Ode to E Pluribus Unum for Sunday March 13 2022

Venus and the Triply Ultraviolet Sun

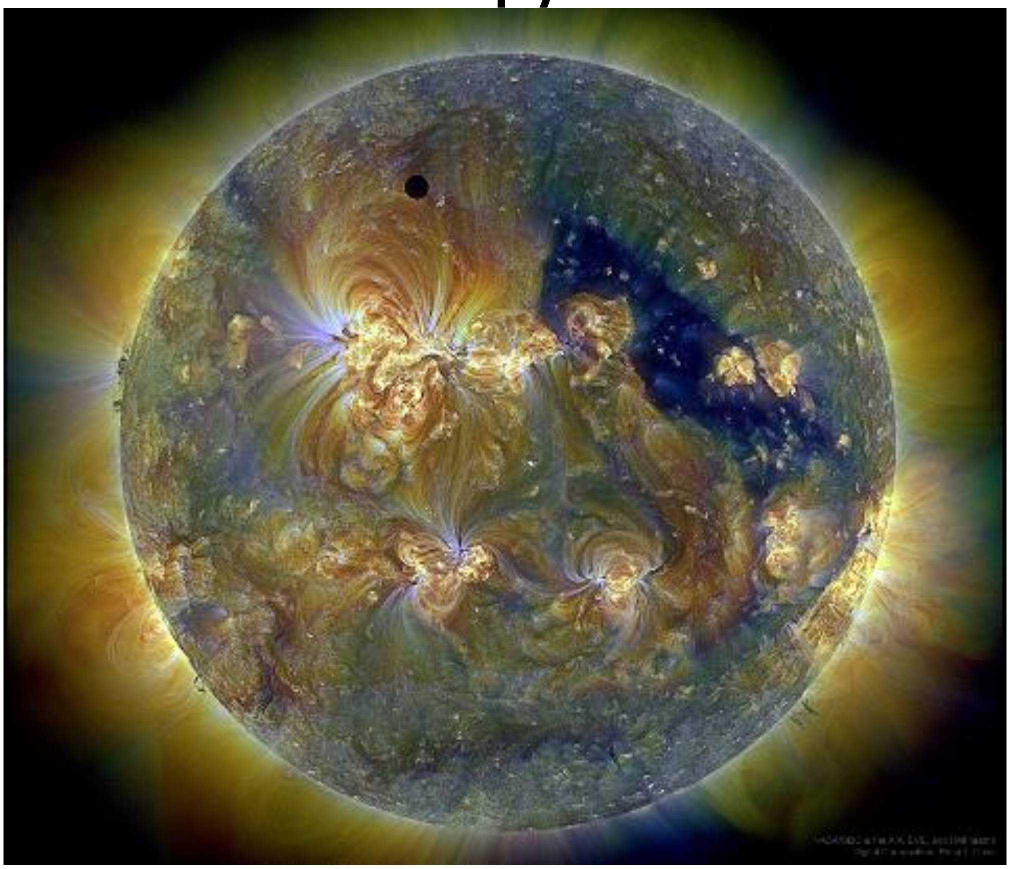

Image Credit: NASA/SDO & the AIA, EVE, and HMI teams; Digital Composition: Peter L. Dove

This was a very unusual type of solar eclipse. Typically, it is the Earth's Moon that eclipses the Sun.

In 2012, though, the planet Venus took a turn. Like a solar eclipse by the Moon, the phase of Venus became a continually thinner crescent as Venus became increasingly better aligned with the Sun. Eventually the alignment became perfect and the phase of Venus dropped to zero.

The dark spot of Venus crossed our parent star. The situation could technically be labeled a Venusian annular eclipse with an extraordinarily large ring of fire.

Pictured here during the occultation, the Sun was imaged in three colors of ultraviolet light by the Earth-orbiting Solar Dynamics Observatory, with the dark region toward the right corresponding to a coronal hole. Hours later, as Venus continued in its orbit, a slight crescent phase appeared again. The next Venusian transit across the Sun will occur in 2117.

