The California Tech

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Caltech uncovers mystery of Titan's features

MARCUS WOO
Science Writer

Saturn's largest moon, Titan, is an intriguing, alien world that's covered in a thick atmosphere with abundant methane. With an average surface temperature of a brisk -300 degrees Fahrenheit (about 90 kelvins) and a diameter just less than half of Earth's, Titan boasts methane clouds and fog, as well as rainstorms and plentiful lakes of liquid methane. It's the only place in the solar system, other than Earth, that has large bodies of liquid on its surface.

The origins of many of these features, however, remain puzzling to scientists. Now, researchers at the Caltech have developed a computer model of Titan's atmosphere and methane cycle that, for the first time, explains many of these phenomena in a relatively simple and coherent way.

In particular, the new model explains three baffling observations of Titan.

One oddity was that Titan's methane lakes tend to cluster around its poles and that there are more lakes in the northern hemisphere than in the south.

Secondly, the areas at low latitudes, near Titan's equator, are known to be dry, lacking lakes and regular precipitation.

But when the Huygens probe landed on Titan in 2005, it saw channels carved out by flowing liquid-possibly runoff from rain. And in 2009, Caltech researchers discovered raging storms that may have brought rain to this supposedly dry region.

Titan's atmosphere is largely composed of nitrogen, while its surface is rocky and peppered with sand dunes and other geological features similar to those found on Earth. Scientists believe that the satellite is a good candidate for the discovery of extraterrestrial life.

- nasa.gov

Finally, scientists uncovered a third mystery when they noticed that clouds observed over the past decade—during summer in Titan's southern hemisphere—cluster around southern middle and high latitudes. Scientists have proposed various ideas to explain these features, but their models either can't account for all of the observations, or do so by requiring exotic processes, such as cryogenic volcanoes that spew methane vapor to form clouds. The Caltech researchers say their new computer model, on the other hand, can explain all these observations-and does so using relatively straightforward and fundamental principles of atmospheric circulation. "We have a unified explanation for many of the observed features," says Tapio Schneider, the Frank J. Gilloon Professor of Environmental Science and Engineering. "It doesn't require cryovolcanoes or anything esoteric." Schneider, along with Caltech graduate student Sonja Graves, former Caltech graduate student Emily Schaller (PhD '08), and Mike Brown, the Richard and Barbara Rosenberg Professor and professor of planetary astronomy, have published their findings in the January 5 issue of the journal Nature.

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In this issue

News briefs from around the globe

Helping readers burst out of the Caltech bubble

Need to know < **100** words about the world this week – topics sorted from good to bad

by Sam Barnett – links to full stories available at barnett.caltech.edu/news

Rise in employment	**200,000** new US jobs last month – 6th straight month of increases	[BBC]
US Navy rescues Iranians	**13** Iranian fishermen were held hostage by pirates for over 40 days	[CNN]
HKA orders new planes	$ **3.8 billion** for 10 Airbus A380s – bet on more Asia-Europe traffic	[BBC]
Japan upgrades air force	**42** F-35s to be produced by Lockheed Martin for over $4 billion	[WSJ]
Unpaid federal taxes	$ **385 billion** (~15%) went unpaid in 2006 – new IRS estimates	[CNN]
Medicare cuts imminent	**650,000** doctors will face 27% pay cuts unless Congress acts soon	[AP]
Iran's nuclear program	**2nd** uranium enrichment site announced despite new sanctions	[NY TIMES]

Food with Mannion!

Do you like eating food?
How about free food at nice restaurants?
Ever want to tell the world exactly what you think of said food?
The Tech will be beginning a new column to chronicle the foodie experiences of new writers every other week...The Catch: They'll be going head-to-head with Tom Mannion who will be reviewing the same restaurant. If you have ever thought you were more of a gourmand than our resident master chef, now's your chance to prove it!
Email us for a spot on the list at tech@caltech.edu

The California Tech

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ASCIT Minutes

Call to order: 12:06pm

Officer's present: Chris Hallacy, Laura Conwill, Diego Caporale, Mario Zubia, Michelle Tang, Laura Santoso
Officer's absent: Margaret Chiu, Prakriti Gaba

President's Report

Hazing: committee will tour all the houses in the next couple weeks to go over the policy.

Officer's Reports

1. IHC (LC)

    a. Freshman admissions: going to work this term to try to involve students more (undergrads recently kicked off)
    b. ESC (executive social committee): see social director report
    c. Revcom chair: need to appoint a new one soon!
    d. House elections: need to sort over rollover period b/w old and new appointments

2. Director of Operations (Diego)

    a. Athletics: will be meeting tri-weekly with Betsy Mitchell to organize athletic clubs (i.e. storage space, etc.)
    b. SAC: talking to Mannion about organizing space
    c. Yearbook: 2010-2011 yearbook will hopefully be coming out soon. Publishing costs have increased so we're looking into increasing the budget for Big T.

3. Treasurer (Mario)

    a. Yearly ASCIT budget: Jesus is submitting form to IRS to approve the change in the ASCIT budget cycle (start every calendar year instead of in the middle of the year). The 2012-2013 ASCIT budget will also be bigger b/c of an increase in dues.
    b. Multi-house funding: each house is allotted $300 for multi-house event ($100/multi-house event), this expires in March so if a house doesn't use their entire budget it will be opened to other houses. Going to email the house presidents about this.

4. Social Representative (Michelle)

    a. ESC: organizing a committee with social reps from all the houses and the ASCIT social director to organize house and all school events
    b. Cross-college concert party: working on one for third term
    c. Movie night: no big hits coming out second term in theatres, don't want to waste money on a bad movie so will likely have an on campus movie screening w/ hot cocoa.

