

KIET School of Computer Applications (KSOCA)

TechEdge Technical Newsletter

Vol. V Issue 10, Oct 2022

In This Issue.....

- Alumni Section
- This AI agricultural robot can help lower greenhouse gas emissions, company claims
- Newly developed 'microlattices' are lighter and 100 times stronger than regular polymers
- China claims discovery of a new mineral on the moon for the first time
- A new AI-powered x-ray technique for detecting explosives could identify cancer
- A peek into the future - bridging the labor force shortage with affordable robotics solutions
- Airless tires made with NASA tech could end punctures and rubber waste
- A startup will build the world's first artificial-gravity space stations
- Scientists claim nanogenerators could produce significant electricity from sea waves

[Disclaimer](#)

The newsletter you received is intended for information purposes only and does not constitute a binding offer. The institute does neither give any guarantee nor assume any liability (of whatever content or nature) for the transmission of its news as well as for the timeliness, completeness and accuracy of the information contained in the newsletter and the contents on websites (including all information, services, software, etc.) directly or indirectly referred to by links or references named in the newsletter.



The end of mobile

5bn people have a mobile phone now, and 4bn have a smartphone.

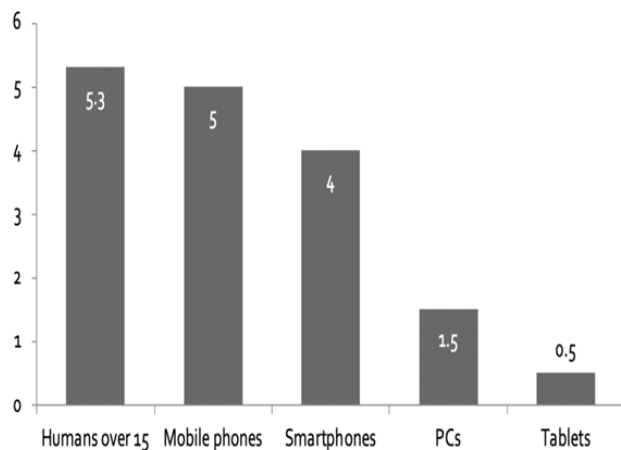
Time to stop making charts.

We've been watching charts of internet use, mobile phones and smartphones since the early 2000s. At one point, they were confounding and exciting could it really be growing that fast? How many people would have these things? Now, we know the answer: everyone. Everyone would have one. There are about 5.3bn people on earth aged over 15. Of these, around 5bn have a mobile phone. This is an estimate: I'm going with the GSMAs but most others are in the same range. The data challenge is that mobile operators collectively know how many people have a SIM card, but a lot of people have more than one. Meanwhile, ownership starts at aged 10 or so in developed markets, whereas in some developing markets half of the population is under 15, which means that a penetration number given as a share of the total population masks a much higher penetration of the adult population.

About 4bn people have a smartphone. How do we get to this number? Well:

- Apple gave a number of 900m active iPhones at the beginning of the year, which is consistent with the unit sales that it reported until recently.

Global installed base, March 2019 (bn)



[Source: World Bank, GSMA, Apple, Google, CNNIC, a16z]

- Google said at this year's in a conference that there are 2.5bn active Android devices, and the Android developer dashboard says that about 95% of these are phones.
- Google's number does not include Android phones in China, which do not come with any Google services (conversely Apple's number does include iOS devices in China). The Chinese government estimates just over 800m internet-connected smartphones in China, and perhaps 20% of these are iPhones, giving a round number of 650m Android phones.

How many of these are online? These sources are all based on devices that connect to the internet regularly in order for them to be counted, but 'connection' is a pretty fuzzy thing. The entry price for low-end Android is now well under \$50, and cellular data connectivity is relatively expensive for people earning less than \$10 or \$5 a day (and yes, all of these people are getting phones). Charging your phone is also expensive if you live without grid electricity, you may need to pay the neighbour who owns a generator, solar cells or car battery to top up your battery. Hence, MTN Nigeria recently reported that 47% of its users had a smartphone but only 27% were active data users (defined as using >5 meg/month). Of course, some of these will be limiting their use to WiFi, where they can get it.