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Perseverance Sol 354

Image Credit: NASA, JPL-Caltech, Processing; Kenneth Kremer

This Navcam mosaic from Perseverance looks out over the car-sized rover's deck, across the floor of Jezero crater on Mars. Frames used to construct the mosaic view were captured on mission sol 354. That corresponds to Earth calendar date February 17, 2022, nearly one Earth year after the rover's landing.

With a mass of over 1,000 kilograms, six-wheeled Perseverance is the heaviest rover to touch down on Mars. During its first year of exploration the rover has collected six (so far) rock core samples for later return to planet Earth, served as the base station for Ingenuity, the first helicopter on Mars, and tested MOXIE (Mars Oxygen In-Situ Resource Utilization Experiment), converting some of the Red Planet’s thin, carbon dioxide-rich atmosphere into oxygen.

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Chuck Yeager’s NF-104 Crash

https://sierrahotel.net/blogs/news/yeagers-nf-104-crash?_pos=1&_sid=122c85737&_ss=r&fbclid=IwAR1BJWk5IBJ9eWH_AbuEvvXSv7BUNp8cDvycUpG3oVBxfrBUf-swLh7uDPg

Yeager wasn't the only pilot to jettison an NF-104.

On a systems test flight in preparation for his assault on the world's altitude record with his personally owned NF-104, Darryl Greenamyer was forced to eject when the landing gear failed to deploy. Sad fates for such beautiful birds.

Ps. Greenamyer's NF-104 set a FAI Class C-1 Group III 3 km speed record of 1,590.45 kilometres per hour (988.26 mph), which still stands.

Conquest 1

Ps2. Greenamyer won the National Air Races six times with his highly modified Grumman F8F-2 Bearcat Conquest I before donating it to the Smithsonian in 1977. Conquest 1 broke the FAI Class C-1 Group I 3 km speed record with a speed of 777.38 kilometres per hour (483.04 mph).

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The Marcels Blue Moon 1961

https://youtu.be/qoi3TH59ZEs

The Marcels Blue Moon 2021

https://youtu.be/YZAbp86tqy4?t=2

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Bach Toccata and Fugue BWV 565 by Edson Lopes

https://youtu.be/ojBYW3ycVTE

Edson Lopes (born 1957 São Paulo, Brazil) is a Brazilian classical guitarist, composer and arranger, seen here taking on Bach's most famous and impressive work for organ.

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The Ring

What feels like the magic
of a conch shell emerges
tucked into the envelope
postmark date hidden under
five stamps
one cent each
cost of letter from
Pasadena to Berkeley
Josephine Street
tells me ’61 or 2
new baby with me
and Mike
letter from Dandi
who filled the place of
grandmother in my heart.
I hold her handwritten words—
the conch—
to my ears here now
in 2022
and memories sing through
time
words like sheets of music
dampened wrinkled in antiquity
the haunting concert of her forgotten words
like tropical islands
large enough to exist
but too small to catch
a cartographer’s eye
thus left alone
right sized
for awe and loss.
This letter, one of dozens,
finally excavated as my time
rounds the final bend
now or never chants the salty breeze
letters from Dandi, mother, father,
brother, sister
onslaught of personal history
from those all gone.
I move into them
slowly
the long ago opened envelopes
I shift from lid of cedar chest
to coffee table

to floor
at the feet of favored chair.
Those re-read put back into
those steeped in patience
does the reading of one infect
the others with an
unexplained angle of light
that my still being alive enhances?
In plain sight
is the loss of family
everyday events recorded
pens to paper
for me
loved one posting themselves
exactly as they were
family ambergris
Dandi's letter glad
I love the ring she sent
she records what she knows of its
provenance
a gift to her mother
from her step mother
(her mother died when she
was 16)
Dandi's mother then dying
when Dandi was 13
dying encircles this ring
amethysts and garnets —
garnets Dandi's birthstone
deepening the depth
of this gift
by the time I come again
to this story
the ring springs from
100 to 160 years old
a ring I so loved I had the gold
holding the stones strengthened
then gave it to my daughter
just now sixty
the baby when the letter with
five green one cent stamps
dancing across the top
of the envelope arrived.
Dandi wished the ring
more valuable,
had a romantic beginning.