5. Secretary (Laura)

    a. Donut: added administrative contacts to donut. Will add blurbs about who to talk to about what.

Discussion

Bookmart: added to Donut for students to buy/sell used textbooks.

Model by Caltech scientists explains Titan phenomena

Continued from page 1

Schneider says the team's simulations were able to reproduce the distribution of clouds that's been observed-which was not the case with previous models. The new model also produces the right distribution of lakes. Methane tends to collect in lakes around the poles because the sunlight there is weaker on average, he explains. Energy from the sun normally evaporates liquid methane on the surface, but since there's generally less sunlight at the poles, it's easier for liquid methane there to accumulate into lakes.

But then why are there more lakes in the northern hemisphere? Schneider points out that Saturn's slightly elongated orbit means that Titan is farther from the sun when it's summer in the northern hemisphere. Kepler's second law says that a planet orbits more slowly the farther it is from the sun, which means that Titan spends more time at the far end of its elliptical orbit, when it's summer in the north. As a result, the northern summer is longer than the southern summer. And since summer is the rainy season in Titan's polar regions, the rainy season is longer in the north. Even though the summer rains in the southern hemisphere are more intense—triggered by stronger sunlight, since Titan is closer to the sun during southern summer—there's more rain over the course of a year in the north, filling more lakes.

> "...the areas at low latitudes, near Titan's equator, are known to be dry, lacking lakes and regular precipitation. But when the Huygens probe landed on Titan in 2005, it saw channels carved out by flowing liquid-possibly runnoff from rain.

In general, however, Titan's weather is bland, and the regions near the equator are particularly dull, the researchers say. Years can go by without a drop of rain, leaving the lower latitudes of Titan parched. It was a surprise, then, when the Huygens probe saw evidence of rain runoff in the terrain. That surprise only increased in 2009 when Schaller, Brown, Schneider, and then-postdoctoral scholar Henry Roe discovered storms in this same, supposedly rainless, area.

No one really understood how those storms arose, and previous models failed to generate anything more than a drizzle. But the new model was able to produce intense downpours during Titan's vernal and autumnal equinoxes—enough liquid to carve out the type of channels that Huygens found. With the model, the researchers can now explain the storms. "It rains very rarely at low latitudes," Schneider says. "But when it rains, it pours."

The new model differs from previous ones in that it's three-dimensional and simulates Titan's atmosphere for 135 Titan years—equivalent to 3,000 years on Earth—so that it reaches a steady state. The model also couples the atmosphere to a methane reservoir on the surface, simulating how methane is transported throughout the moon.

The model successfully reproduces what scientists have already seen on Titan, but perhaps what's most exciting, Schneider says, is that it also can predict what scientists will see in the next few years.

For instance, based on the simulations, the researchers predict that the changing seasons will cause the lake levels in the north to rise over the next 15 years. They also predict that clouds will form around the north pole in the next two years. Making testable predictions is "a rare and beautiful opportunity in the planetary sciences," Schneider says. "In a few years, we'll know how right or wrong they are.

"This is just the beginning," he adds. "We now have a tool to do new science with, and there's a lot we can do and will do."

The research described in the Nature paper, "Polar methane accumulation and rainstorms on Titan from simulations of the methane cycle," was supported by a NASA Earth and Space Science Fellowship and a David and Lucile Packard Fellowship.

In remembrance of Caltech grad Robert Haussler

THE HAUSSLER FAMILY
Contributing Writers

Caltech graduate Robert Walter Haussler passed away peacefully on December 11, 2011, at the age of 93, in the ranch house he built in Templeton, CA. He was born June 23, 1918, in San Francisco to Emmeroye and Walter Haussler.

Bob was the grandson of Otto Haussler, who, with his son Dana (Bob's uncle), was among the early farmers to settle in the Templeton area in the 1920s. Dana Haussler ran a thriving ranch in Templeton until he died in 1966, mostly dry-farming almonds, walnuts, grapes and apricots. The Templeton street "Dana Lane" is named after him. Living in Los Angeles, Bob worked many summers on the Haussler ranch as a boy. After Dana's death, Bob's father Walter ran the ranch, until Bob and his wife Thea, who passed away four years ago, took over in the early 1980s.

Bob and Thea converted the operation into Haussler Organic Orchards, planting more than 70 varieties of fruit and nut trees, and were widely loved in the community for their warm spirit and delicious offerings at the farmer's markets.

These were truly the golden years of their lives, surrounded by nature's bounty, comfortable in the rhythm of time marked by the passing of the seasons, and firmly rooted in the beautiful land that they loved.

Bob grew up in the era of prohibition and the economic turmoil of the Great Depression. He told vivid stories of the rum-runners who rented rooms in his father Walter's boarding house in Los Angeles as a child.

Bob was exceptionally brilliant as a young man, competing in chess competitions and gaining admission to the California Institute of Technology. During his Caltech days he met Thea, and they married the year he graduated, 1939.

Trained as a structural engineer, Bob joined the Army Corps of Engineers and served on the design team for several of the larger dams in the L.A. area. His granddaughter, Gretchen, followed him into the engineering field, becoming a structural engineer specializing in the seismic design of buildings.

Provided by Alexa Bluth

During the war, he and Thea were sent to Cambridge, Massachusetts, with their newborn son Mark, so that Bob could improve the torpedo guidance systems U.S. forces were using. After the war, Bob built his own structural engineering business in Los Angeles, obtained a separate license to practice in each of the 50 states, and rose to the position of President of the Southern California Structural Engineers Association after the birth of his second child, David.

