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# Back to the 1900s: Birth of the Blitzkrieg

**Tim Liu**  
Contributing Writer

The year was 1918, and it was unclear which side would win the First World War.

In the early months of 1918 the ultimate outcome of the First World War still hung in the balance. Through a combination of military skill and ideological warfare, Germany had knocked Russia out of the war in 1917. Russia now devolved into a gruesome civil war, which would ultimately lead to the creation of the Soviet Union several years later. But more immediately, the defeat of Russia freed up one million German troops, soldiers which could now be deployed to the gruesome Western Front.

The calm morning of March 21st 1918 was shattered by an intense, though by First World War standards brief, artillery barrage. Over the course of five hours, German artillery fired 1.1 million shrapnel, high explosive, and gas shells at the British positions in northern France. Near the town of Saint-Quentin, the earth was pummeled and the sky filled with smoke and clouds of wafting poison gas. When the guns quieted, out from the smoke came hundreds of thousands of German stormtroopers. In many ways, their tactics and weapons were similar or even identical to those used in the Second World War. The British soldiers were about to endure the precursor to the infamous German Blitzkrieg that would rattle Europe two decades later.

March 21st marked the beginning of Operation Michael, the first of several major operations that constitute the 1918 Spring Offensive. The offensive came at a critical time for Germany. Despite the victory over Russia,

declared war on Germany in April of 1917 and American soldiers would soon be arriving en masse on the Continent. For the German military, it was now or never. If they didn't achieve victory in early 1918, they would be swamped by a

and infiltration tactics, allowing them to bypass strongholds and sow chaos. Over the course of two weeks, the German soldiers pushed nearly 40 miles into British lines, but at the cost of a quarter million casualties. The French capital

unsustainable and their supply lines failed to keep the armies equipped.

However, Operation Michael was only the first of several planned offensives. The Germans had grievously injured, but not knocked out, the British and the French. A few weeks later, the Germans launched Operation Georgette, a second punch to the Allied lines in northern France. The goal was to capture the ports along the English Channel that the British used to resupply their troops. The seizure of these critical ports would strand the British in France and choke off critical supplies. This offensive saw 26 German divisions push towards the Channel coast, causing the Allied lines to fold and buckle. But once again, the assault lost momentum. The losses were too high, and the German advance quickly outstretched their supply lines.

By the early summer of 1918, the Spring Offensive had worn out, and the Germans were facing the ever growing combined British, French, and American armies. The Spring Offensive had failed, at the cost nearly 700,000 German casualties. The end of the First World War was about to begin.

Figure 1: German World War I lancer equipped with a gas mask and riding a horse. The early First World War was a collision between nineteenth century tactics and brutal, modern technology. The tactics deployed during Operation Michael were a drastic leap forward.

Image courtesy of Wikimedia.

the German people were war weary and beginning to starve. For the first time since 1914, the Germans possessed a numerical advantage over the French and British on the Western Front. But this advantage was fleeting; the United States had

tsunami of American manpower.

The German soldiers burst through the British lines, aided by a mist that concealed their movements. The soldiers had been trained in special stormtrooper

was threatened and came under long range bombardment by the Germans. Despite the stunning advance, the German advance petered out after several weeks. The losses they accumulated were

"Back to the Nineties" is a semi-regular column about historical events. This special piece was written in commemoration of the 100 year anniversary of the German Spring Offensive. If you have feedback or ideas please follow the link here [goo.gl/zee2Ez](http://goo.gl/zee2Ez) or email me at [tsliu@caltech.edu](mailto:tsliu@caltech.edu).

## Taking MRI Technology Down to Micrometer Scales

Caltech Strategic Communications

This article is adapted from a story that was originally published online at [caltech.edu](http://caltech.edu).

New tools from Mikhail Shapiro's lab might allow doctors to better interpret MRI images.

Millions of MRI, or magnetic resonance imaging, scans are performed each year to diagnose health conditions and perform biomedical research. The different tissues in our bodies react to magnetic fields in varied ways, allowing images of our anatomy to be generated. But there are limits to the resolution of these images—generally, doctors can see details of organs as small as a half millimeter in size but not much smaller. Based on what the doctors see, they try to infer what



An MRI scan of the head.

Photo Courtesy of Helmut Januschka, CC-BY-SA-3.0

is happening to cells in the tissue.

Mikhail Shapiro, assistant professor of chemical engineering, wants to make a connection

between MRI images and what happens in tissues at scales as small as a single micrometer—that's about 500 times smaller than what's possible now.

"When you look at a splotchy MRI picture, you may want to know what's happening in a certain dark spot," says Shapiro, who is also a Schlinger Scholar and Heritage Medical

Research Institute Investigator. "Right now, it is hard to say what's going on at scales smaller than about half a millimeter."

In a recent study published in the journal *Nature Communications*, Shapiro and his colleagues introduced a method to correlate magnetic field patterns in tissue, which occur on micrometer scales, with the larger, millimeter-scale features of MRI images. Ultimately, the method would allow doctors to interpret MRI pictures and better diagnose various conditions.

