

http://www.eurekalert.org/pub_releases/2012-12/dc-dlw122512.php

Did Lucy walk, climb, or both?

Australopithecine ancestors -- arboreal versus terrestrial habitat and locomotion

Much has been made of our ancestors "coming down out of the trees," and many researchers view terrestrial bipedalism as the hallmark of "humanness." After all, most of our living primate relatives—the great apes, specifically—still spend their time in the trees. Humans are the only member of the family devoted to the ground, living terrestrial rather than arboreal lives, but that wasn't always the case.

The fossil record shows that our predecessors were arboreal habitués, that is, until Lucy arrived on the scene. About 3.5 million years ago in Africa, this new creature, *Australopithecus afarensis*, appeared; Lucy was the first specimen discovered. Anthropologists agree that *A. afarensis* was bipedal, but had Lucy and her legions totally forsaken the trees? The question is at the root of a controversy that still rages.

"*Australopithecus afarensis* possessed a rigid ankle and an arched, nongrasping foot," write Nathaniel Dominy and his co-authors in Proceedings of the National Academy of Sciences (PNAS). "These traits are widely interpreted as being functionally incompatible with climbing and thus definitive markers of terrestriality," says Dominy, an associate professor of anthropology at Dartmouth.

But not so fast; this interpretation may be a rush to judgment in light of new evidence brought to light by Dominy and his colleagues. They did what anthropologists do. They went out and looked at modern humans who, like Lucy, have feet adapted to terrestrial bipedalism, and found these people can still function as effective treeclimbers.

Co-authors Vivek Venkataraman and Thomas Kraft collaborated with Dominy on field studies in the Philippines and Africa that inform their PNAS paper. Venkataraman and Kraft are Dartmouth graduate students in the Ecology and Evolutionary Biology PhD program in the Department of Biological Sciences, and are supported by National Science Foundation graduate research fellowships.

The studies in Uganda compared Twa hunter-gatherers to their agriculturalist neighbors, the Bakiga. In the Philippines, the researchers studied Agta hunter-gatherers and Manobo agriculturalists. Both the Twa and the Agta habitually climb trees in pursuit of honey, a highly nutritious component of their diets. They climb in a fashion that has been described as "walking" up small-diameter trees. The climbers apply the soles of their feet directly to the trunk and "walk" upward, with their arms and legs advancing alternately.

Among the climbers, Dominy and his team documented extreme dorsiflexion—bending the foot upward toward the shin to an extraordinary degree—beyond the range of modern "industrialized" humans. Assuming their leg bones and ankle joints were normal, "we hypothesized that a soft-tissue mechanism might enable such extreme dorsiflexion," the authors write.

They tested their hypothesis using ultrasound imaging to measure and compare the lengths of gastrocnemius muscle fibers—the large calf muscles—in all four groups—the Agta, Manobo, Twa and Bakiga. The climbing Agta and Twa were found to have significantly longer muscle fibers.

"These results suggest that habitual climbing by Twa and Agta men changes the muscle architecture associated with ankle dorsiflexion," write the scientists, demonstrating that a terrestrially adapted foot and ankle do not exclude climbing from the behavioral repertoire of human hunter-gatherers, or Lucy.

In their conclusions, the Dartmouth team highlights the value of modern humans as models for studying the anatomical correlates of behavior, both in the present and in the dim past of our fossil ancestors.

<http://www.bbc.co.uk/news/uk-england-esssex-20727791>

Singing skills for stroke patients at Harlow hospital

A hospital is using the power of song to help stroke patients regain and improve their language skills.

Staff at Princess Alexandra Hospital in Harlow are encouraging patients to sing as part of their recovery.

While speaking uses the left hemisphere of the brain, singing uses the opposite side.

One of the patients, Angela, said she found it easier to sing words than to speak them. She said she had benefitted from the project. A hospital spokesman said: "Many people suffering from stroke lose their power of speech or their ability to speak fluently.

'Comes naturally'

"However, we are trying a technique which means they can communicate by singing. It uses a different part of the brain and it means by working on that side of the brain it helps them build up their speech function."

The singing sessions are used in the hospital's dedicated stroke support groups. At a recent meeting, some members dressed up as nuns and sang numbers from the film *Sister Act* during a lunch session.

Patsy Simons, a specialist stroke nurse, said: "You will find that a lot of stroke patients who lose the power of speech can do voluntary things like swearing or singing, it just comes naturally.

<http://www.wired.com/wiredscience/2012/12/lets-give/>

Dumb Poisoners: A Year-End Appreciation

About a month ago, I read a story about a Florida woman who'd tried to kill her husband by crushing up some of her Trazadone pills and mixing them into his tuna fish sandwich.

By Deborah Blum

Naturally, I was appalled. “What kind of idiot tries to put a bitter medication like Trazadone into a tuna sandwich?” I demanded of my husband. “She had to know he'd taste it right away.”

As he didn't answer right away, I looked over. He appeared to be sneaking out of the room.

“It didn't work,” I added reassuringly.

He kept going.

When I first started writing about poisons, I had a certain image of poisoners in mind — creepy, yes, but cool, collected. After all, a poison murder is always premeditated. It's a colder kind of killing, one that I used to imagine was somehow infused with extra intelligence.