Bob and Thea leave two sons, each of whom became university professors and well-known scientists in their respective fields. In addition, Bob and Thea celebrated four grandchildren and four great-grandchildren during their lifetimes.

They are survived by sons Mark (Carol) and David (Lu), grandchildren Tanya Feinberg (Curt), Alexa Bluth (Andrew), Gretchen, and Travis, plus great-grandchildren Brynne and Kara Feinberg, and Julia and Meredith Thea Bluth.

Bob was a devoted father and husband, sacrificing his chances to pursue pure science so that he could achieve greater financial stability for the family, while writing and working on science problems as a hobby. He put everything into his boys, teaching them about the universe and the way things work, instilling in them a deep appreciation for nature, and sharing with all who knew him his unique sense of humor and practical philosophy of life. He mentored and supported his family to "do what you love," facilitating the return of Thea to college, an aspiration she suspended in order to raise their two sons, and there she earned her educator credentials and rose to become one of the most loved elementary school teachers in the Los Angeles City School District.

He was proud of granddaughter Alexa who, as a political analyst and writer, now advocates for preserving the pensions of retired teachers in California.

Bob urged his sons to "specialize if you want to be a success," and treat everyone with respect as an equal in your personal and professional lives.

He was the personification of his favorite "self-help" book, *How to Win Friends and Influence People*. In his lifetime, Bob truly won innumerable friends, and greatly influenced many individuals in his beloved California. But his true devotion was to his family.

He was able to attend the graduation of grandson Travis from Caltech in 2009, the 70th anniversary of his own commencement.

He and Thea attended the graduation of granddaughter Tanya from Washington University Medical School, St. Louis, in 1996. In his last years, Bob returned to chess as his passion.

He routinely defeated family members he had taught the game, and remained mentally sharp to the end. The family cherishes the memory of Dad/Grandpa/Great-Grandpa, and will always follow both his pedantic and practical advice for how to live life.

"Life comes at you like a freight train," he once said. Although that freight train has passed, we can all still hear its distant whistle, reverberating through the beautiful legacy of a life very well lived.

Donations in memory of Bob should be made in his name to the California Institute of Technology at https://alumni.caltech.edu/giving.

Caltech Couture: Winter coats invade balmy SoCal

ALEX LANGERFELD
Columnist

Happy New Year, Techers! I hope everyone had a relaxing break full of fun and love and maybe some studying.

Hopefully you also received presents or bought yourself something (besides text books), which you are now enjoying.

Although Pasadena does not have remarkably cold winters, we can still find excuses every once in a while to bust out a coat.

Perhaps you got one as a present from an unsuspecting relative who thinks that you are freezing as you slave away in the brutal climate of Southern California, and therefore you are too busy with work to get a new winter coat to keep warm and so, in a caring gesture, this relative gave you a fine new coat as a holiday present.

So, say you have a new winter coat. What do you do now? If a day comes when you judge it cool enough outside to wear it, make sure it is ready. This definitely means removing all of the basting stitches.

Basting, or tacking, stitching is temporary stitching that is meant to hold fabric in place and must be removed before the finished garment is ever worn. Winter coats often have pleats or slits in the back and you may notice that in stores the bottoms of these pleats or slits may be sewn together by large X-shaped stitches.

These are the temporary stitches (also called cross stitches). Some brands even sew these stiches in obnoxiously bright colors as a reminder that they must be removed before wearing the garment! No, this is not the brand's fashion statement.

The reason these stitches are there in the first place is so that the garment doesn't lose its shape before it reaches the hands of its final owner. Watch out for these stitches in other types of clothing.

For example, pleated skirts and dresses, certain shirts with intense pleating, definitely suit skirts with slits, and jackets.

You'd be surprised by how many people dress diligently and stylishly but forget about those basting stitches! Keeping these stitches is like still wearing the tag for everyone to see.

"You'd be surprised by how many people dress diligently and stylishly but forget about those basting stiches! Keeping these stitches is like still wearing the tag for everyone to see."

Besides getting new things, maybe you also did things in the warm spirit of the holidays.

Caltech certainly got a head start on acts of kindness and hospitality long before break started (though no one says that kindess should be limited to the holiday season!).

Caltech kicked off the celebratory season a bit early with the first Interhouse of the year, courtesy of Page House, near the end of the first term. Per the theme of Alice in Wonderland, partiers entered through a rabbit-hole-inspired entrance and followed a corridor of painted walls to a checkered dance floor bordered by more walls, a DJ-booth displaying the carefully painted Page crest, and a red-F-branded guillotine. From the dance floor, dancers could see a rainbow of colors coming from the paintings.

There was plenty to do inside the house itself, but most of the fun was had outside where the bulk of the construction had taken place.

The dance floor opened up into the bar, which was sandwiched by a tree-like structure and a giant, glowing white mushroom – quite a treat!

Needless to say, the end result of this frivolity did not leave Page House in the prettiest state.

At the end of the party, one House expressed its gratitude to the host by doing it a kind favor. Every doorknob in Page House was adorned with a cherry-scented air freshener.

The generous House, Fleming, not only ordered these air fresheners but also designed them to make its good-hearted message even clearer to the exasperated Page House. Unfortunately, the tired and partied-out Pageboys did not seem to understand the deep meaning of this gift as the air fresheners disappeared fairly quickly. The morning after the party, the familiar Page House aroma of old drinks and other fluids was only slightly modified by a fresh whiff of delicate cherry.