For example, medical researchers can visualize the locations of inflamed tissues in a patient's body by using MRI to take images of immune cells called macrophages that have been labeled with magnetic iron particles. The macrophages take up iron particles injected into a patient's bloodstream and then migrate toward sites of inflammation. Because the MRI signal is affected by the presence of these iron particles, the resulting images reveal locations

of unhealthy tissue. However, the exact level of MRI contrast depends on precisely how the cells take up and store the iron particles on the micrometer scale, which cannot be seen directly in the MRI images.

The new technique could provide an understanding of how different iron distributions affect MRI contrast, and this, in turn, would provide a better idea of the scope of inflammation. The research was led by Caltech graduate students Hunter Davis and Pradeep Ramesh.

The technical paper describing the group's experiments, which involved a technique called diamond magnetometry, is available in the Caltech AUTHORS system, a service of the Caltech Library.

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# ANNOUNCEMENTS

THE CALIFORNIA TECH

## Caltech Y Column

### CALTECH Y

The Caltech Y Column serves to inform students of upcoming events and volunteer opportunities. The list is compiled by Katherine Guo 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.

### Upcoming Events

#### **Costa Rica Alternative Spring Break Trip**

Saturday, March 17th through Sunday, March 25th (9 days) | Cost: \$950

Applications Due: by Noon on November, 22nd

The Caltech Y is excited to seek applicants for our 2017 Alternative Spring Break trip to Costa Rica. Join other Caltech students for a conservation focused spring break trip this year. On the Costa Rica trip we will be working with a host organization OSA Conservation [www.osaconservation.org](http://www.osaconservation.org) – which is dedicated to protecting the globally significant biodiversity of Costa Rica's Osa Peninsula. Don't miss out on this fantastic opportunity to explore another part of our planet and make a tangible difference in the world.

Trips fees include transportation, lodging, and most food. The Costa Rica Alternative Spring Break trip is coordinated by the Caltech Y and has been made possible thanks to generous funding from the Frank and Elsie Stefanko Fund, the George Housner Fund, Caltech Student Affairs, and the Caltech Y. Spaces are limited.

Visit [http://caltechy.org/programs\\_services/areas/asb/](http://caltechy.org/programs_services/areas/asb/) for applications and more information.

The Caltech Y Social Activism Speaker Series presents:

#### **Solving Climate Change: From Policy to Personal**

Thursday | November 30th | 4:00 to 6:00 PM | Location: TBD

The Caltech Y Social Activism Speaker Series is hosting a panel with members of the Citizens' Climate Lobby, a non-partisan volunteer organization dedicated to national policy to address climate change.

Climate change is one of the most pressing issues facing humanity. While the impacts of emissions up to now will be felt potentially for decades, significant policy changes are required in the immediate future to address greenhouse gas emissions and reverse the warming

trend in the long term. Passing legislation to deal with this pressing issue however, remains a problem. CCL campaigns for the passage of a Carbon Fee and Dividend bill designed to tax carbon emissions and return carbon dioxide to its pre-1990s levels. This discussion will feature a panel of CCL members from a variety of backgrounds each of whom will bring their perspective to this issue. Each panel member will talk about their views and then take questions from the audience.

Presentations are intended to introduce one perspective in order to stimulate thought and to provide a forum for respectful dialogue and examination. The views expressed by speakers are solely those of the speakers. Presentations do not necessarily reflect the opinion of the California Institute of Technology or the Caltech Y and should not be taken as an endorsement of the ideas, speakers or groups.

#### **Decompression 2.0**

Friday | December 1st | 3:00 to 5:00 PM | Center for Student Services

We made the move... Decompression is now an end of the week stress reliever with activities, snacks and entertainment. Don't go into finals week stressed out. Join us at the end of class week for a little break before studying. A variety of drinks and snacks, entertainment and activities will be provided.

#### **Caltech Y Explore LA Series The Broad Museum**

Sunday | December 3rd | 2:30 PM | Cost: \$5 | Transportation Included

Sign-up starting Thursday, 11/16 at the Caltech Y

Join us on a visit to The Broad with the Caltech Y! The Broad is a contemporary art museum founded by philanthropists Eli and Edythe Broad. Designed by Diller Scofidio + Renfro in collaboration with Gensler, the museum is home to 2,000 works of art from the Broad collection, which is among the most prominent holdings of postwar and contemporary art worldwide, and presents an active program of rotating temporary exhibitions and innovative audience engagement. The 120,000-square-foot building features two floors of gallery space and is the headquarters of The Broad Art Foundation's worldwide lending library, which has actively loaned collection works to museums around the world since 1984. With in-depth representations of influential contemporary artists like Jean-Michel Basquiat, Barbara Kruger, Cy Twombly, Ed Ruscha, Kara Walker, Christopher Wool, Jeff Koons, Joseph Beuys, Jasper Johns, Cindy Sherman, Robert Rauschenberg, and more, plus an ever-growing representation of younger artists, The Broad enriches, provokes, inspires, and fosters appreciation of art of our time. This offer is for students only; however, students purchasing tickets are permitted to purchase tickets for up to one guest each – and that guest can be a non-student. Explore LA is coordinated by the Caltech Y. The Caltech Y is located in the Tyson House 505 South Wilson (Bldg. 128).