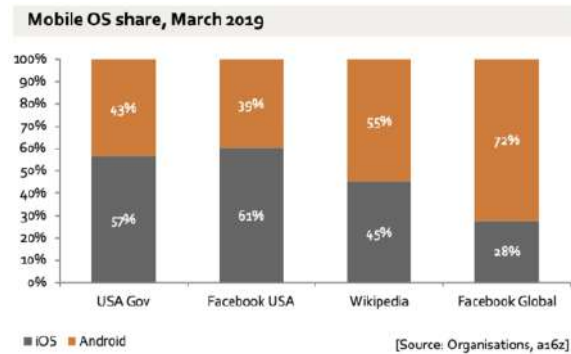
These issues will obviously intensify as the next billion convert to smartphones (or near-smartphones like Kai OS) in the next few years. There are lots of paths to address this, including the continuing cost efficiencies of cellular, cheaper backhaul (*perhaps* using LEO satellites), and cheap solar panels (and indeed more WiFi). The fratricidal price wars started by Jio in India are another contributor, though you can't really rely on that to happen globally. But this issue means that on one hand there are actually more than 4bn smartphones in use in some way, but on the other that fewer than 4bn are really online.

What platforms? The platform wars ended a long time ago, and Apple and Google both won (outside China, at least). However, as one would expect given the range of prices, these devices are not evenly distributed: surveys in the US suggest that over 80% of teenagers have an iPhone, whereas the situation in India is pretty much the reverse. The use of these devices also matters: people who buy high-end phones tend to use them more. Hence the charts below give traffic data from a bunch of sampling points with a lot of traffic: where are

your customers?

Meanwhile, the PC market, which has had flat-to-falling sales for the last few years, has something around 1.5bn active devices (including a bit over 100m Macs and a similar number running Linux of various kinds, and 800m running Windows 10, which was released 4 years ago)

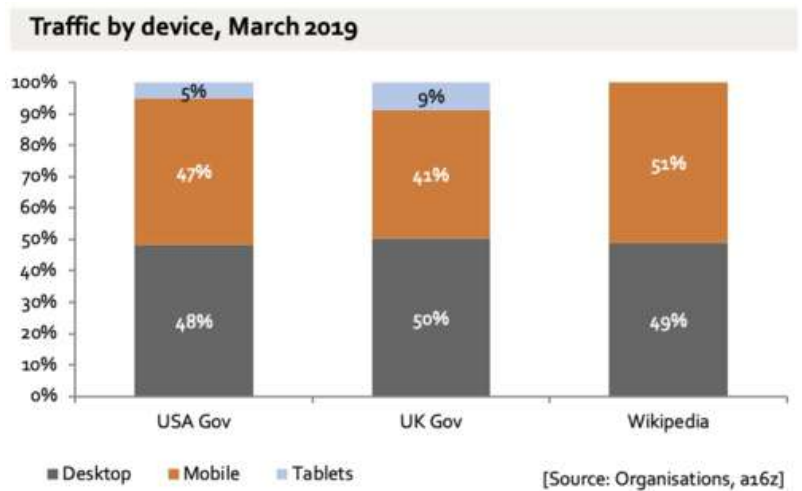
split roughly 50/50 consumer/enterprise. Quite which number you use depends on which analyst firm's estimates you prefer, but they're all in the same range.



What about tablets? Apple says 900m iPhones and 'over 1.4bn' total active devices: if you subtract 200m Macs, Watches and Apple TVs combined leaves about 300m iPads (again, this is consistent with historically reported unit sales) - 350m seems possible. Google's numbers cited above imply something between 100m and 150m Android tablets (I hesitate to be more precise given how rounded these numbers are). Non-Google Android tablets in China might be double that, or even more. Here again the question of whether the device goes online to show up in the stats means it's hard to make a firm estimate (I'm sure people will disagree with this one). But this means there are certainly over half a billion tablets in use.

There's an old joke, the career of an analyst progresses from Word to Excel to PowerPoint. That's pretty much what's happening here over the last 20 years: first we discussed what might happen ("imagine if everyone had a phone!"), then we tracked the numbers of what was happening, and finally we draw diagrams and bullet points of what that means. That's where we are now. We try to work out what it means that almost everyone on earth has a phone or a smartphone.

But this also means that now we go back to the beginning: I'm not updating my smartphone model anymore. The next fundamental trends in tech, today, are probably machine learning, crypto and regulation. I can write about those, but it's too early to make charts.





This AI agricultural robot can help lower greenhouse gas emissions, company claims

According to the US Environmental Protection Agency, 11 percent of 2020 greenhouse gas emissions came from agriculture efforts from livestock such as cows, agricultural soils, and rice production. This means that we have a desperate need to change how we produce our food.