Credit must be given to a particular Flem Frosh, who may or may not wish to remain anonymous, for making this sincere act of good will possible. This Frosh designed, organized, and executed the entire act single-handedly after being struck by a mysterious and genius source of brilliant inspiration which is not to be named.

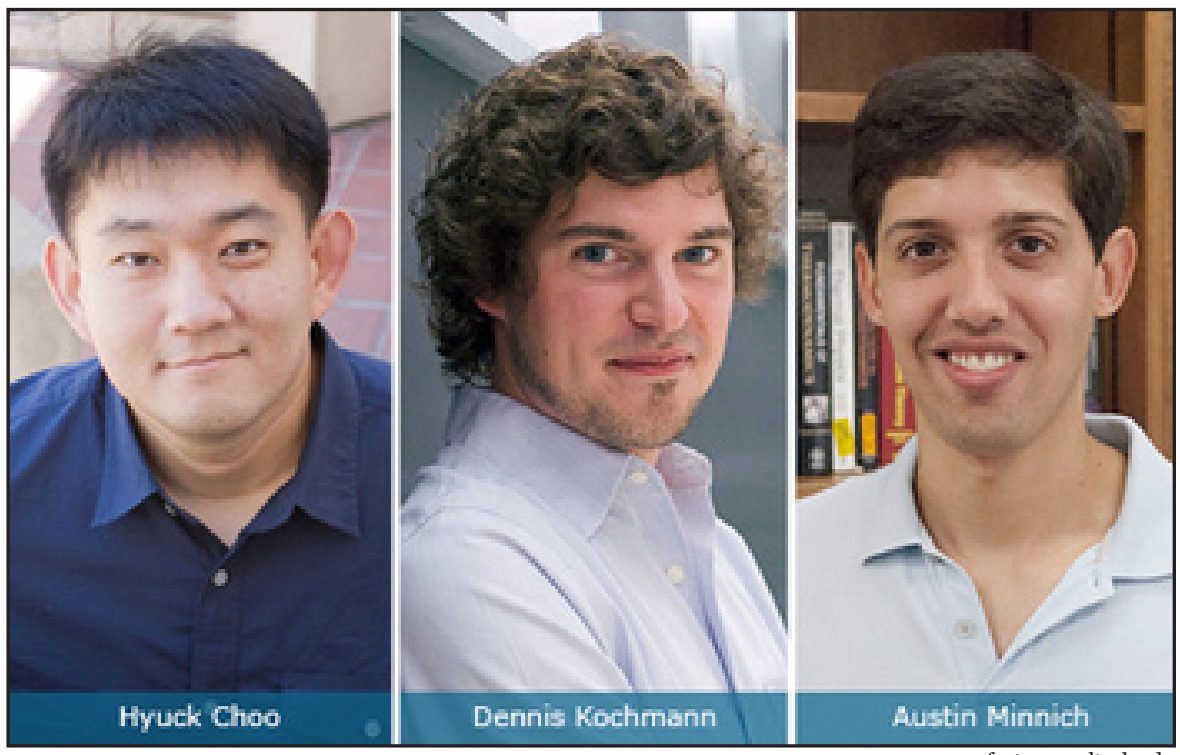
So, hopefully everyone is now well-rested and has many good memories of winter break. Let the New Year get off to a good start! Welcome back to another term at Tech!

Caltech welcomes three new professers in EAS

KIMM FESENMAIER
Science Writer

Three new faculty members in the Division of Engineering and Applied Science (EAS) have big ideas about really small things. Assistant professors Hyuck Choo, Dennis Kochmann, and Austin Minnich focus on quite different challenges, but they all home in on the nanoscale, where they manipulate, model, and measure structures and phenomena at the level of individual atoms.

"Caltech and EAS take pride in lowering the barriers between disciplines to create collaborative environments for researchers such as Hyuck, Dennis, and Austin to work on a variety of topics including understanding and predicting behavior of materials at the nanoscale, which already is an area of strength within EAS," says Ares J. Rosakis, chair of the division, Theodore von Kármán Professor of Aeronautics, and professor of mechanical engineering.



- features.caltech.edu

Hyuck Choo, Assistant Professor of Electrical Engineering

Electrical engineer Hyuck Choo is developing a mechanism to focus laser light down to a spot just 25 nanometers (25 billionths of a meter) in diameter. Such a tiny spotlight could help manufacturers of hard disk drives continue to increase the capacity of their disks.

A typical hard drive includes a platter where data is recorded; that platter is made up of many, many individual magnetic grains, called bits. To increase the storage capacity of these disks, developers have to keep squeezing more bits into each square inch of a platter.

But they've hit a wall of sorts. Top-of-the-line hard drive disks currently hold about 750 gigabytes (GB) per square inch. The upper limit, using current methods and materials, is 1 terabyte (1,024 GB) per square inch. However, to reach such a density, the individual bits need to be smaller than 25 nanometers, and at that size, the ferromagnetic materials they're traditionally made from become unstable at room temperature, making them unreliable for data storage.

Switching to a different material, iron-platinum alloy, for the platters, the individual bits can remain stable down to 2.5 nanometers. The only problem is that iron platinum is so stable that it has to be heated in order to record information.

That's where Choo, who is part of the Kavli Nanoscience Institute, comes in. "We are creating a laser spot that is small enough to go down to the 25-nanometer size, so that we can just heat up individual magnetic bits," Choo says. "Our solution could be used to enable the next generation of hard drive disks."