The Caltech Y Social Activism Speaker Series is hosting a panel with members of the Citizens' Climate Lobby, a non-partisan volunteer organization dedicated to national policy to address climate change.

Climate change is one of the most pressing issues facing humanity. While the impacts of emissions up to now will be felt potentially for decades, significant policy changes are required in the immediate future to address greenhouse gas emissions and reverse the warming

## Caltechlive!

Wednesday, April 11, 2018 • 8 PM

#### **MICROBIAL LIFE SUPPORT: THE VISIBLE LIVING NETWORKS THAT SHAPE OUR OCEANS**



**Victoria J. Orphan**, James Irvine Professor of Environmental Science & Geobiology, Caltech Division of Geological & Planetary Sciences

Dr. Orphan will talk about the activities of marine microorganisms from the ocean surface to deep in the earth's crust.

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#### **Mentors for L.I.F.E**

Volunteer times: 2:45 - 5:00 PM at various locations in Pasadena

Stressed out by school? Step outside the Caltech bubble and mentor tweens who've yet to even consider college. Things you could do: Build a baking soda and vinegar volcano, read a book aloud, play sports or board games, teach the alphabet of another language, do a craft. Having a mentor makes an at-risk student 55% more likely to attend college, 78% more likely to volunteer regularly, and 130% more likely to hold a leadership position. Interested? If you have 180 seconds, you can watch this video and be inspired. If you have an hour a week, you can mentor someone and be their inspiration. If you feel unqualified, don't worry. Ultimately, mentoring is about being a consistent, dependable friend—not a surrogate parent or psychiatrist.

To get started, contact [noelle@caltech.edu](mailto:noelle@caltech.edu).

#### **Hathaway Sycamores**

Every Monday | 5:45 - 8:00 PM | 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 40 minutes of travel time and 1.5 hours of tutoring. Transportation is included.

For more info and to RSVP email Elisabeth at [egallmei@caltech.edu](mailto:egallmei@caltech.edu). Eligible for Federal Work Study.

## Engineered Metasurfaces Replace Adhesive Tape in Specialized Microscope

**ROBERT PERKINS**

Caltech Strategic Communications

This article is adapted from a story that was originally published online at [caltech.edu](http://caltech.edu).

High-tech substitute could unlock the potential of imaging devices that counterintuitively scatter light to obtain high-resolution, high-field-of-vision views.

The latest advance in a new type of optics aimed at improving microscopy started with a game of tennis three years ago.

Unwinding after a long day of research in their respective labs, Mooseok Jang (PhD '16) and Yu Horie (who will receive his PhD in June 2018)—at the time, both graduate students at Caltech—met up for a game of tennis at Caltech's Braun Athletic Center courts.

Jang, a student of Changhuei Yang—the Thomas G. Myers Professor of Electrical Engineering, Bioengineering, and Medical Engineering in the Division of Engineering and Applied Science—had been working on a nascent microscopy technology that uses light scattering to circumvent the traditional tradeoff between resolution (the amount of detail you capture) and field of view (the area you capture). The research had hit a roadblock: the tools that were being used to scatter light were difficult to predict and unreliable.

During the tennis match, Jang described this frustrating conundrum to Horie, a student of Assistant Professor of Applied Physics and Materials Science Andrei Faraon (BS '04). In Faraon's lab, Horie worked on metasurfaces, which are sheets of material whose electromagnetic properties can be altered on demand. Faraon, a nanophotonics engineer, creates metasurfaces that are studded with nanoscale posts made of silicon nitride. These nanoposts are capable of manipulating light with a high degree of precision—for example, to bend light like a lens does or encode holograms on a flat surface. As their conversation migrated from the tennis courts to coffee at the Red Door Marketplace at Caltech, Jang and Horie realized that the expertise of their respective labs could be combined to create a more reliable, predictable light-scattering material.

"As we talked, it became clear that we could work together to solve this problem," Jang says.