There it was again
her wanting more for me.
I feel with all these letters
as though I'm swimming
a dry ditch
conch held to one ear
seeking the jeweled sea
where all those I loved,
on that dot of tropical isle,
I might find
as they
in their paper bottles
found me.
Katherine Holden

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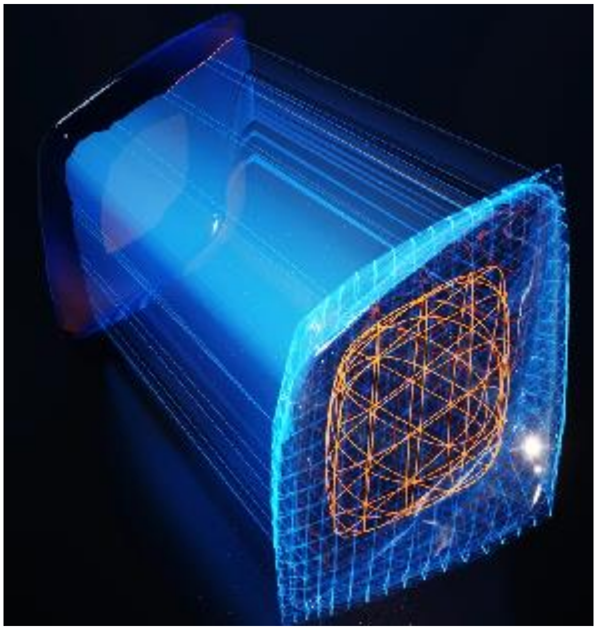
AI and Atomic-Scale Images in Pursuit of Better Batteries

Using artificial intelligence to analyze vast amounts of data in atomic-scale images, Stanford researchers answered long-standing questions about an emerging type of rechargeable battery posing competition to lithium-ion chemistry.



Artist's rendition of a particle analyzed by a combination of machine learning, X-ray and electron microscopy.
(Image credit: Ella Maru Studio)

By Andrew Myers

Today's rechargeable batteries are a wonder, but far from perfect. Eventually, they all wear out, begetting expensive replacements and recycling.

"But what if batteries were indestructible?" asks William Chueh, an associate professor of materials science and engineering at Stanford University and senior author of a new paper detailing a first-of-its-kind analytical approach to building better batteries that could help speed that day. The study appears in the journal Nature Materials.

Chueh, lead author Haitao "Dean" Deng, PhD '21, and collaborators at Lawrence Berkeley National Laboratory, MIT and other research institutions used artificial intelligence to analyze new kinds of atomic-scale microscopic images to understand exactly why batteries wear out. Eventually, they say, the revelations could lead to batteries that last much longer than today's. Specifically, they looked at a particular type of lithium-ion batteries based on so-called LFP materials, which could lead to mass-market electric vehicles because it does not use chemicals with constrained supply chains.

Nanofractures

"Think of a battery as a ceramic coffee cup that expands and contracts when it heats up and cools off. Those changes eventually lead to flaws in the ceramic," Chueh explained. "The materials in a rechargeable battery do the same each time you recharge it and then use up that electricity, leading to failure."

In the battery, Chueh noted, it is not temperature that causes the fissures, but the mechanical strain the materials have on one another with each charge cycle.

"Unfortunately, we don't know much about what's happening at the nanoscale where atoms bond," Chueh said. "These new high-resolution microscopy techniques allow us to see it and AI helps us understand what is happening. For the first time, we can visualize and measure these forces at the single nanometer scale."

Chueh said that the performance of any given material is a function of both its chemistry and the physical interaction in the material at the atomistic scale, what he refers to as "chemo-mechanics." What's more, the smaller things get and the more diverse the atoms making up the material are, the harder it is to predict how the material will behave. Enter AI.