Automation to the rescue

Silicon Valley startup IronOx has been busy doing just that by using automation. It has moved crops indoors, used robots to manage them, and put them under the watchful eyes of smart cameras. The purpose? To grow more and better efficiently and sustainably, according to an article by *CNET*, a Red Ventures company.

It has three new robots working at its facility: Grover, Ada, and Max. The first moves trays of plants to a photo bay for inspection, the second tackles individual plants, and the third handles the amount of water and nutrients to be given to plants based on what the cameras report.

"We get a really high-resolution scan of all the plants," said David Silver, the director of robotics at *CNET*.

"This lets us make sure they're growing on track, predict how much we're going to have at harvest and see if an intervention is needed."

This complex system takes care of all sorts of interventions such as water, nutrients, light, temperature, and humidity, resulting in what IronOx calls "renewable food."

The company's crops provide high quality and yield and ensure residual irrigation water is reused along with any unconsumed nutrients. In addition, IronOx ensures only the right amount of fertilizer is used in its processes since it is a major source of methane, one of the most powerful and dangerous greenhouse gases. "Fertilizer requires a lot of energy to produce and emits a lot of greenhouse gases," said Silver. "The total greenhouse gas emissions of world agriculture is comparable to world transportation. If we want to reduce greenhouse gases, we have to look at the agriculture sector."

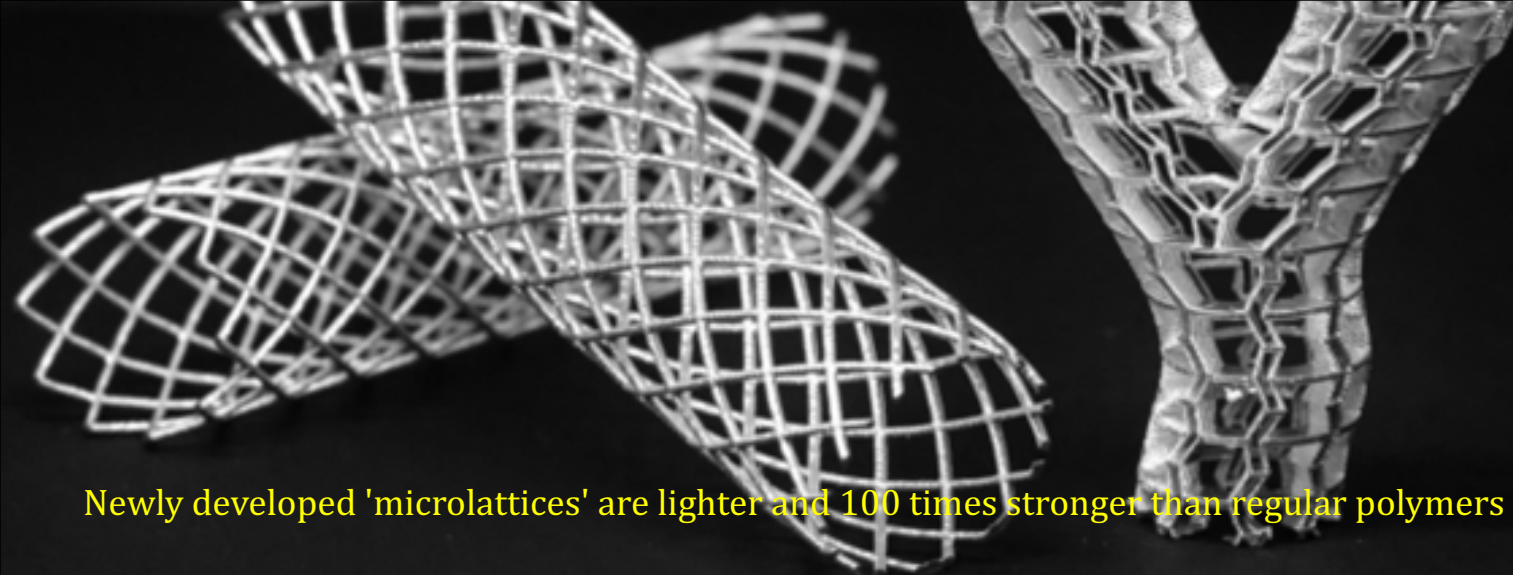
The best human farming techniques

IronOx has trained the AI to function according to the best human farming techniques. "That's how we train the system, with knowledge experts," explained Silver. "You decouple action from mobility."

