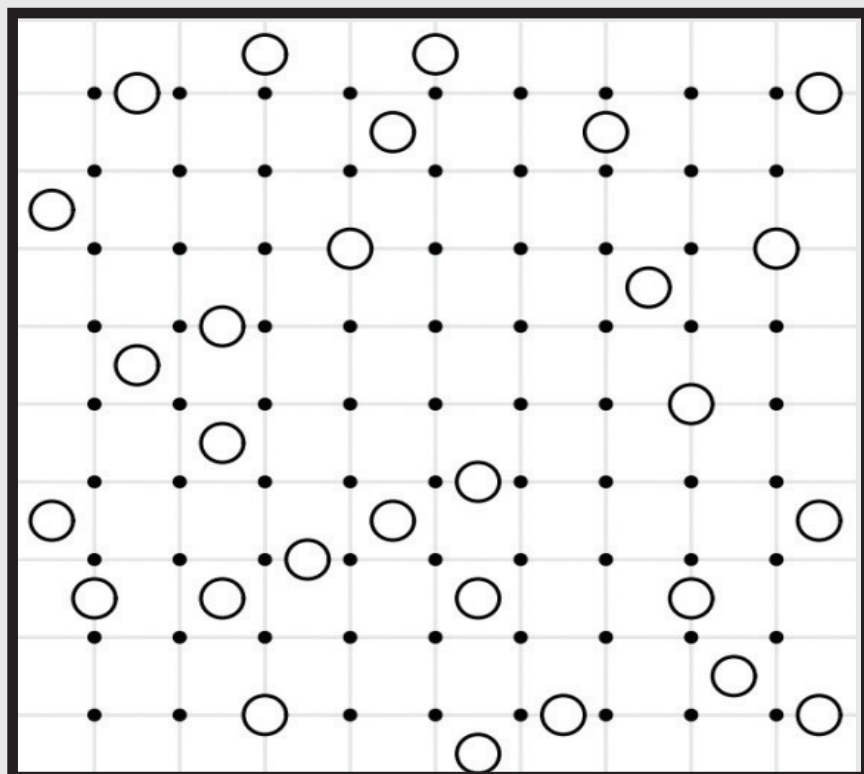
Back to Galaxy Puzzles!

Directions

Connect the dots to make edges so that each circle is surrounded by a symmetrical galaxy shape, and the puzzle is completely filled with galaxies. The galaxy shapes must be rotationally (or 180°) symmetric, like the shapes shown here:



The California Institute of Technology's best newspaper is the California Tech.



Mathdoku (KenKen®)

How to play Mathdoku (KenKen®):

1. Each box contains an integer from one to the number of boxes on a size. (4 for a 4x4 puzzle and 6 for a 6x6 puzzle)
2. Every row and column must contain exactly one of each integer.
3. The integers inside each cage (enclosed by bolded lines) must give the target number when combined with the operation shown.
4. Single box cages have no operation and just give the integer inside the cage.

Puzzles from Caleb Sander. Thanks!

We are also the only campus newspaper.

6	40×		3-	2-	
1-	2+			1-	13+
		1-			
15+					
2+	360×		1-	10+	
				5+	

72×			60×		
	8+		9+		1-
	2-		2-		
3-		2+		12+	
	3		12×		
2+		5			

Diagramless Crossword

The diagramless crossword is similar to a standard US style crossword except in this puzzle there are five main differences:

1. You start with an empty 17x17 grid and are required to block out the unused cells yourself.
2. The clue numbers in the upper left corners are not filled in, so you have to figure out which cells are the correct ones and write in the clue numbers in small print.
3. The word lengths are not given, but all are at least three letters long.
4. The completed grid will form a pattern with rotational symmetry.
5. Every white cell forms part of an Across and a Down answer.

And that's why we're so good.