To illuminate such a miniscule spot, Choo's group has developed a device called a "plasmonic waveguide." Made of gold and glass, the three-dimensional guide channels laser light through a tapering geometry to a tip that's just 14 nanometers across. Choo explains that when they shine laser light at an angle along the waveguide, "the energy of the photons gets transferred to the electrons at the interface between the glass and the gold." Once that happens, an electron wave travels down to the tip, compressing the energy into a very small spotlight.

> Caltech and EAS take pride in lowering the barriers between disciplines to create collaborative environments for researchers such as Hyuck, Dennis, and Austin to work on a variety of topics including understanding and predicting behavior of materials at the nanoscale...
>
> **- Professor Rosakis**

Choo was born in the United States, raised in South Korea, and went to high school in Worcester, Massachusetts. He did his undergrad work at Cornell University and earned his PhD at the University of California, Berkeley. In addition to the light-focusing project, Choo's lab is also working on label-free imaging for glaucoma research.

Dennis Kochmann, Assistant Professor of Aerospace

Aerospace engineer Dennis Kochmann is developing theoretical and computational models of solid materials across multiple time and length scales-from the nano all the way up to the macroscale, which we deal with on an everyday basis.

"The behaviors that you observe at the macroscale usually stem from very many mechanisms from components at lower scales," Kochmann says. "If you zoom in with a microscope on a piece of metal, which looks homogeneous to the naked eye, you will see that it has microstructure-that there are many, many very small things going on across various length scales."

For example, a metal is basically a regular lattice of atoms. But if you zoom in, that lattice is full of defects such as misplaced or completely missing atoms (so-called dislocations or vacancies). Kochmann says these innumerable defects are extremely important because they provide a material with its very distinct properties. "We need to model these lower scales in order to, on the one hand, be able to understand the behavior of materials, but also to predict the behavior of materials," Kochmann says. "If you want to design a material, you need to understand where its properties come from."

In his research, Kochmann focuses on modeling the behavior of crystalline solids bridging scales from the nano all the way up to the macro. At the lowest scale, methods of molecular dynamics help him to investigate the basic mechanisms at play within a crystal. These studies inform higher-scale engineering models and lay the basis for full-physics material models. He hopes that such complete and efficient models will help engineers simulate and predict material behavior with high accuracy.

He's also interested in designing new materials, in particular composite materials with novel properties that can be turned on and off. As a grad student, he was involved in the creation of such a material, which could be made both highly stiff and highly damping, or energy absorbent, at a particular temperature. At Caltech he plans to expand this concept to create new materials with tunable properties.

Kochmann, who was born and raised in Germany, earned his Diplom and doctoral degree in mechanical engineering from Ruhr-University Bochum. He also studied at the University of Wisconsin-Madison as a Fulbright fellow, and earned his MS in engineering mechanics there. He spent the last academic year working as a postdoctoral scholar in the lab of Michael Ortiz, the Dotty and Dick Hayman Professor of Aeronautics and Mechanical Engineering at Caltech.

Austin Minnich, Assistant Professor of Mechanical and Civil Engineering

Mechanical engineer Austin Minnich is interested in thermoelectrics-materials that are capable of converting heat directly into electricity. Thermoelectrics have been around for decades but are receiving increased attention now because they could help with energy conservation efforts. "The simplicity and reliability of thermoelectric devices offer many opportunities to recover wasted energy," Minnich says.

Thermoelectrics require an unusual combination of properties. "You're looking for high electrical conductivity and low thermal conductivity," Minnich explains. Just as electrical conduction is the flow of electrons through a material, thermal conduction refers to the flow of phonons, packets of vibrational energy, through a material.

Typically, he says, a material is high in both types of conductivity or low in both. For example, metals are high in both, while glass is low in both.

But over the past decade, researchers have started to find that they can improve existing thermoelectrics by introducing nanostructures-tiny inclusions. If the inclusions are carefully sized, they can disrupt or scatter phonons, while retaining most of the material's electrical conductivity.

Minnich is focused on developing and using different tools to investigate the nanoscale physics at play in such thermoelectric materials.

To properly size the nanoinclusions to scatter phonons, Minnich says it would be useful to know a measurement called the mean free path-the distance that phonons travel without being disrupted-for a variety of materials. The problem is, these values haven't been determined for most materials. "This means that we don't really know what size or distribution of sizes of nanostructures are needed to optimally scatter phonons," he says.

As part of his research program, Minnich has developed a method to measure the details of heat transport at nanometer-length scales using ultrafast lasers.

Fourier's law, which governs heat transfer at the macroscopic level, no longer holds true at nanometer scales.