But over the last year, I've come to realize that I might be overrating the poison killer. Not just because of the Trazadone-in-tuna idiocy — and I'll return to that. Did I mention the SpeedyDry in oatmeal fiasco? Or the window cleaner recipe for brownies? The poisoners of 2012 didn't seem to be carefully planning as much as they seemed to be grabbing up the first bottle lurking in the medicine chest or under the kitchen sink. I've been picking up a pattern of stumbling rather than capability.

And, over all, I've realized that's something to be appreciated. We don't actually want our would-be killers to be too smart. The dumber and the more easily caught the better. There are earlier, classic examples of this point, such as the 1926 murder trial of Ruth Snyder in New York City. Snyder, and her lover, Judd Gray, killed her husband with poisoned alcohol, chloroform (and also a lead sash weight, and length of picture wire), all with such clumsy obviousness (they didn't even get rid of the weapons) that the writer Damon Runyon (of Guys and Dolls fame) nicknamed their story, “The Dumbbell-Murder.”

But although there's mockery in that description, there's also a clue as to how their story ended. They were caught. They were tried. And in the summary way of 1920s justice, they were executed (but not before Snyder had received more than 100 marriage proposals from men willing to overlook a little thing like murder.)

Of course, that's a different class of dumbbells.

In early December a disgruntled employee of the Waterbury, Connecticut parks department decided to get revenge on his boss by putting poison in the oatmeal container the supervisor kept in his desk. The employee, William Lampron, didn't look far — he just scooped up some of the SpeedyDry, a compound used by the department to soak up oily spills on roads.

As he explained to the police, his boss had been making him work too hard. Lampron decided to respond chemically to the demanding supervision. After he'd been treated at the hospital, the boss remembered that the oatmeal had tasted a little off. When he inspected the canister opened he could see the large absorbent granules mixed in with the oats. This evidence came in very handy when the police arrived.

But poisoners tend to have, let's say, a curious way of seeing the world — and their place in it. When detectives interviewed Lampron, he felt he had cause: “He said he was close to retirement and he should be able to slow down the last few months.” Just as a Michigan college student who sent her roommate to the hospital (again in the first week of December) explained that she poured bleach into the other girl's tea after they argued over who should wash dirty dishes. Her roommate was “mean” about it, she said.

I've written before about bleach poisonings. They remind us that household supplies are the most frequent source of such attacks. They remind us that people sometimes just poison to punish. In November, for instance, a deputy sheriff in Florida was charged with dumping hand sanitizer into a co-worker's coffee following an argument over vacation days.

They remind us, once again, that the everyday poisoner is vindictive. Sneaky. But not necessarily that smart. Not that I'm dismissing the dangers of the homicidal poisoner. Police believe that the Australian girl who delivered an October gift of brownies laced with toilet and window cleaning chemicals to some neighbor boys, was trying to do real harm (and might have come so if the treats hadn't smelled so strongly of ammonia). And there's strong evidence that the woman who put Trazadone in her husband's sandwich was hoping for a lethal ending.

On first look, Trazadone, is a lousy homicidal poison. It's an old-time antidepressant (a serotonin re-uptake inhibitor) that tends to be used most often for insomnia treatment. It's not particularly toxic. An analysis of some 70 suspected overdose cases found that the primary symptoms were a loss of muscle coordination and drowsiness. Not one person died.

But, as it turns out, this poisoner wasn't looking for a drop-dead effect. The intended victim, Gregory Richards, was an electrician whose job required him to climb up and down ladders. His wife, Beth, was hoping to induce an accident.

She'd made a point of texting him during lunch to make sure he was eating the sandwich. Her plan was undone, in part, by the problem I'd noted to my husband. The sandwich, which contained six crushed Trazadone tablets, was extremely bitter. Richards couldn't finish it. Still, he did become dizzy enough to slip as he was climbing a ladder. The tumble was minor and at the hospital, doctors picked up on the drug reaction. Still his wife was so impressed with her own cleverness that she bragged to a family member who was horrified enough to call the police.

After her arrest, she refused to tell the police why she'd poisoned her husband. But the Polk County sheriff noted that he did have an insurance policy that paid \$250,000 if he was killed on the job. And in this we do see evidence of the classic poisoner at work, plotting out murder. Of course, it always was an iffy kind of plot. The best thing about dumb poisoners is that their victims usually survive — and the plotter usually gets caught. "I wondered if it would have worked better if she'd put it in something like chili that would hide the taste," I mused to my husband.

But, for some reason, he'd left the room again

<http://news.discovery.com/human/alcohol-social-lubricant-for-10000-years-121231.html#mkcpgn=rssnws1>

Alcohol: Social Lubricant for 10,000 Years

As people ring in the New Year with dancing and a bit of bubbly, they can consider themselves part of an ancient human tradition.

Analysis by DNews Editors

Several new archaeological finds suggest that alcohol has been a social glue in parties, from work festivals to cultic feasts, since the dawn of civilization.

In the December issue of the journal *Antiquity*, archaeologists describe evidence of nearly 11,000-year-old beer brewing troughs at a cultic feasting site in Turkey called Göbekli Tepe. And archaeologists in Cyprus have unearthed the 3,500-year-old ruins of what may have been a primitive beer brewery and feasting hall at a site called Kissonerga-Skalia. The excavation, described in the November issue of the journal *Levant*, revealed several kilns that may have been used to dry malt before fermentation.