A transformative tool

Using AI for image analysis is not new, but using it to study atomic interactions at the smallest of scales is. In medicine, artificial intelligence has become a transformative tool in analyzing images of everything from faulty knees to deadly cancers. Meanwhile, in materials science, new methods of high-resolution X-ray, electron and neutron microscopy are allowing direct visualization at the nanoscale.

For their subject, the team chose lithium iron phosphate or "LFP," a well-known material used in positive electrodes that is gaining popularity with electric car makers and other battery-intensive businesses. This electrode does not contain cobalt and nickel, which are used in many commercially available batteries. LFP batteries are also safer, though they hold less electricity per pound.

Though LFP has been studied for two decades, two key outstanding technical questions could only be guessed at until now. The first involves understanding the elasticity and deformation of the material as it charges and discharges. The second pertains to how it expands and contracts in a specific regime where the LFP is partially stable, or "metastable."

Deng helped explain both for the first time using his image-learning techniques, which he applied to a series of two-dimensional images produced by a scanning transmission electron microscope, and to advanced (spectro-ptychography) X-ray images. The findings, he said, are important to a battery's capacity, energy retention and rate. Better yet, he thinks it is generalizable to most crystalline materials that might also make good electrodes.

"AI can help us understand these physical relationships that are key to predicting how a new battery will perform, how dependable it will be in real-world use and how the material degrades over time," Deng said.

New directions

Chueh calls Deng an "academic entrepreneur." He is a chemist by background but taught himself the nuances of artificial intelligence to take on this challenge. Deng said the approach is a form of "inverse learning" in which the result is known – high-resolution still images of degraded LFP – and AI helps reconstruct the physics to explain how it got that way. That new knowledge, in turn, becomes the basis for improving the materials.

Deng noted that previous non-AI studies have illuminated correlations in how mechanical stresses affect electrode durability, but this new approach provides both an exciting way and the motivation to develop a more fundamental understanding of the mechanics at play.

Next up, the researchers say they are already at work to bring their techniques to elucidate promising new battery designs at the atomic level. One outcome might be new battery control software that manages charging and discharging in ways that can improve battery life. Another exciting avenue is the development of more accurate computational models that allow battery engineers to explore alternative electrode materials on a computer instead of in a lab.

"That work is already underway," Chueh said. "AI can help us look at old materials in new ways and maybe identify some promising alternatives from some as-yet-unknown materials."

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How to Make a Gate in Your Spare Time

https://youtu.be/wYefdO1j9as

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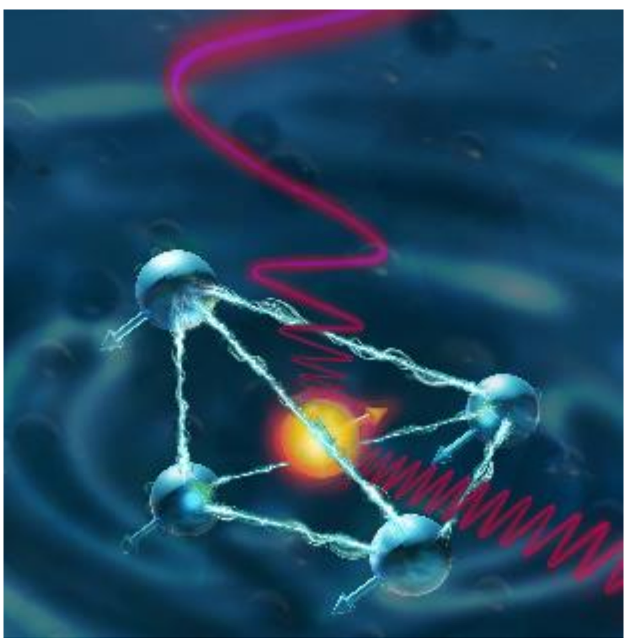
Chaining Atoms Together Yields Quantum Storage

New technique could make quantum networking possible

Engineers at Caltech have developed an approach for quantum storage that could help pave the way for the development of large-scale optical quantum networks.