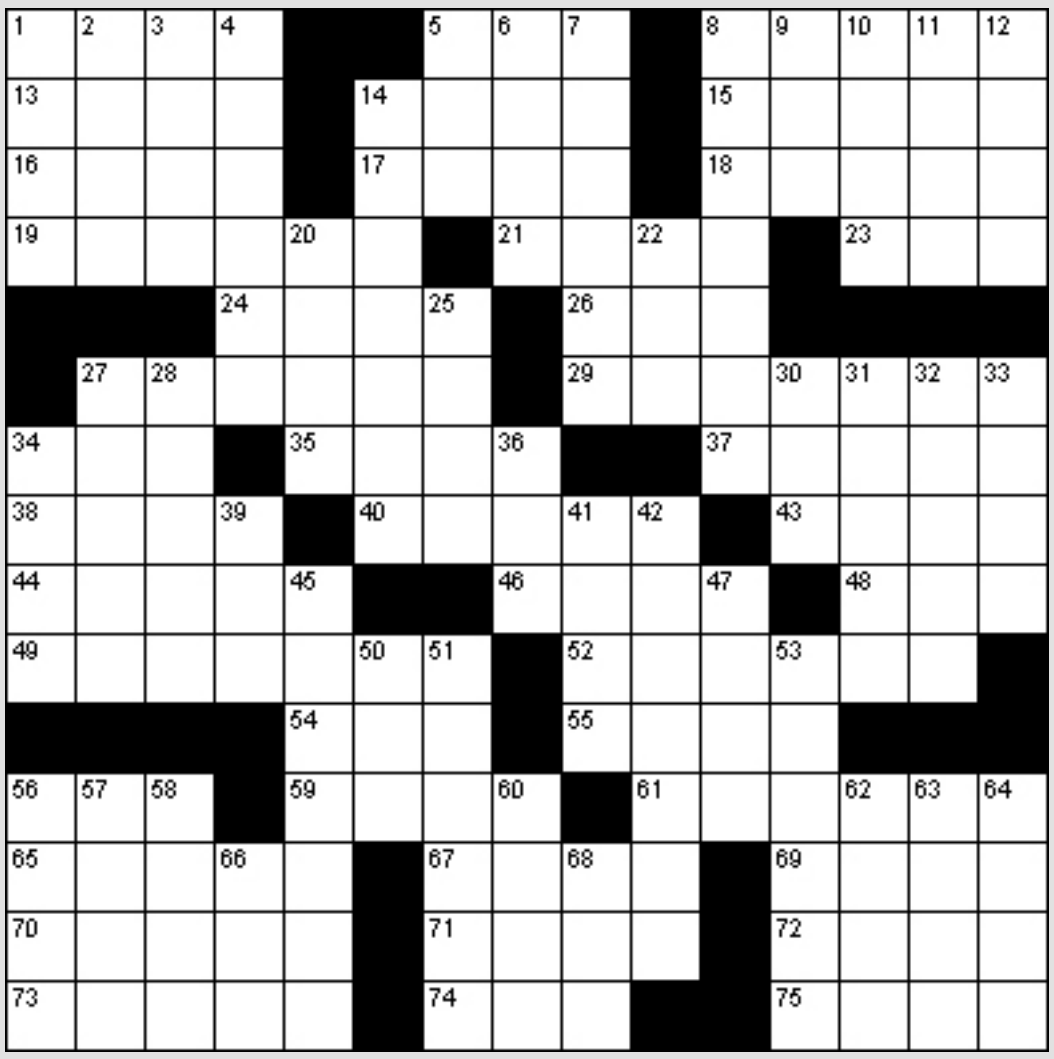
Minnich systematically varies the size of the region heated by the laser and observes both how that heat moves through the material and how heat transfer deviates from what would be expected with Fourier's law. From those deviations, he can figure out how different phonon mean free paths contribute to the material's heat conduction.

"We use these techniques with very fine time resolution, looking at thermal conduction over periods of just femtoseconds," he says. "And that allows us to look at details of transport that are normally just lost if you look at longer time scales."

So far, he's been able to measure mean free paths for phonons in silicon and sapphire, and he plans to apply the technique to many more semiconductors, including thermoelectric materials.

Minnich grew up on the East Coast and went to high school in New Mexico. He completed his undergraduate education at the University of California, Berkeley, and earned his PhD at the Massachusetts Institute of Technology.

Today's Puzzle: Crossword



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

Across

1. Common infection
5. Flightless Australian bird
8. Stage
13. Musical instrument
14. Support
15. Lawful
16. Quantity of paper
17. Newspaper display
18. Stadium
19. Generator
21. Acute
23. Lair
24. Pleasant
26. Consume
27. Part of the Indian Ocean
29. Preliminary piece of music
34. Was victorious
35. Exam
37. Regenerate
38. Car
40. Two
43. Barb
44. Cut of meat
46. Percussion instrument
48. Mariner
49. Consummate
52. Suitable
54. Female pig
55. British peer
56. Part of a circle
59. Small branch
61. Female Japanese entertainer
65. Court panelist
67. Part of the neck
69. Target
70. Solitary
71. Cheerful and bright
72. Part of a ship
73. Repulse
74. Snakelike fish
75. Helen of ___

Down

1. Lanyard
2. Comply
3. Money borrowed
4. Peremptory request
5. Epoch
6. Treat with contempt
7. Maintenance
8. Decorative pot
9. Belonging to a female
10. Matured
11. Reasonable
12. Zeal
14. Go forward
20. Thin fog
22. Listening device
25. Relieve
27. Road
28. Go in
30. Section of a journey
31. Combine
32. Suspend
33. Pitcher
34. Insect
36. Pull
39. Lout
41. Manage
42. Infuriated
45. Falcon
47. Bloodshed
50. Female animal
51. Sudden sharp pain
53. Predicament
56. Slightly open
57. Reign
58. Harvest
60. Strong wind
62. Rancid
63. Aura
64. Friendly nation
66. Single item
68. Buddy

Answers to last week's crossword from puzzlechoice.com

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

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

Näo mixes electronics with live music

CLEMENT LACROUTE
Contributing Writer

For the sake of full disclosure, the following sentence has to open this article: Näo's drummer is a friend of mine.

That being said, please be assured that this review is absolutely fair and unbiased. And that I did listen to the album a good dozen times before writing it.

Näo started as a one-person project; a couple years ago, Pierre André released his first album under the name Picture this if you will. About a year later, he decided to recruit a live band, which after a few iterations converged to the current line-up: Pierre André plays the "machines", Jordan plays the guitar, and Tibo plays the drums. This proved to be a brilliant idea: before long the Näo Live Band started touring European electronic music festivals and ended up signing a deal with German electronica label Ant-Zen and with French label Jarring Effects. Their new album, Näo, is the result of a union of machines and instruments. Näo's down-tempo, melancholic music produces a wide range of moods, from light and airy melodies to more industrial-sounding pieces.