The practice of scattering light in order to take a high-resolution image with a wide field of view seems counterintuitive,

point of uselessness. In order to make sense out of the scrambled light, the SLM needs to know exactly how it was affected by the scattering medium. Different types of scattering media currently in use—including adhesive tape—are full of randomly located

With a scattering medium like adhesive tape, this characterization has traditionally meant calibrating the medium by projecting known images through it using the SLM and then working backwards to determine the action of the medium on the

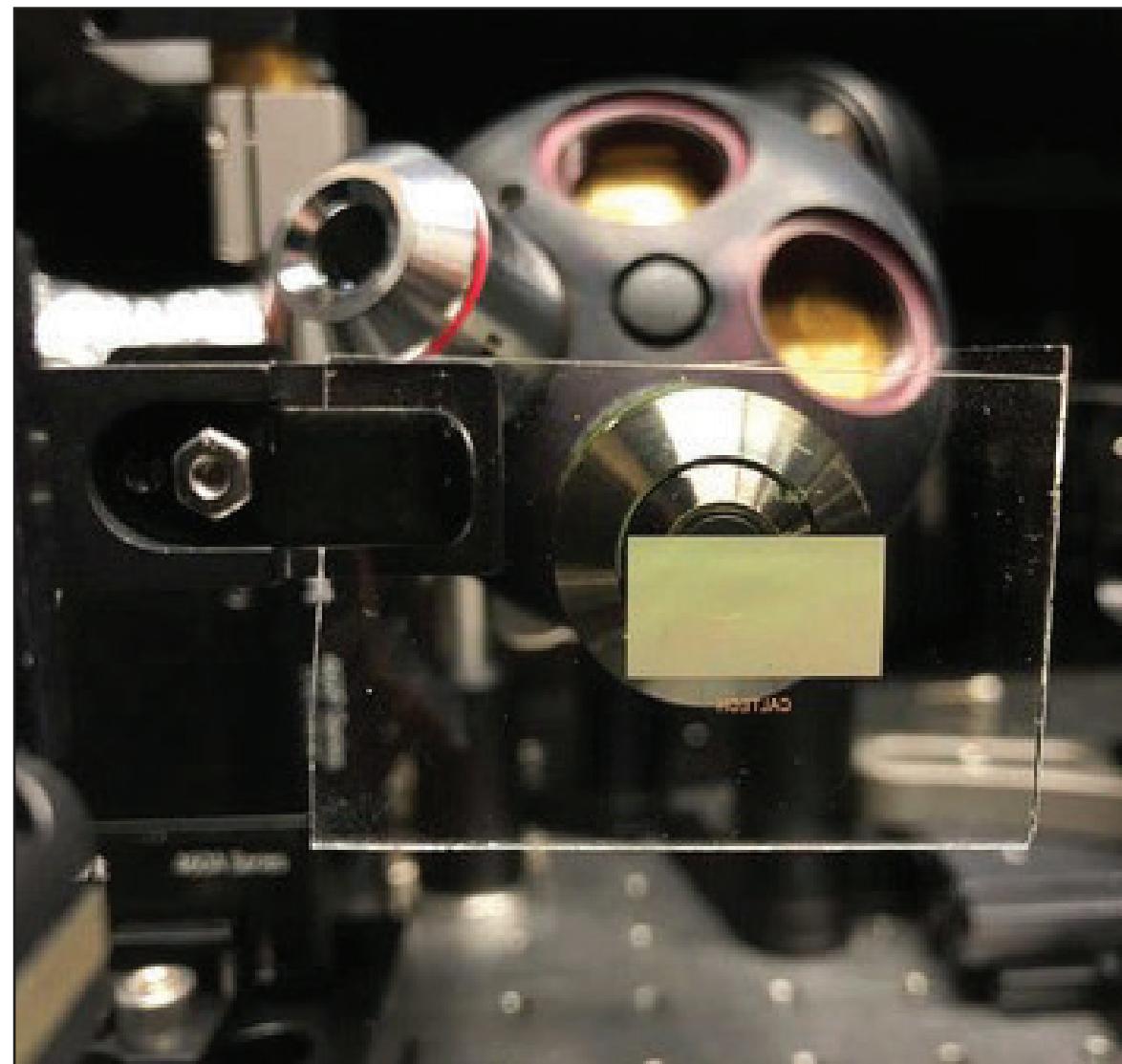
says. They were eventually convinced, however, and in a paper published in *Nature Photonics* this month, the two labs demonstrate the production of a high-resolution image—corresponding to a numerical aperture greater than 0.5—with a relatively wide (8 millimeter) field of view. The image had an estimated 2.2 billion individual focal spots. For comparison, a typical high-quality microscope with the same numerical aperture produces an order of magnitude fewer focal spots.

With continued improvements like this, scientists and pathologists will be able to scan samples with microscopes quicker and at a higher resolution.

"The hope is that our work will prompt further interest in this area of optics and make this type of microscopy and its advantages feasible for practical, everyday use—not just as a proof of concept," says Josh Brake (MS '16), a graduate student in Yang's lab who continues to work on the project with Faraon and Yang.

Since their breakthrough collaboration, Jang and Horie have finished their doctoral work and gone their separate ways: Jang returned to his native Korea, where he continues his research as part of his mandatory military service, while Horie took a job at Apple. The two stay in touch, though. And both still play tennis.