The findings suggest that alcohol has been a social lubricant for ages, said Lindy Crewe, an archaeologist at the University of Manchester, who co-authored the *Levant* paper.

For bread or beer?

While the cultivation of grain clearly transformed humanity, why it first happened has been hotly contested. "This debate has been going on since the 1950's: Is the first cultivation of grain about making beer or is it about making bread?" Crewe said.

Some researchers suggest that beer arose 11,500 years ago and drove the cultivation of grains. Because grains require so much hard work to produce (collecting tiny, mostly inedible parts, separating grain from chaff, and grinding into flour), beer brewing would have been reserved for feasts with important cultural purposes. Those feasts -- and alcohol-induced friendliness -- may have enabled hunter-gatherers to bond with larger groups of people in newly emerging villages, fueling the rise of civilization. At work parties, beer may have motivated people to put a little elbow grease into bigger-scale projects such as building ancient monuments. "Production and consumption of alcoholic beverages is an important factor in feasts facilitating the cohesion of social groups, and in the case of Göbekli Tepe, in organizing collective work," wrote *Antiquity* paper co-author Oliver Dietrich in an email. Dietrich is an archaeologist for the German Archaeological Institute.

Ancient party sites

The site in Cyprus includes a courtyard and hall, along with jugs, mortars and grinding tools, and crucially, several kilns that Crewe and her colleagues believe were used to toast barley for a primitive beer. To test their hypothesis the team replicated the kilns to produce malted barley and used it in a cloudy and slightly weird-tasting beer, Crewe told *LiveScience*.

The Göbekli Tepe site in southwestern Turkey, meanwhile, dates to nearly 11,000 years ago. Neolithic hunter-gatherers worshipped ancient deities through dancing and feasting at the temple site, which is filled with t-shaped pillars carved with animal shapes and other ancient designs. The site also had what appears to be a primitive kitchen with large limestone troughs that held up to 42 gallons (160 liters) of liquid. The troughs held traces of oxalates, which are produced during the fermentation of grain into alcohol.

At both sites, the idea of a beer-soaked party must have been a real treat, Crewe said.

"There must have been a real sense of anticipation within the community when you knew a big beer event was coming up," she said.

<http://nyti.ms/WebKcX>

In a Place for the Dead, Studying a Seemingly Immortal Species

A mycologist believes lichens may help answer one of science's greatest questions: Is immortality biologically possible?

By HILLARY ROSNER

PETERSHAM, Mass. - On a sparkling New England afternoon, as hawks coasted overhead and yellow leaves drifted to the ground, Anne Pringle stood before a large granite obelisk that marked the graves of a family called French.

In this bucolic cemetery, steps from the headquarters of Harvard's research forest, she was pondering mortality. But she wasn't thinking about the Frenches. She was thinking about lichens.

Pale green and vaguely ruffled, like calcified doilies, lichens grow all over the tombstones and the old stone walls that fringe properties in this part of the world. Most people barely notice them. But Dr. Pringle, a mycologist at Harvard, believes they may help answer one of science's greatest questions: Is immortality biologically possible?



Dr. Pringle returns to this cemetery each year, to measure, sketch and scrutinize the lichens. Evan McGlenn for The New York Times

For eight years, Dr. Pringle, 42, has been returning to this cemetery each fall, to measure, sketch and scrutinize the lichens, which belong to the genus *Xanthoparmelia*. She wants to know whether they deteriorate with the passage of time, leaving them more susceptible to death.

Biologists call it senescence: the grim reality of decline with age. Are the lichens more likely to break apart as the years pass? Does their chemistry or bacterial composition change, leaving them more vulnerable to pathogens?

Lichens are not individuals but tiny ecosystems, composed of one main fungus, a group of algae and an assortment of smaller fungi and bacteria. To reproduce, they can either launch a single fungal spore that must then find new algae to join with, or they can send out fingerlike projections called isidia, which contain the whole lichen package and need only a nice rock to land on.

Once attached, they hardly lead a carefree life. They may face chemical warfare from neighboring lichens, as well as the menace of a hard rain.

While lichens are communities, Dr. Pringle is largely interested in the fungi. Mycologists, the scientists who study fungi — not the most glamorous corridor of biology — have long assumed that many of these organisms don't age.

The clear exception is yeast, a single-cell fungus that does senesce and that researchers use as a model to study aging. But most multicellular fungi, the assumption goes, don't senesce.

No one has ever proved that, though, or even collected much data. The belief in fungi everlasting has been buoyed in part by *Armillaria bulbosa*, a species known as the "humongous fungus," which grows to be as heavy as a blue whale and can take over acres of forest. (Crystal Falls, Mich., holds an annual Humongous Fungus festival, complete with the world's largest mushroom pizza, to celebrate a 38-acre, 1,000-ton *Armillaria* that grows nearby and is thought to be 1,500 to 10,000 years old.)

Does that mean *Armillaria* and many of the world's other fungi are not aging? Some experts believe it does. If true, such organisms would be the fungal equivalent of vampires, able to die only by external means. ("A bus can still run over them," Dr. Pringle said.) But the concept has yet to catch on in the wider world of biology, dominated by scientists who study plants and animals.

In the world beyond fungi, whether organisms can escape aging is a matter of scientific controversy. A longstanding explanation for aging pins the blame on built-up genetic mutations activated once fertility begins to taper off. But this theory doesn't work for fungi, which reproduce more, not less, as they grow older.