Artist's illustration depicts the quantum spin of an ytterbium ion with the surrounding yttrium orthovanadate crystal. The spin states of the atoms can be used as a processing unit (like transistors on a computer chip). By using the ytterbium to control four vanadium atoms simultaneously, the engineers were able to realize a 2-qubit processor, an important building

block in the development of quantum computers and quantum networks.
(credit: maayan visuals)

The new system relies on nuclear spins—the angular momentum of an atom's nucleus—oscillating collectively as a spin wave. This collective oscillation effectively chains up several atoms to store information.

The work, which is described in a paper published on February 16 in the journal Nature, utilizes a quantum bit (or qubit) made from an ion of ytterbium (Yb), a rare earth element also used in lasers. The team, led by Andrei Faraon (BS '04), professor of applied physics and electrical engineering, embedded the ion in a transparent crystal of yttrium orthovanadate (YVO4) and manipulated its quantum states via a combination of optical and microwave fields. The team then used the Yb qubit to control the nuclear spin states of multiple surrounding vanadium atoms in the crystal.

"Based on our previous work, single ytterbium ions were known to be excellent candidates for optical quantum networks, but we needed to link them with additional atoms. We demonstrate that in this work," says Faraon, the co-corresponding author of the Nature paper.

The device was fabricated at the Kavli Nanoscience Institute at Caltech, and then tested at very low temperatures in Faraon's lab.

A new technique to utilize entangled nuclear spins as a quantum memory was inspired by methods used in nuclear magnetic resonance (NMR).

"To store quantum information in nuclear spins, we developed new techniques similar to those employed in NMR machines used in hospitals," says Joonhee Choi, a postdoctoral fellow at Caltech and co-corresponding author of the paper. "The main challenge was to adapt existing techniques to work in the absence of a magnetic field."

A unique feature of this system is the pre-determined placement of vanadium atoms around the ytterbium qubit as prescribed by the crystal lattice. Every qubit the team measured had an identical memory register, meaning it would store the same information.

"The ability to build a technology reproducibly and reliably is key to its success," says graduate student Andrei Ruskuc, first author of the paper. "In the scientific context, this let us gain unprecedented insight into microscopic interactions between ytterbium qubits and the vanadium atoms in their environment."

This research is part of a broader effort by Faraon's lab to lay the foundation for future quantum networks.

Quantum networks would connect quantum computers through a system that operates at a quantum, rather than classical, level. In theory, quantum computers will one day be able to perform certain functions faster than classical computers by taking advantage of the special properties of quantum mechanics, including superposition, which allows quantum bits to store information as a 1 and a 0 simultaneously.

As they can with classical computers, engineers would like to be able to connect multiple quantum computers to share data and work together—creating a "quantum internet." This would open the door to several applications, including the ability to solve computations that are too large to be handled by a single quantum computer, as well as the establishment of unbreakably secure communications using quantum cryptography.

The paper is titled "Nuclear spin-wave quantum register for a solid-state qubit." Co-authors include graduate students Chun-Ju Wu and Jake Rochman (MS '19). This research was funded by the Institute of Quantum Information and Matter (IQIM), a National Science Foundation Physics Frontiers Center, with support from the Gordon and Betty Moore Foundation, the Office of Naval Research, the Air Force Office of Scientific Research, Northrop Grumman, General Atomics, and the Weston Havens Foundation.

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The 2012 London Olympics…The Queen's Gambit

https://youtu.be/1AS-dCdYZbo?t=3

Followed by Mr. Bean's Live Performance

https://youtu.be/CwzjlmBLfrQ

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FROG PARKING ONLY ALL OTHERS WILL BE TOAD
IF YOUR CAR IS RUNNING I'M VOTING FOR IT
I WANT TO GROW MY OWN FOOD BUT I CANT FIND BACON SEEDS
WHAT HAPPENS IF YOU GET SCARED HALF TO DEATH TWICE?
THIS IS MY STEP LADDER I NEVER KNEW MY REAL LADDER
MY WIFE SAID I NEVER LISTEN TO HER. OR SOMETHING LIKE THAT
I CHECKED INTO THE HOKEY POKEY CLINIC & I TURNED MYSELF AROUND
IS THERE EVER A DAY THAT MATTRESSES ARE NOT ON SALE?