The *Nature Photonics* paper is titled "Wavefront shaping with disorder-engineered metasurfaces." Co-authors include postdoctoral scholars Atsushi Shibukawa, Yan Liu, and Haowen Ruan from Yang's lab; and graduate student Seyedeh Mahsa Kamali (MS '17) and postdoctoral scholar Amir Arbabi from Faraon's lab. This work was supported by the National Institutes of Health, a GIST-Caltech Collaborative Research Proposal, a Japan Student Services Organization fellowship, the National Science Foundation, Samsung Electronics, Japan Society for the Promotion of Science Overseas Research Fellowships, the National Institute of Biomedical Imaging and Bioengineering, the Donna and Benjamin M. Rosen Bioengineering Center, and the Department of Energy. The device nanofabrication was performed at the Kavli Nanoscience Institute at Caltech.



A disorder-engineered metasurface (the beige rectangle) scatters incoming light as part of an advance in optics that uses light scattering to yield images with a high resolution and a wide field of view.

Photo Courtesy of Josh Brake

but demonstrations over the past decade have shown that it can be effective. While scattered light does not propagate in a simple way like light passing through a lens, it can be processed for high-resolution optical focusing and imaging using a device called a spatial light modulator (SLM), which corrals and directs the raw scattered components to enable high-fidelity optical control. The result is an image with an increased number of resolvable focal spots that are spread out over a wider field of view—in other words, a clearer, broader image.

The problem, however, is that this strategy is difficult to practically implement, to the

suspended particles. When a piece of tape is placed in the path of a beam of light, those particles do a great job of scattering light in a random fashion, which is the goal. However, because of the inherent random nature of their location in the tape, it can take weeks for the measurement process to fully characterize the scattering and enable high-quality focusing over the maximum number of individual points in an image. Worse, the suspended particles have a bad habit of migrating in the tape, even during the calibration process, which has the potential to render the painstakingly long measurement process worthless by the time it is finished.

incoming light—then repeating this process over and over again to fully characterize the medium.

However, using the metasurfaces generated in Faraon's lab—materials that scatter light in entirely predictable ways—the calibration time could drop from hours to just minutes, converting the time-consuming measurement process to a simple alignment procedure. As an added bonus, recalibration would never be necessary.

"I think that Dr. Yang and his colleagues were skeptical at first that we could control light with such precision using these metasurfaces," Horie

## A Better Way to Model Stellar Explosions

**WHITNEY CLAVIN**

Caltech Strategic Communications

This article is adapted from a story that was originally published online at [caltech.edu](http://caltech.edu).

Caltech scientists create new computer code for calculating neutron stars' "equation of state".

Neutron stars consist of the densest form of matter known: a neutron star the size of Los Angeles can weigh twice as much as our sun. Astrophysicists don't fully understand how matter behaves under these crushing densities, let alone what happens

when two neutron stars smash into each other or when a massive star explodes, creating a neutron star.

One tool scientists use to model these powerful phenomena is the "equation of state." Loosely, the equation of state describes how matter behaves under different densities and temperatures. The temperatures and densities that occur during these extreme events can vary greatly, and strange behaviors can emerge; for example, protons and neutrons can arrange themselves into complex shapes known as nuclear "pasta."

But, until now, there were only about 20 equations of state readily available for simulations of

astrophysical phenomena. Caltech postdoctoral scholar in theoretical astrophysics Andre da Silva Schneider decided to tackle this problem using computer codes. Over the past three years, he has been developing open-source software that allows astrophysicists to generate their own equations of state. In a new paper in the journal *Physical Review C*, he and his colleagues describe the code and demonstrate how it works by simulating supernovas of stars 15 and 40 times the mass of the sun.

The research has immediate applications for researchers studying neutron stars, including those analyzing data from the National Science

Foundation's Laser Interferometer Gravitational-wave Observatory, or LIGO, which made the first detection of ripples in space and time, known as gravitational waves, from a neutron star collision, in 2017. That event was also witnessed by a cadre of telescopes around the world, which captured light waves from the same event.

"The equations of state help astrophysicists study the outcome of neutron star mergers—they indicate whether a neutron star is 'soft' or 'stiff,' which in turn determines whether a more massive neutron star or a black hole forms out of the collision," says da Silva Schneider. "The more observations we have from LIGO

and other light-based telescopes, the more we can refine the equation of state—and update our software so that astrophysicists can generate new and more realistic equations for future studies."

More detailed information can be found in the *Physical Review C* study, titled "Open-source nuclear equation of state framework based on the liquid-drop model with Skyrme interaction." Other authors include Luke F. Roberts of Michigan State University and Christian D. Ott. The study was funded by Conselho Nacional de Desenvolvimento Científico e Tecnológico, the National Science Foundation, and the Sherman Fairchild Foundation.

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## 2018 CALTECH UNDERGRADUATE WRITING PRIZES

Each year the division of Humanities and Social Sciences awards a number of prizes for undergraduate writing. Consider submitting your work to be recognized and rewarded for your work as a writer.

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Awarded to an outstanding essay related to the work of Shakespeare.