According to a second theory, aging occurs because some traits that make us more reproductively successful may also set the stage for our demise. High testosterone levels, for instance, might help males make more babies — but also predispose them to prostate cancer.

Both theories explain aging as a biological imperative, a cellular commandment no life form can escape. Dr. Pringle says that way of looking at the world does not account for the realities of life as a fungus.

“What you know is based on the organisms you study,” she said. “What would you say about the evolution of senescence if instead of working with insects, you worked with modular organisms, which is what lichen are?” Daniel Doak, a University of Colorado ecologist, agrees that the question is worth asking. Research like Dr. Pringle’s — along with other studies of species including the bristlecone pine tree and the wandering albatross, a bird, both of which may avoid senescence — suggests another possible path.

“It’s saying something fundamental,” Dr. Doak said, “that senescence is not an inevitable part of life. Which means there might be ways to prevent it.” That idea could eventually have implications for human medicine. “There is variation in the natural world,” said Deborah Roach, a biologist at the University of Virginia who studies aging in plants. “One of the cool things to ask is: How do these other species escape this process? What rules that confine us to be an aging species don’t exist in other species?”

Before Dr. Pringle started the study, a colleague suggested she was wasting her time: to prove that something doesn’t age would take far longer than the duration of a research grant, perhaps longer than a researcher’s career or even life. But she stood her ground.

“I wanted to learn about fungi because those are the organisms that broke all the rules,” she said. “I wanted to know their natural history, their biology, so I could go back to fundamental principles of ecology and say, ‘Yeah, but in fungi it works like this.’”

At the Frenches’ grave, Dr. Pringle held up a transparent sheet of plastic with the penciled outlines of about 60 lichens from a year earlier. She painstakingly located each on the tombstone, took notes on its appearance and traced it onto a new sheet. After so many years watching the lichens, she thinks of them “like old friends,” she said.

Most were alive and healthy — lacy green circles growing predictably year by year. Most, but not all. No. 94 was a tiny dot on last year’s tracing. Now it was covered over by another type of lichen, a different genus.

“That’s mortality,” said Dr. Pringle, “but not from senescence.” No. 59 was dead too; probably it was “swallowed by No. 8,” but it may have simply slid off the obelisk. “The hardest thing for a lichen here is hanging on,” she said. “It’s a vertical cliff face.”

Dr. Pringle’s preliminary results show that as a lichen grows older and larger, it is less likely to die. “If you made me answer the question now,” she said, “I’d say there can be senescence of parts of an individual. But I don’t think an individual ever senesces.” The definition of aging, then, may differ from organism to organism. Death as we know it rests on an animal-centered idea of individuality.

After she finished monitoring the lichens on the Frenches’ grave marker, Dr. Pringle walked across a field, past her blue Prius with its “Mycologists Have More Fungi” bumper sticker. She followed a dirt path into the forest and stopped before a stone wall snaking through the woods.

“This is the largest individual I’ve seen, and it’s probably around 30 years old,” she said, pointing out a Xanthoparmelia roughly six inches in diameter. Nearby on the wall, she had taken samples of a half-dozen lichen the previous autumn, to see if they would grow back. A few showed no signs of regrowth, but in two of the bare patches, tiny dots of lichen were beginning to fill in.

Until now, most of her work has involved such observations. But she plans to begin more direct experiments, like putting a tracer on part of a lichen to watch how it moves. After all, she said, “this is a slow system,” and while a lichen may live forever, a biologist will not.

<http://nyti.ms/Vtunej>

Pill Could Join Arsenal Against Bedbugs

Volunteers who let their arms be bitten in the name of science. Eastern Virginia Medical School Volunteers who let their arms be bitten in the name of science.

By DONALD G. MCNEIL JR.

THE HYPOTHESIS: A common deworming drug can be used to kill bedbugs.

THE INVESTIGATOR: Dr. Johnathan M. Sheele, Eastern Virginia Medical School
It was a visit to a cousin in New York City two years ago that inspired Thang D. Tran, a medical student at Eastern Virginia Medical School, to volunteer to become a human booby trap in the war on bedbugs.

WARRIOR: Dr. Johnathan M. Sheele, an emergency medicine specialist, in his lab at Eastern Virginia Medical School.

“She told me everyone in New York was scared of bedbugs,” he said of his cousin. So when Dr. Johnathan M. Sheele, an emergency medicine specialist at his school, asked for volunteers to test a new way of killing the pests, Mr. Tran raised his arm. Soon, it was covered with itchy welts.

Dr. Sheele’s study, released at a tropical medicine convention in November, unveiled a possible new superweapon against *Cimex lectularius*: a deworming pill.



You take the pill and go to bed — perchance even to sleep, if you can sleep knowing how patiently bedbugs wait in your walls or mattress, sniffing for the sweet stream of your exhaled carbon dioxide and for your warm skin to grow still. You let them bite you. And then — in a few days — they die.

The technique is known as xenointoxication, which sounds like intergalactic beer pong but in medical pathology is Greek for “poisoning the guest.” In Dr. Sheele’s study, over 60 percent of the bedbugs died after volunteers like Mr. Tran took a single pill. Bigger or more regular doses might improve the lethality.

And it’s not as if the drug is rare and dangerous. It’s already in thousands of American households: ivermectin, the active ingredient in the beef-flavored Heartgard Chewables that kill heartworm in dogs.