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NOT QUITE SURE.....IS THIS A COPY CAT
OR A CAT SCAN?

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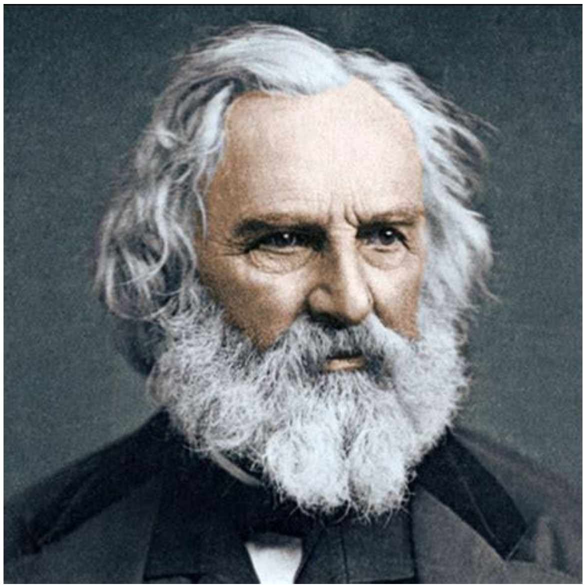
Henry Wadsworth Longfellow (1807–1882)



Longfellow was an American poet and educator whose works include "Paul Revere's Ride", The Song of Hiawatha, and Evangeline. Longfellow wrote many lyric poems known for their musicality and often presenting stories of mythology and legend. He became the most popular American poet of his day and had success overseas. He has been criticized by some, however, for imitating European styles and writing specifically for the masses.

Excelsior

The shades of night were falling fast,
As through an Alpine village passed
A youth, who bore, 'mid snow and ice,
A banner with the strange device,
    Excelsior!

His brow was sad; his eye beneath,
Flashed like a falchion from its sheath,
And like a silver clarion rung
The accents of that unknown tongue,
    Excelsior!

In happy homes he saw the light
Of household fires gleam warm and bright;
Above, the spectral glaciers shone,
And from his lips escaped a groan,
    Excelsior!

“Try not the Pass!” the old man said;
“Dark lowers the tempest overhead,
The roaring torrent is deep and wide!
And loud that clarion voice replied,
    Excelsior!

“Oh stay,” the maiden said, “and rest
Thy weary head upon this breast!”
A tear stood in his bright blue eye,
But still he answered, with a sigh,
    Excelsior!

“Beware the pine-tree’s withered branch!
Beware the awful avalanche!”
This was the peasant’s last Good-night,
A voice replied, far up the height,
    Excelsior!

At break of day, as heavenward
The pious monks of Saint Bernard
Uttered the oft-repeated prayer,
A voice cried through the startled air,
    Excelsior!

A traveller, by the faithful hound,
Half-buried in the snow was found,
Still grasping in his hand of ice
That banner with the strange device,
    Excelsior!

There in the twilight cold and gray,
Lifeless, but beautiful, he lay,
And from the sky, serene and far,
A voice fell, like a falling star,
    Excelsior!

The Children’s Hour

Between the dark and the daylight,
    When the night is beginning to lower,
Comes a pause in the day’s occupations,
    That is known as the Children’s Hour.

I hear in the chamber above me
    The patter of little feet,
The sound of a door that is opened,
    And voices soft and sweet.

From my study I see in the lamplight,
    Descending the broad hall stair,
Grave Alice, and laughing Allegra,
    And Edith with golden hair.

A whisper, and then a silence:
    Yet I know by their merry eyes
They are plotting and planning together
    To take me by surprise.

A sudden rush from the stairway,
    A sudden raid from the hall!
By three doors left unguarded
    They enter my castle wall!

They climb up into my turret
    O'er the arms and back of my chair;
If I try to escape, they surround me;
    They seem to be everywhere.