If you are worried about robots completely taking over, it should be noted that the company still uses human staff to harvest and pack the produce.

However, one does have to wonder whether these jobs will also be eventually replaced by robots. This brings us to an important question: will there be a day when robots handle all of agriculture?

Experts argue that the automation of industries will just result in new and improved jobs for humans. After all, someone needs to oversee automated procedures. But will there be enough jobs to tackle all the positions lost to automation? No matter how worrisome that idea is, we cannot stop growth and automation is clearly here to stay, especially since it provides a more sustainable way of doing things.



Newly developed 'microlattices' are lighter and 100 times stronger than regular polymers

The 3D printing industry has been trying to make lightweight materials more durable and ductile for a long time. Regarding this, a move came from the University of Hong Kong, also known as CityU.

Researchers have discovered a low-cost, direct method to turn commonly used 3D printable polymers into lightweight, ultra-tough, biocompatible hybrid carbon microlattices. More importantly, these microlattices are 100 times stronger than regular polymers.

According to the study team, this novel method can be utilized to develop complex 3D parts with customized mechanical properties for a variety of applications, such as coronary stents and bio-implants.

"3D printing is becoming a ubiquitous technology for producing geometrically complex components with unique and tuneable properties. Strong and tough architected components usually require metals or alloys to be 3D printed, but they are not easily accessible owing to the high cost and low resolution of commercial metal 3D printers and raw materials," as explained by Professor Lu Yang in the Department of Mechanical Engineering. He also led the research.

"Polymers are more accessible but typically lack mechanical strength or toughness. We found a way to convert these weaker and brittle 3D-printed photopolymers into ultra-tough 3D architectures comparable to metals and alloys just by heating them under the right conditions, which is surprising."

A "magic-like" circumstance

Microlattices are an example of a 3D architected metamaterial that combines the inherent qualities of its component materials with the advantages of lightweight structural design concepts. In many cases, advanced fabrication is needed to create these microlattices, claims CityU.

As said, the most effective approach for increasing the strength of these 3D printable polymer lattices is pyrolysis.

Professor Lu discovered a "magic-like" circumstance in the pyrolysis of the 3D-printed photopolymer microlattices, which caused a 100-fold increase in strength and a two-fold increase in ductility of the original material.

To get the best strength and ductility, the proportion of polymer to carbon fragments is also essential. The material loses strength if there are too few carbon pieces, and it becomes brittle if there are too many. The researchers successfully developed an ideally carbonized polymer lattice throughout the study.

The research team also found that these "hybrid carbon" microlattices showed improved biocompatibility compared to the original polymer.

"Our work provides a low-cost, simple, and scalable route for making lightweight, strong and ductile mechanical metamaterials with virtually any geometry," said Professor Lu.



China claims discovery of a new mineral on the moon for the first time

For the first time, Chinese scientists have claimed the discovery of a new mineral on the Moon, making China the third country to do so.

During a press conference on Friday, Dong Baotong, vice chairman of the China Atomic Energy Authority (CAEA), announced the name of the new mineral as Changesite(Y), according to a report published by the Chinese state news agency *Xinhua*.

"This is a major scientific achievement China has made in the field of space science," said Baotong.

"It is also a powerful exploration of cross-industry and cross-professional cooperation between nuclear and aerospace."

Changesite-(Y) is a phosphate mineral in columnar crystal found in lunar basalt particles.

From the 140,000 lunar sample particles, researchers from the Beijing Research Institute of Uranium Geology identified, analyzed, and interpreted a single crystal particle with a radius of around 10 microns using sophisticated techniques, including X-ray diffraction.

China's Commission on New Minerals, Nomenclature and Classification (CNMNC) of the International Mineralogical Association (IMA) has classified Changesite(Y) as a new mineral.

It is the sixth new mineral identified by humans on the Moon, and China has joined the US and Russia as the three countries in the world to do so.

In 2020, China's *Chang'e-5* mission returned lunar samples to Earth for the first time in over 40 years, weighing roughly 1,731 grams. The newly discovered lunar mineral was also retrieved from the Moon.

Researchers from several agencies, including the Chinese Academy of Sciences, the Ministry of Education, and the Ministry of Natural Resources, participated in the study of Moon samples.