(For humans, the brand name is Stromectol, and it is available by prescription only, usually for travelers who pick up worms overseas, or toddlers who get them from playing in sandboxes used by dogs.)

Ivermectin is also very safe. Millions of doses have been given to African children to kill the worms that cause river blindness. Many Papua New Guineans get double doses to kill scabies. One early study of the drug found that up to 10 times the normal dose was safe.

The bitten arm of the study’s leader, Dr. Johnathan M. Sheele, Eastern Virginia Medical School The bitten arm of the study’s leader, Dr. Johnathan M. Sheele.

Ivermectin attacks a type of “gated chloride channel” in the nerves of insects that does not exist in mammals.

Dr. Sheele is not advising bedbug-tormented Americans to start eating Fido’s worm tablets. With only four volunteers, his study was tiny and preliminary, he emphasized. Neither the Food and Drug Administration nor any medical society has approved using ivermectin this way, and no one yet knows what the ideal antibedbug dose is.

But ivermectin experts say his idea isn’t crazy.

“Maybe partially crazy,” said Dr. Peter J. Hotez, dean of the National School of Tropical Medicine at Baylor College of Medicine. “But not entirely crazy.”

Dr. Hotez’s hesitation is mostly that bedbugs, unlike body lice and worms, do not cause disease, so xenointoxication seems heavy-handed.

But many Americans, including many New Yorkers, are so terrified of the bugs that they have spent thousands of dollars fighting them, so ivermectin could be cost-effective.

Brian D. Foy, a virologist at Colorado State University’s veterinary school, has shown that it also kills mosquitoes, and so could be used against malaria. His initial reaction to using it against bedbugs was that he thought it would be easier to clean one’s house and throw out one’s mattress.

“But maybe that’s just my ignorance about bedbugs,” he admitted. “We don’t have them out here in Colorado.” (Local news reports do not back him up on that.)

“Needless to say,” he correctly pointed out, “this isn’t going to solve the problem of bedbugs in hotel rooms.”

Dr. Sheele speculated that ivermectin might be best used in combination with current measures like pesticides, desiccant powders, mattress covers, heat treatment, steaming and vacuuming. While it might not work alone, it could give exterminators a head start.

Dr. Frank O. Richards Jr., a parasitologist at the Carter Center in Atlanta who has spent years running programs in Africa and Asia that give out ivermectin donated by Merck to fight river blindness, said he was “excited to see how this plays out.” Americans might be initially squeamish about deworming pills, he said, but the country does have “a lot of worried rich people who don’t like bug bites.”

He has tracked women in his river-blindness programs who took ivermectin before realizing they were pregnant, he said, “and all their babies were cool.” Nonetheless, he said, even though one 2002 study found a huge dose to be safe, which theoretically means that multiple small ones also would be, “as a physician, I’d be very concerned about an off-label use like that.”

“If I gave that out, and something happened,” he continued, “I would not have a leg to stand on in court.”

Because each bug feeds only occasionally, he said, “I don’t buy that a week would do the trick. I think you’re going to need two, three, four weeks. And that’s concerning. We don’t have any toxicity data like that.”

Like Dr. Sheele, he favors more testing of multiple doses.

Ivermectin is not cheap. In the United States, a typical adult dose of Stromectol is about \$40, and no generic version is sold legally. A year’s supply of Heartgard for a big dog can cost more than \$100.

But, Dr. Sheele said, that pales beside the price of multiple visits by a team of exterminators.

He got interested in bedbugs, he said, because they plagued so many of his Norfolk, Va., emergency room patients.

“I even had one patient come in with a baggie full of them,” he said. “As a physician, there’s nothing you can do for them except give them Benadryl and steroids for the itching.”



He knew about ivermectin's power to kill skin parasites because he had done a fellowship in international emergency medicine, he said.

His school provided financing but was nervous about letting him officially import bedbugs to campus, so he had to borrow the lab of a tick researcher at Old Dominion University. (Mr. Tran remembers it as humid and redolent of lab rats.)

Eastern Virginia Medical School also wanted animal studies before he recruited medical students, so he dosed mice first; in that case, 86 percent of the bedbugs died.

Now he hopes to find support for a full-fledged clinical trial.

And he is working on a new project: If xenointoxication kills bedbugs, he surmised, how about ticks?

The parasite-host relationship isn't as predictable as it is between bedbugs and their dinner. But the stakes are higher, since ticks carry serious diseases like Lyme and babesiosis.

"It could be interesting for people who have to spend a lot of time in the woods — like soldiers," he said.

Meanwhile, Mr. Tran and An Teng, another medical student and study participant, are enjoying their new notoriety.

"My friends were completely grossed out that I let myself be bitten," said Mr. Tran, whose rash from the bites lasted for a month. "But working on something so relevant to society caught my attention."

http://news.cnet.com/8301-17938_105-57561433-1/dystextia-muddled-texts-can-signal-stroke-doctors-say/

'Dystextia': Muddled texts can signal stroke, doctors say

While anyone who texts has probably sent or received weirdly illegible messages at some point, Harvard researchers point to garbled texts as one possible indicator of neurological problems.

by [Leslie Katz](#) December 31, 2012 1:33 PM PST

Most of us have sent a garbled text or two (or dozens) in our day, and probably received more than our share as well. But such disoriented messages can in some rare cases move beyond the parlance of speedy modern-day communication to signal a health emergency, Harvard scientists caution.