Prize amount: \$500.00

Copies of last year's prizewinning writing are stored in CaltechTHESIS, and they can be viewed by following links from this writing center webpage: <http://writing.caltech.edu/community/prizes>

### Submission Guidelines:

## Deadline: April 6th, 2018

Only currently enrolled full-time students may submit. Entries should be double-spaced PDFs. Winners will be announced in June, and winners' names will be in the commencement program. Winning writing will be archived using CODA through the Caltech Library. Email entries to Cecilia Lu at [cecilia@caltech.edu](mailto:cecilia@caltech.edu), noting the prize to which you are applying in the email subject and filename.

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## Baseball Reels in First SCIAC Win of Year Against Sagehens

GOCALTECH.COM

Actual Sports Content Editor

PASADENA (Mar. 29, 2018) – The Caltech baseball team showed on Saturday afternoon there is still an ounce of 2017 magic left when junior pitcher Jonah Krop (Santa Monica, Calif. / Santa Monica) and the Beavers recreated last year's milestone victory over visiting Pomona-Pitzer Colleges with another victory over the Sagehens. The win is the Beavers' first in SCIAC play this season.

Caltech's junior starting pitcher needed to hurl one of, if not the best game of his career for the Beavers to have a chance against a deep and experienced Sagehens squad and Krop did not disappoint. He froze the Sagehens looking for five of his eight strikeouts on the day while scattering six hits over the nine-inning complete-game outing. Following the Beavers' go-ahead runs in the eighth inning, Head Coach Matthew Mark opted to leave Krop, one of his most trusted arms in the game to finish the job. Three quick outs, two of which came on the ground erased the SCIAC monkey in the heads of the Beavers and gave Krop the second biggest win of his career. The junior, of course got a complete-game victory last year at when the Beavers took down the Sagehens in similarly dramatic fashion, at North Field no less to undo a near 20-year SCIAC winless streak.

Saturday	Game	2:	
Caltech	3,	Pomona-Pitzer	2



The first baseman was clearly not ready for such a sick pickoff move.

-gocaltech.com

## No. 36 Men's Tennis Notches First SCIAC Win

GOCALTECH.COM

Actual Sports Content Editor

PASADENA, Calif. (Mar. 31, 2018) – A straight-set singles sweep fueled No. 36 Caltech men's tennis to its first SCIAC win in a decisive 8-1 victory over Chapman University on Saturday morning.

The win marked Caltech's fourth consecutive and raised the Beavers' record to 7-5 overall and 1-1 in SCIAC play.

With the Mar. 29 individual regional rankings still not released, it is unclear where the rookie duo of Varun Shanker (Midland, Mich. / Midland Dow) and James Wei (Chappaqua, N.Y. / Horace Greeley) stands among their peers, but they continued to make their case with an eighth straight doubles victory at the top spot to kick things off. Classmate Kevin Yu (Mason,



Find yourself someone who looks at you the way Kevin looks at a tennis ball

-gocaltech.com

## Wang Takes Thriller at

## Three-Set Chapman



Tennis faces are my favorite thing besides tennis grunts

-gocaltech.com

GOCALTECH.COM

Actual Sports Content Editor

PASADENA, Calif. (Mar. 31, 2018) – The Caltech women's tennis team picked up three wins at Chapman University on Saturday morning, including a three-set singles win from senior Erin Wang (Auburn, Calif. / Del Oro).

Reisler, meanwhile needed to win two tiebreakers to win her match at second singles but managed to win the first, 7-5 to force the decisive super tiebreaker.

Head Coach Mandy Gamble and the Beavers return to home court on Friday, Apr. 6 to host Whittier College at 3 p.m.

Wang had to win the second and third set to work her way back into the match but successfully came from behind with consecutive 6-3 sets to score for the Beavers. Sophomore Angelica Zhou (Temple City, Calif. / Arcadia) picked up a pair of victories as well, first by teaming with junior Julia Reisler (Plano, Texas / Greenhill) at second doubles to earn an 8-5 win over the Panthers. Zhou later won at fourth singles and overcame a competitive 7-5 first set to dominate the second set, 6-1. Doubles partner

Ohio / Cincinnati Country Day) and sophomore Connor Soohoo (Redwood Shores, Calif. / Crystal Springs) gave Caltech the 2-1 lead heading into singles play, where all six Beavers swept their matches in straight sets. Victories of particular note came at court two, as Wei won his 10th straight match, and court five, where Yu notched his seventh consecutive win.

Head Coach Mandy Gamble and the Beavers face a crucial SCIAC challenge at Whittier College (2-7, 1-0) on Friday, Apr. 6 at 3 p.m.

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THE CALIFORNIA TECH

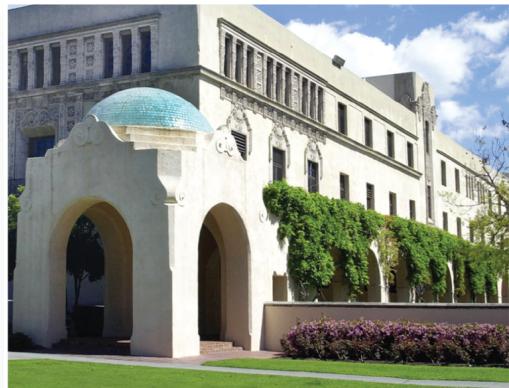
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## ASCIT Minutes

Meetings are every week in SAC 13

**ASCIT Board of Directors Meeting**

Minutes for March 9, 2017. Taken by Sarah Crucilla.