The discoveries they have made so far have significant ramifications for our understanding of the Moon's formation and evolution, as well as our efforts to determine the most efficient way to use its resources.

Chang'e-5 mission

Named after the Moon goddess in Chinese mythology, the Chinese Lunar Exploration Program's fifth lunar exploration mission, Chang'e 5, is also the country's first sample-return mission to the Moon. The mission was launched into space on November 23, 2020.

On March 15, 2021, the Chang'e 5 (CE-5) orbiter was successfully grabbed by the Sun-Earth L1 Lagrange point, making it the first Chinese spacecraft to orbit the L1 Lagrange point, which lies 1.5 million kilometers inside the Earth's orbit, partway between the Sun and the Earth.



A new AI-powered x-ray technique for detecting explosives could identify cancer

Researchers at *University College London* (UCL) in the UK have created a novel x-ray technique for detecting explosives that might also be used to identify tumors.

The potentially early-stage fatal tumors in humans could be noticed by the new x-ray method that collaborates with a deep-learning Artificial Intelligence (AI) algorithm to detect explosives in luggages, according to a report published by *MIT Technology Review*.

"The AI is exceptionally good at picking up these materials even when they're hidden inside other objects," said Sandro Olivo, study lead author from the UCL's Department of Medical Physics and Biomedical Engineering.

"Even if we hide a small quantity of explosive somewhere because there will be a little bit of texture in the middle of many other things, the algorithm will find it."

The technique could be used in medical applications, particularly cancer screening, according to the research team.

Although the researchers have not yet tested whether the technique can successfully distinguish the texture of a tumor from surrounding healthy breast tissue, they are excited about the possibility of detecting very small tumors that would have previously gone undetected behind a patient's rib cage.

"I'd love to do it one day," said Olivo. "If we get a

similar hit rate in detecting texture in tumors, the potential for early diagnosis is huge."

Explosives inside electronics

It can be challenging to find explosives using traditional X-ray techniques when they are hidden inside electronics and other things. However, researchers found that under test settings, the new approach had a 100 percent accuracy rate for detecting explosives.

Small amounts of explosives, such as Semtex and C4, were concealed by the UCL team inside electrical appliances like computers, hair dryers, and cell phones to closely resemble a traveler's bag. The products were put inside bags together with toothbrushes, chargers, and other everyday items.

The researchers used a specially constructed machine with masks sheets of metal with holes drilled into them, which split the beams into an array of smaller beamlets to scan the bags instead of using ordinary X-ray machines, which hit objects with a uniform field of X-rays.

The beamlets were scattered at angles as small as a microradian (roughly one 20,000th the size of a degree) as they moved through the bag and its contents. The scattering was examined by AI, which had been trained to identify the texture of specific materials from a particular pattern of angle changes.

The onslaught of the Covid pandemic has triggered various workforce shortages across many industries. The labor force, especially, has the largest gap when comparing the shortages across several industries. To put a number to the shortage, 47 million workers quit their jobs in 2021.

An increased focus on educational attainment can be cited as a crucial factor compelling people to look for better work-life balance and an increased standard of living. In the aftermath, there's a dire need for innovative technology to replace manual labor, and affordable robotics solutions are the only way to go forward.

Introducing Ally Robotics

Washington-based company Ally Robotics works relentlessly to provide feasible robotic solutions to bridge the labor shortage across various industries like restaurants, construction, manufacturing, and much more. Now, they seek investors as they aim to expand.

Combining affordable and reliable hardware with intelligent software, Ally creates robotic arms that can easily carry out various manual tasks and eliminate the need for human interference. These arms are lightweight and easy to set up and use. Most importantly, they can save loads of cash that could otherwise be spent on upfront costs and maintenance of robots.

How Ally Robotics makes existing robot technology better

On average, companies may have to spend around \$485,000 over a decade to set up and maintain robotic solutions for industrial applications. And there are several reasons why it accumulates such mammoth numbers in expenses.

The setup process of a robotic arm system alone takes a massive investment, as do the programming activities at the back end to make them work properly. Programming robotics can take an extensive amount of time to get them in proper working order.

Ally Robotics aims to simplify this complex system by providing a smart and intuitive robot that uses *imitation learning* to carry out sophisticated manual tasks, skipping the wearisome steps of setup and programming. All you have to do is perform the action, and the robotic arm will imitate it while also “learning” the overall movement/activity. Thus acting as a substitute for a manual job.