They almost devour me with kisses,
    Their arms about me entwine,
Till I think of the Bishop of Bingen
    In his Mouse-Tower on the Rhine!

Do you think, O blue-eyed banditti,
    Because you have scaled the wall,
Such an old mustache as I am
    Is not a match for you all!

I have you fast in my fortress,
    And will not let you depart,
But put you down into the dungeon
    In the round-tower of my heart.

And there will I keep you forever,
    Yes, forever and a day,
Till the walls shall crumble to ruin,
    And moulder in dust away!

Nature

As a fond mother, when the day is o'er,
Leads by the hand her little child to bed,
Half willing, half reluctant to be led,
And leave his broken playthings on the floor,
Still gazing at them through the open door,
Nor wholly reassured and comforted
By promises of others in their stead,
Which, though more splendid, may not please him more;
So Nature deals with us, and takes away
Our playthings one by one, and by the hand
Leads us to rest so gently, that we go

Scarce knowing if we wish to go or stay,
Being too full of sleep to understand
How far the unknown transcends the what we know.

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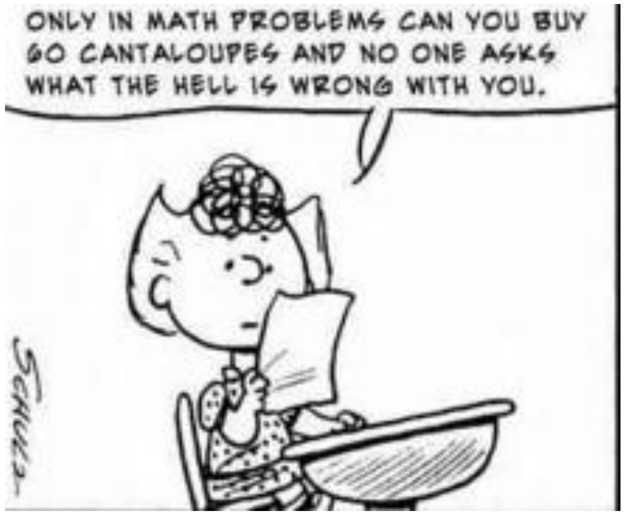

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MIT Scientists Create a Plastic 2 Times Stronger than Steel

And yes, it should be recyclable, too.

[Illustration: Fast Company]

By Mark Wilson

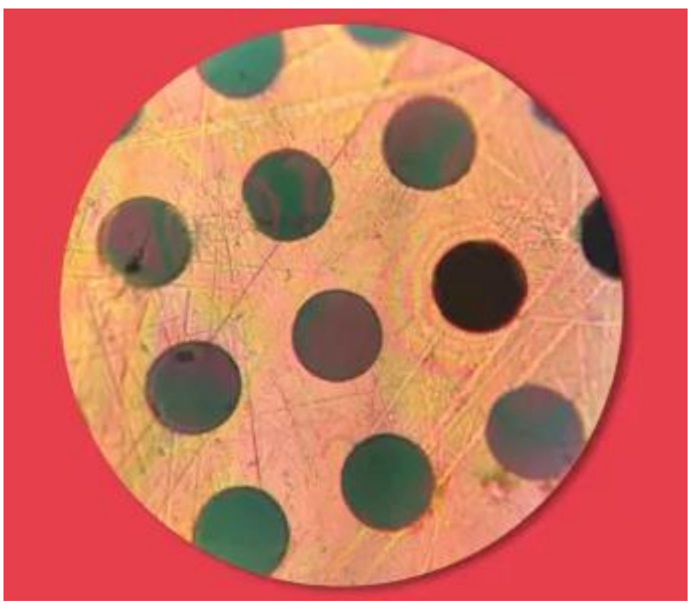
Plastic has a bad rap. Yes, society has handled it incorrectly, as corporations pump out one-time-use products that end up in our oceans. But as a material unto itself, plastic is wondrous: light, strong, moldable. Plastic enabled the development of airplanes and electronics. And it takes very little energy to produce, unlike glass or steel.