**Officers Present:** Sakthi Vetrivel, Kavya Sreedhar, Sara Adams, Sarah Crucilla, Alice Zhai**Guests:** Caltech Chinese Association (CCA), George Daghlian**Call to Order:** 5:03 PM

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:** 5:28 PM**President's Report (Sakthi):**

- ACRL meeting last Monday
  - Read meeting minutes to find out what happened!
- NO ASCIT MEETING NEXT FRIDAY

**Officer's Reports:****V.P. of Academic Affairs (Kavya):**

- Faculty board meeting
  - Expanding outreach efforts to elementary schools
  - Diversity initiatives
- Course Compliments are coming in
- New guide for TQFRs coming out soon
- Fill out TQFRs please

**V.P. of Non-Academic Affairs (Rachael):**

- Nothing to report

**Director of Operations (Sara):**

- Buying the projector soon so we can fix the ASCIT screening room

**Treasurer (Sarah):**

- The CCA proposed for funding for their Chinese New Year Event
- George Daghlian proposed for funding for the Caltech Christian Fellowship Veritas Forum
- Tax forms need to be filled out
- Meeting next week to discuss Bylaws and money allocation to Interhouses and Ditch Day

**Social Director (Alice):**

- ASCIT formal sign-ups are beginning
- ASCIT Formal (April 6)
- Trivia Night (April 12)
- Escape Room event will be sometime third term