The cost-effective nature of the Ally system also enables businesses to plan and scale efficiently. Ally robots can be deployed at a much faster rate when compared to traditional robotic systems, saving valuable energy and time.

Decoding the robotic arms - hardware and software

Ally Robotics is on a mission to simplify the complicated system of robotic solutions while also trying to bring it down to an economic scale where it can be easily afforded by small businesses. The question is, how do they do it?

Ally Robotics cuts down on manufacturing costs by using economical hardware, all while ensuring the build quality isn't compromised. It uses quasi-direct drive actuators, which cost only 30% of the traditional actuators. With manoeuvrability and affordability being the focus of the entire system, the company uses low-cost materials to produce the final product.

On the software end, Ally Robotics uses cutting-edge artificial intelligence, coupled with imitation learning to eliminate the need to program the robots for certain tasks. All you need to do is perform the actions with your hand, and the robotic arm will emulate it flawlessly.



Airless tires made with NASA tech could end punctures and rubber waste

NASA 'are simply the best in the world at modelling these materials, hands down,' SMART Tire co-founder Brian Yennie says. Brian Yennie: "Yes! Without pressurized air inside your tires, punctures are no longer a concern. Even large tears won't slow these tires down: you could stick a kitchen knife right through and keep on riding, because it's not going to affect the structural integrity of the tire. The really special thing we're doing, though, is making an airless tire that is also fuel efficient, able to carry heavy loads, and gives a smooth, quiet ride. The reason you don't see airless tires on the road is because nothing on the market passes even two of those criteria, let alone all three."

Over 20% of roadside emergencies involve a tire issue, and the vast majority of those are due to a loss of pressure or improper inflation. We strive to ensure that Space Apps is a place where every person feels they belong, where they are comfortable being authentic, and where they are empowered to contribute to their fullest. Beyond that, SMART tires have a very specific advantage: a longer, flatter contact patch. This is the portion of the tire that is in contact with the road, and in a conventional tire it's more of an oval most of the time. Just look at the uneven wear on your tires, which you have to regularly rotate. It's a subtle thing, but tires making even contact with the road is a huge deal for traction, safety, and tire life. Motion detection and motion-activated recording didn't work at all for me at first.

A lot of people ask about automotive [tires] (who wouldn't want these on their car?), and the short answer is: yes, but it's a few years away. As you can imagine, DoT regulations and testing requirements are extremely in-depth, especially for something different than the status. Ultimately the timing will be good: electric vehicles have major problems with tire wear and higher vehicle weight: both areas where we excel. Beyond that, there are some really interesting niche applications (mining, agriculture, offroad, military) but the one that really stands out is aerospace. Commercial aircraft use extremely heavy and high-pressure tires. I couldn't drain the battery in my almost two weeks of testing, and a built-in solar panel on the lock's key cover will trickle charge the battery, but it's very small and would need a lot of sunlight to make much impact.

Replacing them with something safer and lighter is a no-brainer (and will save a lot of jet fuel someday). Of course, we're also developing lunar tires for Project Artemis, the original space application. That means SMART tires on the next moon buggy driving around the surface of the Moon. Researchers at NASA's Glenn Research Center working on an SMA rover tire.

How involved is NASA in the process of helping build your technology? Can you tell us anything about what it's like to work with NASA? We work with NASA by licensing their patents, and through a public/private partnership agreement called a Space Act Agreement. Setting up access codes and fingerprints in the usable (but cluttered) app was straightforward.

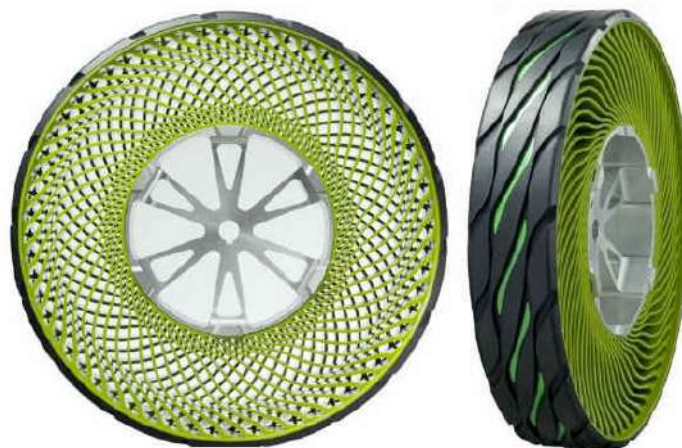
On the one hand, NASA is a large government entity, and there is a bit of a learning curve. They can't just pick a private company and endorse you, or operate the same way that a corporate partner would. You need to understand regulations, how the licensing process works, and how to interact with the U.S. Government in general. I had this issue when I tested the original Lockly Vision, so this time, I installed the lock on my back door, which has a bit more space so I could use the fingerprint reader.