Don't worry if you don't know much about electronica, abstract hip-hop, or electronic music in general (if you've never heard of DJ Shadow's Endtroducing, if you think DJ Krush is a brand of blenders, or if you know Trent Reznor only because he wrote the score of The Social Network, then you probably fall into this category).

You might still like Näo's music, as all of their tracks carry an amazing energy and a great sense of melody, rhythm, and nuance. The band's music is tailored for the stage: it's dark, melancholic, and quite heavy at times, but don't be fooled though—it will definitely make your booty move.

The album is now available in digital format on the main mp3 digital shop, and CDs can be imported through, well, you know, that website.

Caltech men's basketball team loses to strong CMS squad

AMOL KAMAT
Sports Editor

The Caltech men's basketball team opened SCIAC play on Saturday evening with a loss at home to Claremont-Mudd-Scripps. The Stags, who are ranked 19th in the nation, defeated the Beavers 77-42.

CMS jumped to an early lead, holding the Beavers to two points in eight minutes while scoring 13 themselves. The Caltech offense eventually got going, but they were no match for the overpowering Stag offense, going into halftime down 39-22.

The second half brought little relief to the struggling Beavers. With 17:58 left in regulation, they did see their deficit drop to 16 off a Pan Wang three-pointer, but it was the lowest the difference would be in the half.

Despite the 35-point loss, I can't say the game wasn't exciting. The referees certainly did their part, making enough bad calls to incite the fury of Caltech head coach Oliver Eslinger, much to the delight of the Beaver fans. A questionable technical foul against Caltech sophomore Mike Paluchniak also got the crowd riled up, which is always a good time.

Additionally, the game saw Caltech juniors Christophe Kunesh and Arjun Chandar get some playing time, again, to the delight of the Caltech faithful.

Said one group of Caltech fans: "ARJUUUUUUUUUN!!!"

Alex Runkel and Collin Murphy led the Beaver offense with seven points each. Runkel also had a game high 13 rebounds.

The Beavers hope to overcome the loss, and season low in points, when they travel to Occidental College this Wednesday. If you don't know what happened the last time the men's team played Oxy, you probably aren't from around here.

Caltech's Arjun Chandar passes the ball during Saturday's game. Despite a valient effort, the Beavers fell short of the Stags, 77-42, because, you know, beavers are shorter than stags.

- Amol Kamat

Here is a classic example of how basketball is played. One of the players holds the ball while the other tries to get it. In this respect it is similar to soccer, football, and water polo. It is nothing like baseball. When we consider hockey, things get confusing because they use a puck, which is like a flat ball but not really.

- gocaltech.com

Weekly Scoreboard

January 7, 2012
Men's Basketball
vs. Claremont-M-S
L, 77-42 Final

Women's Basketball
vs. Claremont-M-S
L, 51-36 Final

January 5, 2012
Women's Basketball
at Occidental
L, 83-27 Final

January 3, 2012
Men's Basketball
vs. Mt. St. Mary (N.Y.)
L, 73-60 Final

January 2, 2012
Women's Basketball
vs. Rutgers-Camden
L, 71-42 Final

Claremont-Mudd-Scripps Comebacks for Win; Burtons Claims 500th Victory

from gocaltech.com

PASADENA, Calif. – The Claremont-Mudd-Scrippswomen's basketball team overcame a six-point first half deficit to post a 51-36 win over Caltech on Saturday night in a SCIAC match-up.

The victory gives Athenas head coach Jodie Burton her 500th career win during her 32nd season at the helm. She is the 14th NCAA Division III women's basketball coach to achieve the milestone.

In a low scoring first half the Beavers solid defense forced 13 Claremont-Mudd-Scripps turnovers and converted those miscues into nine points in taking a 16-10 lead into intermission.

The Athenas raced out to an 8-2 advantage less than five minutes into the game but a stingy Caltech defense helped the home squad score 14 of the first frame's final 16 points. Caltech went 6-for-24 (25 percent) from the field in the stanza while Claremont-Mudd-Scripps hit four of their 32 field goal attempts (12.5 percent).

Claremont-Mudd-Scripps started the second half on 11-2 scoring run in taking a 21-18 lead with 13:43 left in regulation. Caltech responded and took a 24-23 lead on a Rachel Hess jumper with 10:56 remaining. It was the last lead of the game for Caltech. The visitors took control of the game with a 21-5 scoring spurt over the next 6:47 in posting the win.