In a study published online in the [Archives of Neurology](#) last week, the researchers coin the term "dystextia" to describe a confused text message that may indicate neurological dysfunction.

They cite the case of a 25-year-old pregnant woman who sent her husband a series of confusing messages about their baby's due date following a routine doctor's appointment.

Him: *So what's the deal?*

Her: *Every where thinging days nighing*

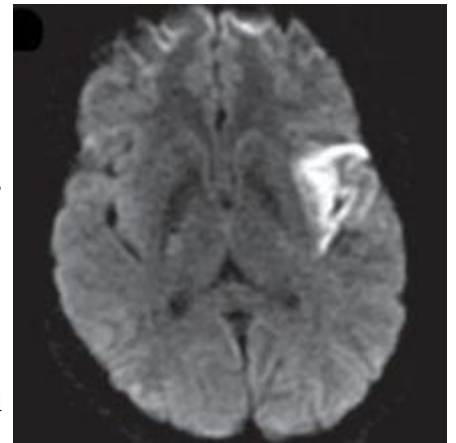
Her: *Some is where!*

Him: *What the hell does that mean?*

Him: *You're not making any sense.*

Concerned, the husband rushed his wife to the emergency room, where doctors determined she was having a stroke and suffering from [dysphasia](#) (also known as aphasia), an impairment of communication abilities common to brain injury and even complex migraine headaches.

Fortunately, the woman was treated and quickly recovered from the episode, with no evidence the stroke had harmed the fetus. The doctors credit her texts with being one piece of useful data that helped identify what type of stroke had hit.



An MRI of a pregnant woman's brain showed a stroke in the region of the brain connected to language. (Credit: Archives of Neurology)

"In this case, the availability of texting may have been particularly valuable, because the patient's hypophonia (a weak voice due to lack of coordination in the vocal muscles, in her case from a cold) likely prevented early detection of her dysphasia," Arvind Ravi, Vikram Rao, and Joshua Klein of Harvard Medical School wrote in the study, titled "Dystextia: Acute Stroke in the Modern Age."

They think there's a good chance text messages will increasingly play a similar role.

"The growing digital record will likely become an increasingly important means of identifying neurologic disease, particularly in patient populations that rely more heavily on written rather than spoken communication," the doctors wrote.

With so many distracted texters punching away while walking and driving, it's easy to joke that an SMS survey would show a preponderance of digerati suffering from a neurological impairment. Then there's autocorrect, which can "give the false impression of a language disorder," Klein [told NPR](#). "In our patient's case, autocorrect had been previously disabled on her mobile device."

But while the Harvard doctors caution that dystextia alone is not necessarily cause for alarm, they do say it can be a useful sign when taken in the context of the sender's usual communication style, as well as other possible symptoms.

Indeed, earlier today, we reported on a similar case in which a British woman, upon feeling dizzy and beginning to fall unconscious, posted a [disoriented call-for-help Facebook update](#) that may have saved her life. She is also believed to have suffered a stroke, a condition where early diagnosis and management are considered key.

http://www.eurekalert.org/pub_releases/2013-01/jonp-sis122012.php

Second impact syndrome: A devastating injury to the young brain

New imaging findings

Charlottesville, VA - Physicians at Indiana University School of Medicine and the Northwest Radiology Network (Indianapolis, Indiana) report the case of a 17-year-old high school football player with second impact syndrome (SIS). A rare and devastating traumatic brain injury, SIS occurs when a person, most often a teenager, sustains a second head injury before recovery from an earlier head injury is complete. To the best of the authors' knowledge, this is the first reported case in which imaging studies were performed after both injuries, adding new knowledge of the event. Findings in this case are reported and discussed in "Second impact syndrome in football: new imaging and insights into a rare and devastating condition. Case report," by Elizabeth Weinstein, M.D., and colleagues, published today online, ahead of print, in the *Journal of Neurosurgery: Pediatrics*.

The patient sustained the first injury when he received a helmet-to-helmet hit from an opposing player during a punt return. Despite immediate symptoms of dizziness and visual disturbance, he continued to play in the game. For the next few days he experienced severe headaches and fatigue. Four days after the game, he consulted a doctor about the headaches. Computerized tomography (CT) scans of the patient's head appeared normal, but he was advised not to return to play until all of his symptoms were gone. The young man chose instead to return to practice immediately.

The following day, despite complaints of headache and difficulty with concentration, the young man participated in hitting drills. After a few hits he was slow standing up, and after several more hits he collapsed, became unresponsive, and suffered a seizure. He was transferred initially to a local emergency department, where a CT examination revealed small, thin subdural hematomas on each side of the brain. The patient received intubation and was treated medically. Shortly thereafter he was airlifted to a tertiary trauma and neurosurgical center at Indiana University Health Methodist Hospital in Indianapolis.

At the tertiary center, the patient was found to be minimally responsive and to have increased intracranial pressure (25-30 mm Hg; normal 5-15 mm Hg). Additional CT scans obtained there confirmed the presence of the subdural hematomas and mild cerebral swelling. Magnetic resonance images of the brain and upper spinal cord showed downward herniation of the brain, subdural hematomas on both sides of the brain, and abnormal diffusion in the medial left thalamus. Structures in the vicinity of the brain's midline, including the thalamus and hypothalamus, had shifted downward. There did not seem to be any blood vessel damage or spinal cord injury. The MR images did not detect cerebral edema.