NASA are simply the best in the world at modeling these materials, hands down. Now, the good part. There's only one NASA. Under our Space Agreement titled Shape Memory Alloy Modeling and Development, they primarily assist us with computer modeling and optimization of our SMA tires. They are simply the best in the world at modeling these materials, hands down. It also works with Google Home for voice control of the lock using a PIN.

Our lab is located in Akron, Ohio about 40 minutes from NASA Glenn Research Center (Cleveland) where we periodically get to go on-site. Not everyone at NASA is a literal rocket scientist, but the expression is apt, as they do employ many of the top scientists and researchers in the world. What do you say to people who think we shouldn't be investing in space technology? It'd say that space technology is just technology. Stories about eccentric billionaires or out-of-control budgets are headline grabbers, but the majority of work in this area is valuable. From satellites that monitor the weather or provide global communications, to pushing the limits of energy storage, growing plants under extreme conditions, or better tires, space technology is notorious for contributing to terrestrial applications. The primary data a smart door lock collects is when you lock / unlock the door and how keypad, manually, with the app, etc.

We put solar panels on a satellite in 1958. Now anyone can put them on their roof. So, the payback is not always immediate, but over time it's significant. My one caveat is that we need to continue to support public institutions like NASA, and not just rely on the Elon Musks and Jeff Bezos of the world to take the reins. There's room for both. Lockly says all data it collects from the app is encrypted in transit and is transferred over a secure connection.

Finally, how have you furthered your technology in the past year? In the past year, we've reduced material costs by over 85% from the first bicycle prototype, integrated a lightweight casing, added replaceable rubber treads, and developed a continuous manufacturing process for the tires. Compared to last year, we've gone from proof-of-concept prototype to final tweaks before going to market. We also redesigned NASA's spring tire to meet much higher requirements than ever before for the Moon.





A startup will build the world's first artificial-gravity space stations

Vast, a California-based startup, has revealed that the company will develop artificial-gravity space stations to enhance human productivity in space. With a team of exceptional engineers, industry experts, and an aerospace engineer and former vice president at SpaceX, Hans Koenigsmann, the company aims to create a setting where people can live as well as work in space.

"Vast's mission is to enable a future where millions of people are living across the solar system," said Jed McCaleb, who worked on projects such as Stellar, the Astera Institute, Ripple, and eDonkey2000.

"The solar system has an incredible amount of resources. If we had access to those resources, our civilization could grow and thrive while preserving our planet. Once large populations of humans can live in space, we can create the industry and infrastructure needed to access those resources at scale."

"I have always believed in leveraging technology to reduce inefficiency and improve the human condition. To expand human habitation in space, we must create technologies that perfect sustainability," McCaleb added.

The company's space station will be able to accommodate over 40 people and measure 100 meters (328 miles) in length.

Living in zero gravity is cool, but...

Doing a few somersaults in a row or moving as if you're swimming in space might sound cool to the ears for a short term. However, exposure to zero gravity for a long time can possibly damage astronauts' health. Some of the side effects include muscle atrophy, bone loss, and even brain damage. McCaleb's innovative idea targets providing a healthier environment for long-term missions through artificial gravity. A gravity-like pull is created through centrifugal force occurring thanks to a large spinning structure.