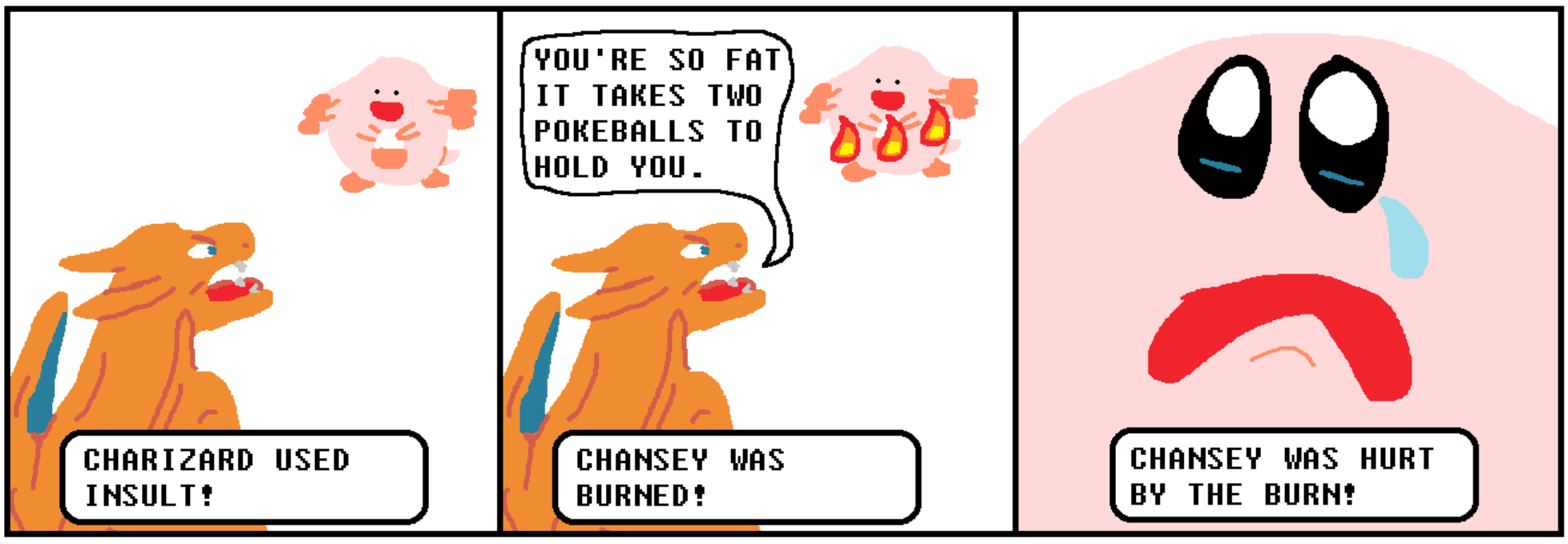
During the second frame the Athenas posted a 19-5 rebounding edge while shooting 14-of-24 (58.3 percent) from the field to aid in their comeback win.

Lyndsay Bergus scored a game high 19 points while dishing out a team best three assists to pace the Athenas efforts. Madeline Barnes chipped in an 11-point evening.

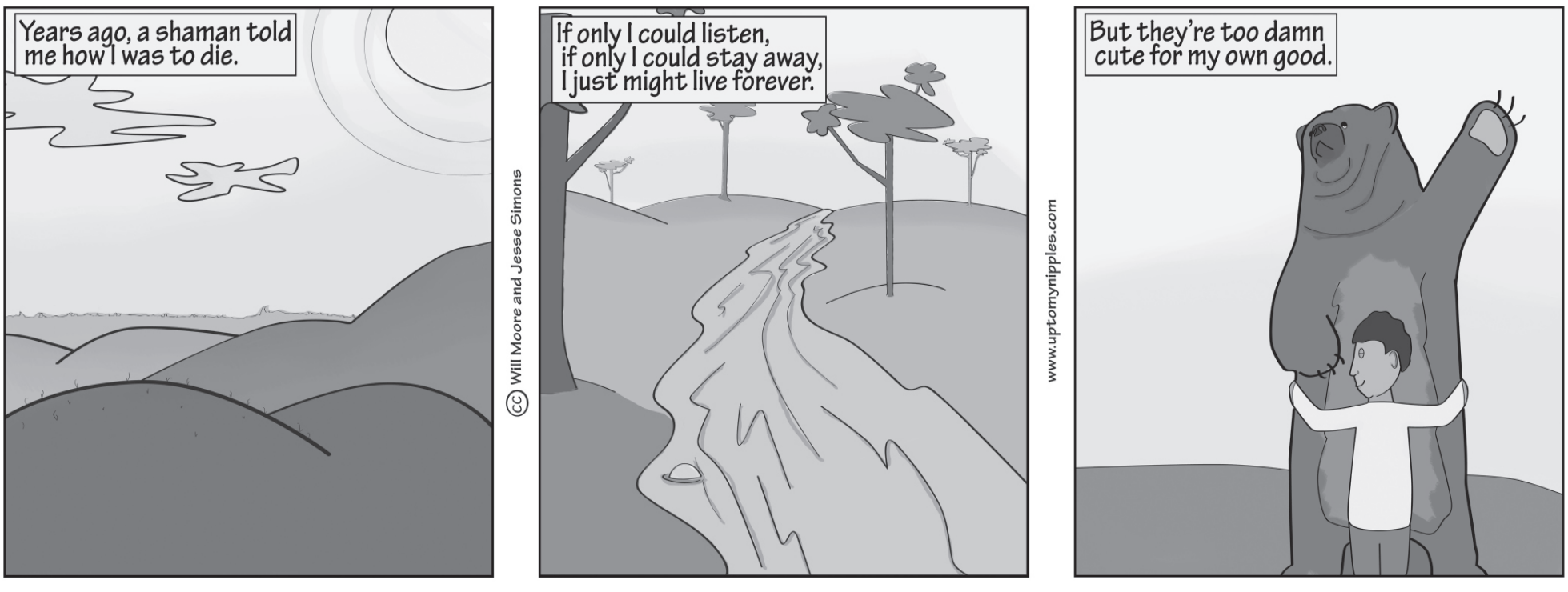
Rachel Hess had a team best 15 points while contributing game highs in steals (4) and assists (4). Teri Juarez chipped in an eight-point, nine-rebound performance

POKEMON WARZ

BY RON HAPKEAD



Up to my Nipples



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

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