The patient's injury involved other serious consequences identified during the hospital stay, including prolonged elevated intracranial pressure, areas of brain softening (in both thalami, the medial frontal lobes, and elsewhere), hypotension, renal failure, sepsis, pneumonia, and temporary cardiac arrest. Even with optimal care, the patient remained in the hospital for 98 days and was unable to walk or talk when he was discharged. Three years later, he has regained much of his speech but is very impulsive and is confined to a wheel chair.

In SIS, the brain injury produces a loss of cerebral autoregulation. Cerebral arteries widen, allowing more blood to flow throughout the brain, and massive cerebral swelling can occur. These lead to increased intracranial pressure, causing the brain to enlarge. Because the skull is a limited container, the brain can become herniated as it seeks a space to expand. The authors note that some investigators previously postulated that the loss of cerebral autoregulation is caused by a "space-occupying injury" from the initial injury. Findings in this case do not substantiate that claim because the CT scan was normal. Weinstein and colleagues point out that several types of injury do not necessarily register on an imaging study, and "a normal head CT scan does not obviate the need for close clinical follow-up and for the athlete to be cognitively normal and asymptomatic before return to play."

In this case, the patient experienced severe headaches throughout the interval between injuries. The authors state that evidence of persistent, long-lasting, severe headaches, which have repeatedly been identified in patients with SIS, indicate an ongoing and significant pathological neurophysiological condition in the absence

of evidence on the CT scan. The authors suggest that this symptom may be a specific predictor for the possibility of SIS if a second injury occurs before the first has resolved.

The take-away message in this study, according to coauthor Dr. Michael Turner, "is that there must not be a return to play if the athlete is at all symptomatic. A normal CT scan will not identify a patient who can be released to play. The mechanism of SIS is probably hyperemia [increased blood in the brain], not occult hematoma."

SIS rarely occurs, but when it does the effect is usually devastating. Often the patient dies. The authors stress the importance of educating coaches, athletes, family members, and treating physicians about the risks and possible consequences of sports-related head injuries.

Weinstein E, Turner M, Kuzma BB, Feuer H. Second impact syndrome in football: new imaging and insights into a rare and devastating condition. Case report. *Journal of Neurosurgery: Pediatrics*, published online, ahead of print, January 1, 2013; DOI: 10.3171/2012.11.PEDS12343.

Disclosure: Dr. Henry Feuer is the neurosurgical consultant for the Indianapolis Colts and is a member of the Return to Play Subcommittee of the National Football League Head, Neck, and Spine Medical Committee. He is also the neurosurgical consultant for the Indiana High School Athletic Association. Dr. Elizabeth Weinstein provides emergency medical support along with Indiana University Health for NFL players at Indianapolis Colts home games.

<http://www.bbc.co.uk/news/magazine-20695743>

History's weirdest fad diets

A government minister is the latest to warn people of the dangers of fad diets, but people have been following them for centuries. Why?

By Denise Winterman BBC News Magazine

As early as the Greeks and Romans people have been dieting. But while it was largely about health and fitness back then, it's the Victorians who really kick started the fad diet.

"The Greek word diatia, from which our word diet derives, described a whole way of life," says Louise Foxcroft, a historian and author of *Calories and Corsets: A History of Dieting Over 2,000 Years*.

"Dieting back then was about all-round mental and physical health. People really got a taste for fad dieting in the 19th Century. It is during this time that things tip over into dieting more for aesthetic reasons and the diet industry explodes." So what are the weirdest and unhealthiest fad diets from history?

Chew and spit

At the turn of the 20th Century the American, Horace Fletcher, decided a lot of chewing and spitting was the way to lose weight. Fletcherism, as it was called, promoted chewing a mouthful of food until all "goodness" was extracted, then spitting out the fibrous material that was left.

He was fairly prescriptive in how many times you had to chew different foods. Just one shallot needed to be chewed 700 times. It was hugely popular and had some famous followers, including Henry James and Franz Kafka. It got to a point where people were timed at dinner parties to make sure they were chewing enough, says Foxcroft.

"The diet also meant only defecating once every two weeks and it was nearly odourless, described by Fletcher as smelling like 'warm biscuits'," she says. "Fletcher carried a sample of his own faeces around with him to illustrate this wonder."

Tapeworm diet

Not for the squeamish, in the 1900s the tapeworm diet became all the rage. The opera singer Maria Callas reportedly ate the parasites to try and lose weight.

Dieters would swallow beef tapeworm cysts, usually in the form of a pill. The tapeworms reached maturity in the intestines and absorbed food. This could cause weight loss, along with diarrhoea and vomiting.

Once a person reached their desired weight they then took an anti-parasitic pill which, they hoped, would kill off the tapeworms. The dieter would then have to excrete the tapeworm, which could cause abdominal and rectal complications.

It was risky in many ways. Not only can a tapeworm grow up to 30 feet (9m) in length, they can also cause many illnesses including headaches, eye problems, meningitis, epilepsy and dementia.

"During the 19th Century dieting became big business," says food historian Annie Gray. "Advertising was becoming more and more sophisticated, with more and more diet products being peddled."

The diet industry boom was also down to the rise in celebrity and the media and the development of new medicines, says Foxcroft.