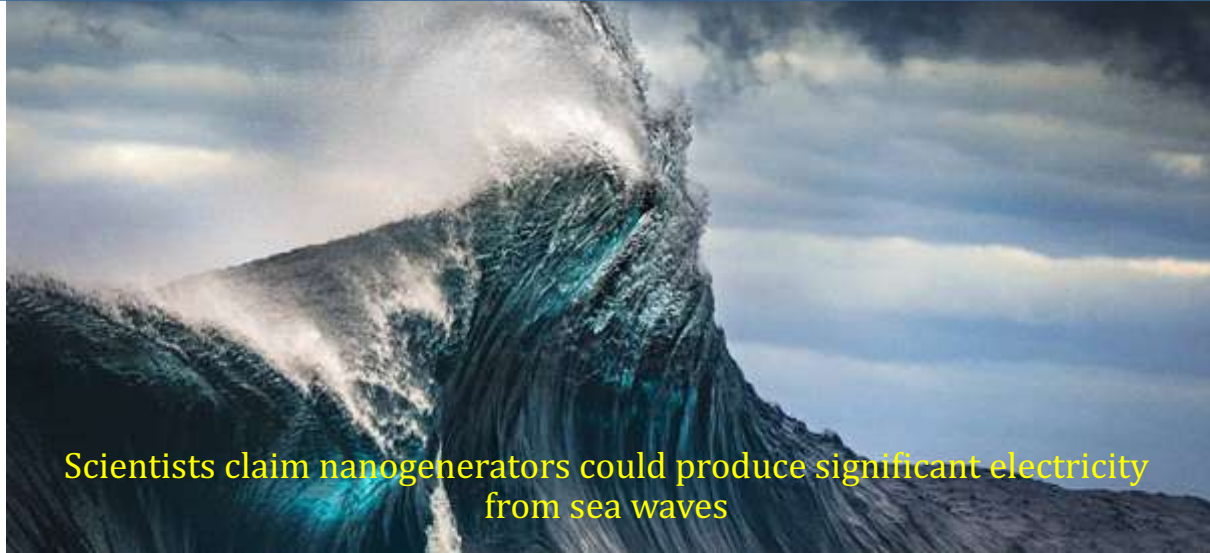
"We still crave new frontiers, with many of us spending our lives anticipating the time when space will be unlocked for us," said McCaleb. "By pushing our frontiers and expanding our habitat into the vastness of space, we may actually preserve Earth for thousands of years and generations to come."

Vast's goal is ambitious. The company implies that the new ecosystem will enable further expansion into the solar system.

McCaleb once told his friends that he would mine asteroids if he ever had lots of money, Space News reported. And after leading three successful cryptocurrency companies, he delved into solving problems preventing humanity from exploring further the solar system.

This is not the first time a company attempted to build an artificial gravity structure in space. As space tourism becomes the new black, different industry leaders wouldn't miss a chance to give people what they wanted.

Back in 2021, we reported on The Orbital Assembly Corporation's plans to build an orbital space hotel with artificial gravity.



Scientists claim nanogenerators could produce significant electricity from sea waves

Wave power from the sea has a lot of potential as a renewable energy source, but it is still not widely used.

However, it may soon receive the boost it needs to become commercially viable thanks to a new invention made up of tiny generators that rely on the triboelectric effect.

Capturing energy from static electricity

The new development has been unveiled by a team in China that boasts that it doubles the previous record for power generated per volume. It does this by capturing the energy that results from the static electricity that is produced when different materials rub together. This phenomenon is known as the triboelectric effect, and devices that make use of this effect to produce energy are referred to as “nanogenerators.” Despite numerous attempts to incorporate the triboelectric effect into current technologies, no invented devices have yet to be mass produced or even sold. However, the new research proposes to link thousands of triboelectric nanogenerators together in long chains to generate enough power to make the devices efficient for wave power. The new concept is being suggested by a team led by Zhong Lin Wang at the Beijing Institute of Nanoenergy and Nanosystems in China. Wang was responsible for the first working triboelectric nanogenerator engineered in 2012.

He has now developed a design for wave power that consists of a spring-like coil inside a cylinder. As the waves push the cylinder back and forth, the separate parts of the spiral come together and separate, generating a small but significant current.

So far, the new invention has been found to produce up to 347 watts of power per cubic meter which is double the best previously achieved record. It's also 30 times more than other triboelectric devices.

The researchers claim this is because they managed to pack more generators into the same space. When dealing with devices as small as nanogenerators, high numbers are key to getting enough energy to make a substantial impact.

Additional developments in wave power

This isn't the only development that seeks to make a difference in the way wave power is produced and harnessed. In August of 2021, researchers designed a prototype technology they claimed was capable of doubling the power harvested from ocean waves.

The new wave energy converter developed by a research team under the leadership of RMIT University was reported to function twice as well as comparable technologies developed before by using a never before seen dual-turbine design.

In September 2022, U.S.-based startup CalWave announced the successful completion of an open-ocean test of its xWave clean power technology which demonstrated over 99 percent system uptime that lasted a total of 10 months.