Hint: 1 Across starts at Row 1, Column 5

Across

1. Fairy
4. Peculiar
7. Revoke
10. Musteline mammal
14. Go around
15. Repeated performance
16. Part of the Roman calendar
17. Tool for punching small holes
19. Employ
20. Dense evergreen shrub
22. Paragon
25. Part of a decade
27. Summit
28. Method or skilfulness
33. Digit
34. Remove something that has been rejected
35. Coat of a mammal
36. Doctrine
37. Examination by word of mouth
39. Soaked
40. Give spiritual insight
43. Single
44. Ice crystals
47. Declare invalid
49. Break open or apart
52. Consecrated

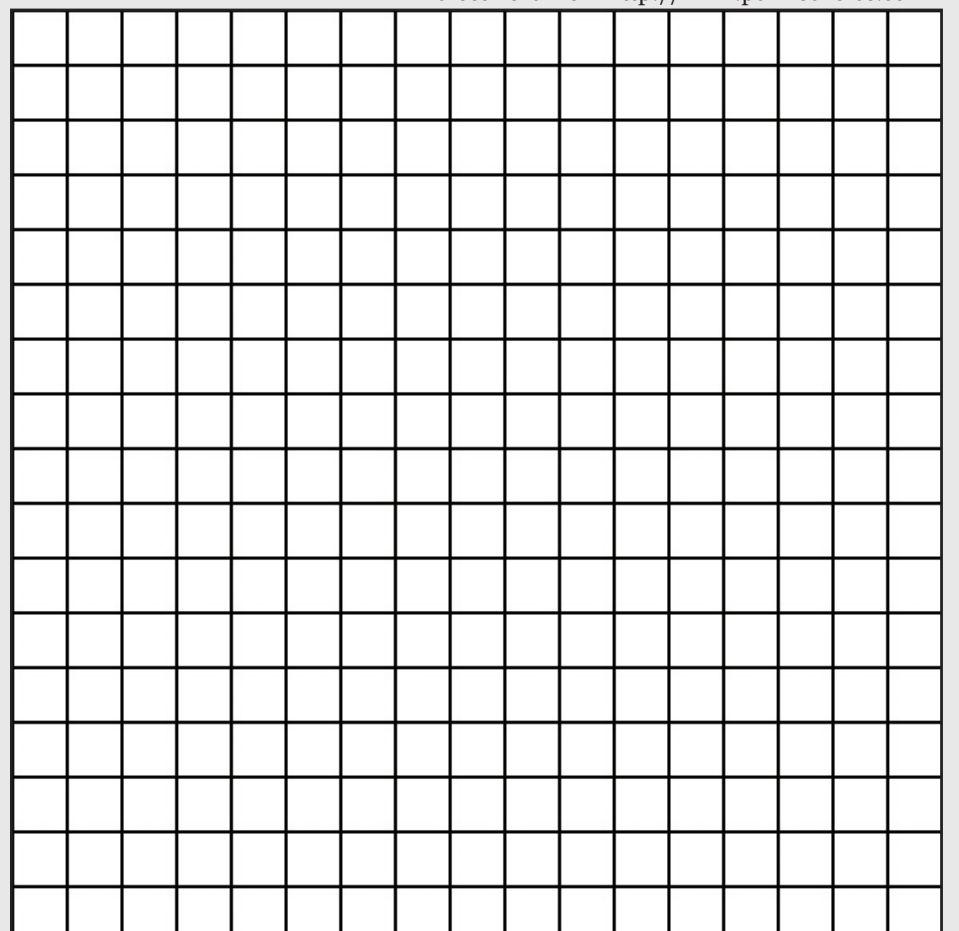
54. Small cask or barrel
57. Replete
58. Place of business for retailing
61. Skilled worker
63. Rut
64. Small shallow dish
65. Indicating maiden name
66. Flow out

Down

1. Snakelike fish
2. Molten rock
3. Journeyed by air
4. Be indebted to
5. Lair
6. Russian country house
7. Remake
8. Each and all
9. Temporary police force
11. Earth
12. Make a mistake
13. On the sheltered side
14. Horse-drawn vehicle
18. Svelte
21. Consume
23. Spanish title
24. Long narrative poem
26. Tennis stroke
29. Type of reef
30. Silence
31. Greatcoat
32. Type of tree
35. Enemy

38. Large predatory feline
39. Edible marine snail
41. Large African antelope
42. Pen point
45. Euphony
46. Delete
47. Singing voice
48. Synthetic fabric
50. Celestial body
51. Decimal base
52. Pig
53. Belonging to us
55. Facilitate
56. Seize
59. The night before
60. Golf pin
62. Vat

crossword from <http://www.puzzlechoice.com>



Hot New Startup

D. Xu

Sometimes I just sit and think about how rich I could get by drilling for oil on campus. I'm almost thirty percent sure that under the olive walk, there exists a huge reservoir of Texas Tea ready to be tapped. The existence of an oil field under campus makes perfect sense to me. From Ch1a, I learned that like attracts like. Therefore, the oil from the olive trees on the olive walk should flow to where all the oil is. I don't see oil on the surface pavement, hence, the oil must be underground.