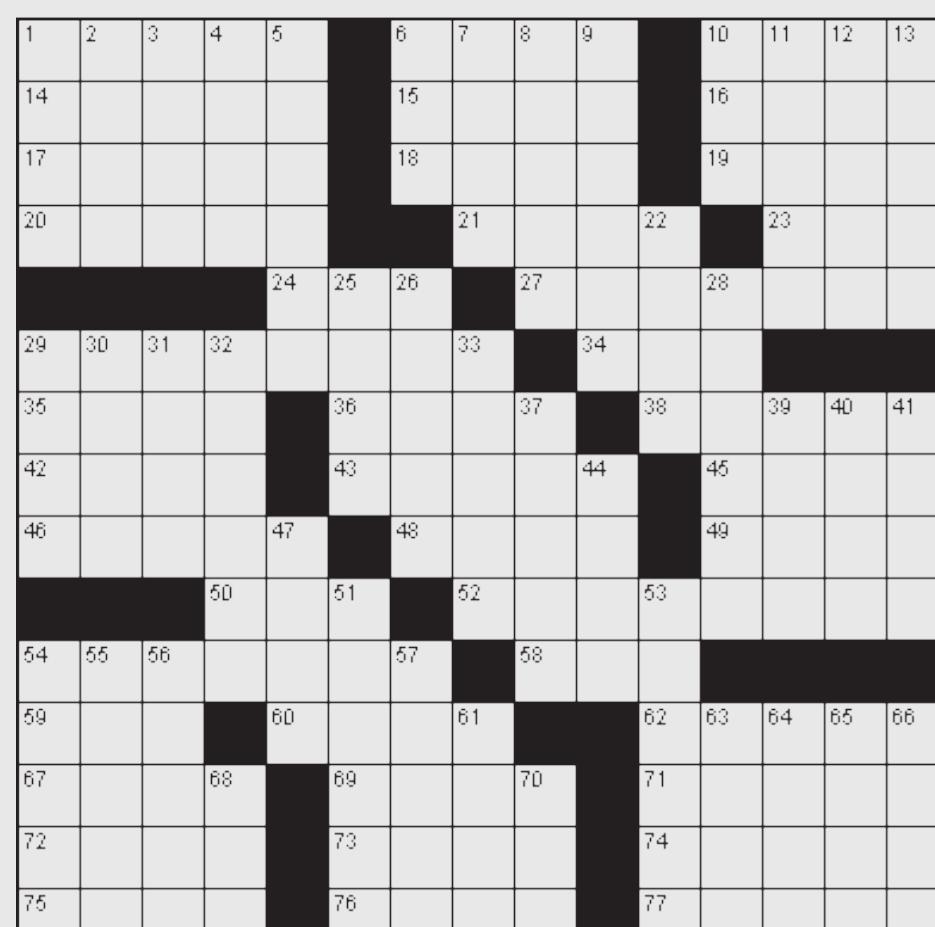
**Secretary (Dana):**

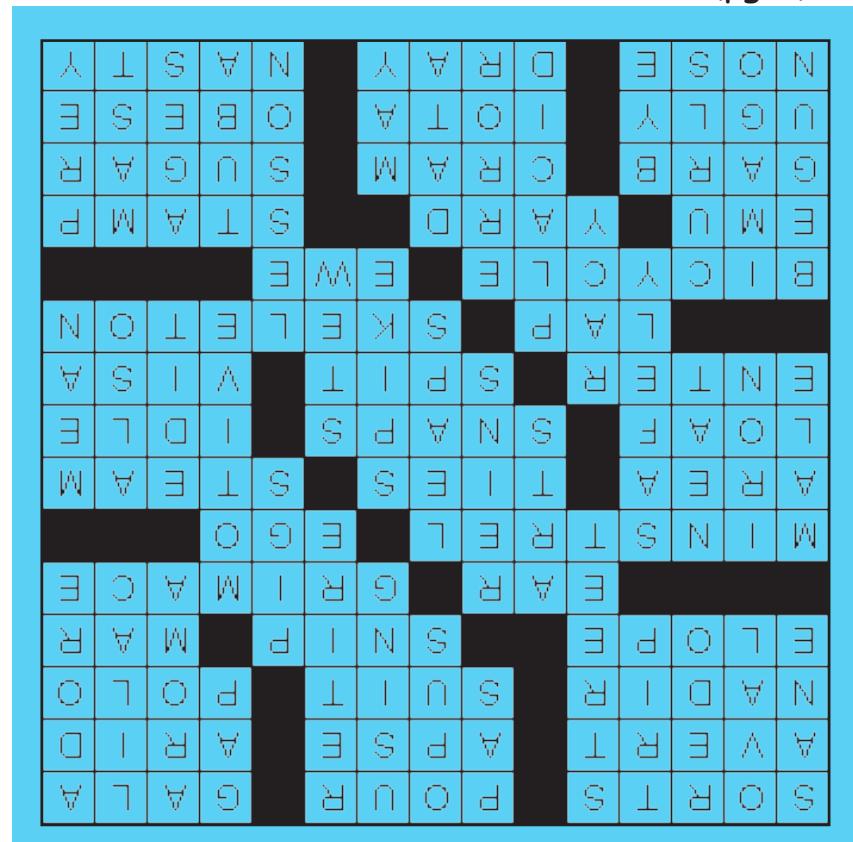
- Not in attendance.

## Crossword

Across														
1.	Varieties	60.	Enclosed land around a house	32.	Securely									
6.	Rain heavily	61.	Postal token	33.	Jumps									
10.	Festive event	62.	Clothing	34.	Transient variation in voltage									
14.	Obviate	63.	Pack to capacity	35.	Redact									
15.	Part of a church	64.	Sweetner	36.	In addition									
16.	Waterless	65.	Horrible	37.	Signify									
17.	The lowest point of anything	66.	Scintilla	38.	Cook slowly in liquid									
18.	Be agreeable or acceptable	67.	Corpulent	39.	Risque									
19.	Field game	68.	Proboscis	40.	Tranquil									
20.	Run away together to marry	69.	Camion	41.	Unit of instruction									
21.	Clip	70.	Awful	42.	Started									
23.	Spoil			43.	Adult insect after metamorphosis									
24.	Sense organ			44.	Ringlets									
27.	Facial expression			45.	Mistake									
29.	Troubadour			46.	Information									
34.	Self			47.	Musical instrument									
35.	Region			48.	Matures									
36.	Binds			49.	Vertical spar									
38.	Rise as vapor			50.	Animal hunted for food									
42.	Be lazy			51.	Advance to the next round without playing									
43.	Informal photos			52.	Thorny shrub									
45.	Not in active use			53.										
46.	Go in			54.										
48.	Skewer			55.										
49.	Passport			56.										
	endorsement													
50.	Circuit													
52.	Supporting structure													
54.	Vehicle													
58.	Female sheep													
59.	Large flightless bird													

Down														
1.	Mentally healthy	32.	Securely											
2.	Elliptical	33.	Jumps											
3.	Make new	34.	Transient variation in voltage											
4.	Journey	35.	Redact											
5.	Thoroughfare	36.	In addition											
6.	Ballet step	37.	Signify											
7.	Musical composition	38.	Cook slowly in liquid											
8.	Employing	39.	Risque											
9.	Withdraw	40.	Tranquil											
10.	Narrow opening	41.	Unit of instruction											
11.	Fragrance	42.	Started											
12.	Hardy shrub with showy flowers	43.	Adult insect after metamorphosis											
13.	Worship	44.	Ringlets											
14.	Swine	45.	Mistake											
15.	Humanities	46.	Information											
16.	Used to control a horse	47.	Musical instrument											
17.	The reason for an action	48.	Matures											
18.	Gender	49.	Vertical spar											
19.	Metallic element	50.	Animal hunted for food											
20.	Orderly	51.	Advance to the next round without playing											
21.		52.	Thorny shrub											



**LAS GUERRAZ DE LA MAFIA****POR DAVID GINOLA****Answers to current crossword (pg 7)**-<http://puzzlechoice.com>***The California Tech*****Editor-in-Chief**  
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