Which is why new research out of MIT, which was just published in the esteemed journal Nature, is so exciting. The team developed an entirely new form of plastic dubbed 2DPA-1. It's two times stronger than steel under load tests, with just one-sixth the material bulk. It's capable of conducting electricity and blocking gas. Ultimately, the material has implications for everything from how we build the gadgets we hold in our hands to the buildings we live in, because the patents behind 2DPA-1 are already being licensed by private companies.

To understand why 2DPA-1 is so advanced, I called up Michael Strano, an MIT chemical engineering professor and lead author on the paper, who offered a quick chemistry lesson.

When you look at polymers—aka plastics—at a molecular scale, you'll see a mess of squiggly molecules that he likens to spaghetti. Unto themselves, these squiggles have strength. The gaps between them are what's weak. Those gaps are a breaking point, but they also are porous, allowing gas through. They're why you can smell a hint of last night's dinner through a ziplock plastic bag.

"Think of a plate of spaghetti: The sauce goes deep inside," Strano says.



[Image: courtesy of the researchers/MIT News]

2DPA-1, on the other hand, arranges its polymers as flat discs rather than 3D spaghetti. Laid out like a one-molecule-thick sheet of paper, these discs link to one another with the strongest molecule-to-molecule bond in nature: the hydrogen bond. But you don't need to really understand the science to appreciate Strano's air quotes comparison: It's "2D Kevlar," he says. Kevlar, 2DPA-1's chemical cousin, is best known for its use in bulletproof vests.

However, 2DPA-1's mechanical properties are only exciting because the material is also relatively practical to produce. To anyone who follows materials science closely, the ultra-strong 2DPA-1 might sound a lot like graphene, another headline-grabbing, two-dimensional material that showcases impossible-sounding traits. But graphene's limitations are in scaling the material out of the lab. With few exceptions, it's generated in high temperature ovens—we're talking about temperatures that can run 1,800 degrees Fahrenheit—directly onto the surface of an object.

"It's not a way to produce bulk materials," Strano says. "[With 2DPA-1] you put it in a beaker at room temperature and we can make kilograms of this stuff." In other words, the conditions you need to make 2DPA-1 is similar to making most other plastics. You just need to start with a monomer (in this case, Strano used melamine as found in dishes) and add some chemical solvents to make thin sheets of 2DPA-1.

You can theoretically stack these sheets over and over to make ultra-light and strong building materials that would put steel to shame. You can roll them up into tiny tubes, then mix them into other plastics to make composites like carbon fiber (which Strano's team has already demonstrated). But the most immediate commercial implications for 2DPA-1 are as a barrier coating, according to Strano.

We paint everything from our cars to our homes to prevent oxidation, the rust and rot that happens when a material bonds with the oxygen in our air. But because 2DPA-1 can block gasses, "it turns out to be a very good barrier," Strano says. Those barriers might be sold in the forms of paints or industrial coatings. They might also make their way into formulations for products like ziplock-style bags, which Strano notes could use far less material, more effectively, with 2DPA-1.

In other words, better plastic might allow us to use less plastic for some of the same products. Strano also notes that, since the molecularly similar Kevlar is recyclable, 2DPA-1 should be as well. Which is why, on the horizon, I could see two simultaneous futures for the plastic industry. In one lane, we have super strong plastics (like 2DPA-1) for permanent uses like buildings, that can outperform materials like steel while reducing their carbon footprint. In the other lane, we have other types of naturally sourced ultra-compostable plastics, which we can throw away without the guilt.

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Autograph

The band rose to prominence opening for Van Halen, ultimately playing 48 shows, an act of distinction for an unsigned band. Due to their rising popularity, Autograph soon signed a contract with RCA Records, following a performance at Madison Square Garden in New York City in late 1984.

Autograph's debut album, Sign In Please, was completed and released in October, but did not make an appearance on any record charts until January 1985. The album contains the band's only major hit, and now signature song, "Turn Up the Radio.

Turn Up the Radio https://youtu.be/j8CcTYsMHYU

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