I've been keeping this to myself since frosh year to try to keep it from rival interests. I was worried that the administration must have come to the same

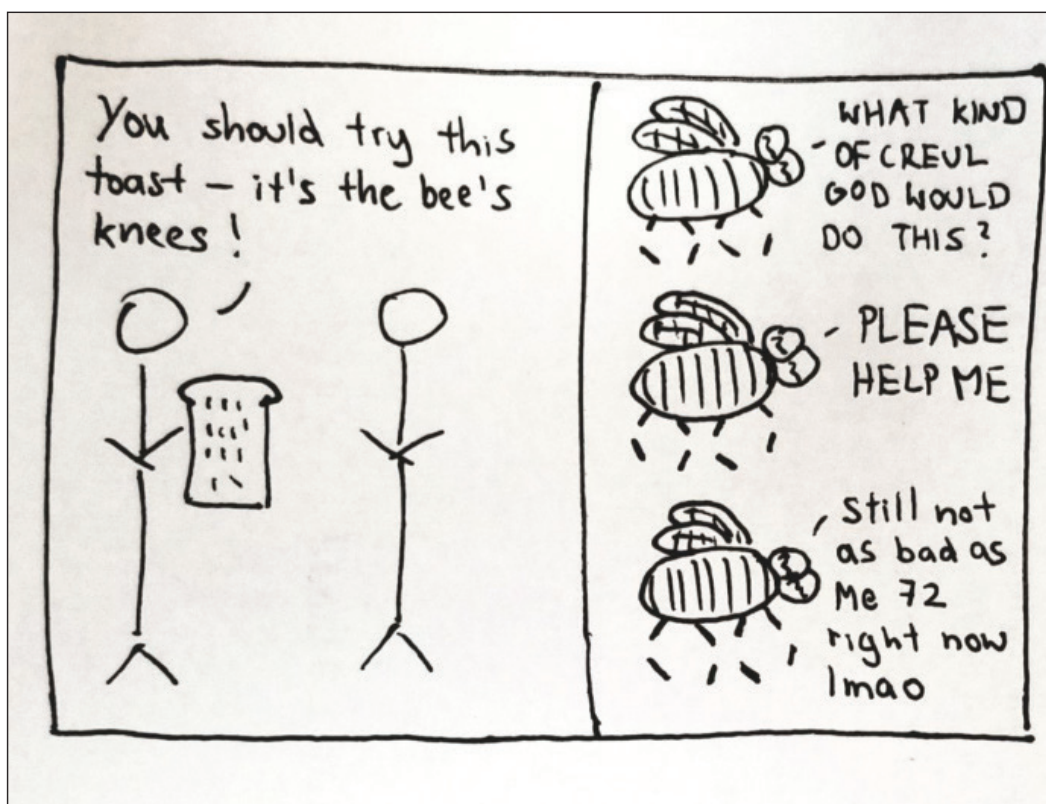
conclusion when my smore year, they dug out the grass along the olive walk 2 or 3 times in a year. However, I was told that they just did that to put in more water pipes.

Now, I have decided to go public with my extremely reasonable hypothesis. Hopefully, within the next few weeks, I will get a major investment from an overseas firm to begin excavation. I'm pretty sure that Caltech would find an oil derrick in the middle of campus unsightly, so I've decided to place all my equipment in the SAC.

If anyone would like to join me on this lucrative venture, just contact me via interdepartmental mail 160-86.

Answers to Puzzles and Crossword:

<http://bit.ly/2zegcGo>



Sara Fish (b. 1999)

Missed Opportunity for a Loss Meme 2018

Ink on reverse of Ma 121 notes.

The California Tech

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We are always accepting submissions for comics, and will pay you.

Letters from the Editors-in-Chief

Amrita Rhoads: aaaaaa

Sophie Piao:

Milan Roberson: "Food
\$200
Data \$150
Rent \$800
Candles \$3,600
Utility \$150

someone who is good at
the economy please help me

budget this. my family is dying"
wint (dril). 29 September 2013,
1:06 PM. Tweet.

Dan Xu: I'm deep undercover
investigating some shady busi-
ness practices of a local well-
known corporation. Will report
on findings later.

This week's recommended The California Tech
Tech usage after reading
is: Projector shim

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