Arsenic

Diet drugs, pills and potions became increasingly big business in the 19th Century. But these so-called "wonder-remedies" often had dangerous ingredients, including arsenic and strychnine.

"It was advertised as speeding up the metabolism, much like amphetamines do," says Foxcroft.

While the amount of arsenic in the pills was small, it was still extremely dangerous. Often dieters would take more than the recommended dose of the pills thinking they would lose more weight, risking arsenic poisoning. Also, arsenic was occasionally not advertised as an ingredient meaning people didn't know what they were actually taking.

"Such poisons were loosely controlled then and easily obtained for all sorts of household and medicinal purposes," says Foxcroft. "Charlatans set themselves up as experts with diets to promote and products to sell. Plenty of people bought into these 'miracle cures'."

Vinegar

Celebrity dieters are nothing new. Lord Byron was one of first diet icons and helped kick start the public's obsession with how celebrities lose weight.

Much like today people wanted to look like celebrities of the time and new diet fads were advertised in the expanding media. And like today's celebrities, Byron worked hard to maintain his figure. In the early 1800s the poet popularised a diet consisting mainly of vinegar. If he were alive today he would probably be endorsing a book about the diet - and it would probably be a bestseller.

In order to cleanse and purge his body he would drink vinegar daily and eat potatoes soaked in the stuff. Side effects included vomiting and diarrhoea.

Because of Byron's huge cultural influence, there was a lot of worry about the effect his dieting was having on the youth of the day. Romantics were restricting themselves to vinegar and rice to get Byron's fashionably thin and pale look.

"Our young ladies live all their growing girlhood in semi-starvation," wrote one critic at the time.

During this time eating patterns became more prescriptive, with set dining styles, says Gray.

"This also caused people to worry about their size. Queen Victoria was terrified of putting on weight."

Rubber

In the mid 1800s Charles Goodyear figured out how to improve rubber beyond its natural state with a process called vulcanization.

With the Industrial Revolution and mass production, suddenly the use of rubber expanded massively.

That included rubber knickers and corsets. The thinking behind both was that rubber held in fat but more importantly caused sweating, hopefully leading to weight loss.

They were worn by both men and women, says Foxcroft. It wasn't much fun as the skin-macerating underwear meant flesh would be softened and broken down by extended exposure to moisture, making it vulnerable to infection.

"At the time all sorts of gadgets and treatments were being advertised as the way to lose weight," says Gray.

It was World War I that curbed the fad, with rubber being needed for the war effort.

<http://wapo.st/ZbgB5u>

Bacterial traces from 3.5 billion years ago are 'oldest fossils,' experts say

Scientists analyzing Australian rocks have discovered traces of bacteria that lived a record-breaking 3.49 billion years ago, a mere billion years after Earth formed.

By Devin Powell, Published: January 1

If the find withstands the scrutiny that inevitably faces claims of fossils this old, it could move scientists one step closer to understanding the first chapters of life on Earth. The discovery could also spur the search for ancient life on other planets.

These traces of bacteria "are the oldest fossils ever described. Those are our oldest ancestors," said Nora Noffke, a biogeochemist at Old Dominion University in Norfolk who was part of the group that made the find and presented it last month at a meeting of the Geological Society of America.

Unlike dinosaur bones, the newly identified fossils are not petrified body parts. They're textures on the surfaces of sandstone thought to be sculpted by once-living organisms. Today, similar patterns decorate parts of Tunisia's coast, created by thick mats of bacteria that trap and glue together sand particles. Sand that is stuck to the land beneath the mats and thus protected from erosion can over time turn into rock that can long outlast the living organisms above it.

Finding the earliest remnants of this process required a long, hard look at some of the planet's oldest rocks, located in Western Australia's Pilbara region. This ancient landscape was once shoreline. Rocks made from sediment piled up billions of years ago are now exposed and available for examination. Relatively pristine in condition, such outcrops, along with others in South Africa, have long been a popular place to look for traces of life from the Archean eon, which ended 2.5 billion years ago.

There are older rocks on Earth, said Maud Walsh, a biogeologist at Louisiana State University in Baton Rouge. “But these are the best-preserved sedimentary rocks we know of, the ones most likely to preserve the really tiny structures and chemicals that provide evidence for life.” Last year, another team of researchers published the discovery of microscopic fossils in Pilbara’s Strelley Pool Formation, about 3.4 billion years old.

“It’s not just finding this stuff that’s interesting,” says Alan Decho, a geobiologist at the University of South Carolina’s Arnold School of Public Health. “It’s showing that the life had some organization to it.” Ridges that crisscross the rocks like strands in a spider web hint that primitive bacteria linked up in sprawling networks. Like their modern counterparts, they may have lived in the equivalent of microbial cities that hosted thousands of kinds of bacteria, each specialized for a different task and communicating with the others via chemical signals.

Many of the textures seen in the Australian rocks had already shown up in 2.9-billion-year-old rocks from South Africa, reported on by Noffke and colleagues in 2007.

Still, old Australian rocks have proved deceptive before. As early as 1980, rippling layers within the Strelley Pool were thought to be the handiwork of bacteria. But such stromatolites, which are different from the structures that Noffke studies, can also be the work of natural, non-living processes. For instance, water flowing along a seafloor can create similar structures under the right conditions. So can spraying jets of liquid loaded with particles onto a surface, as scientists at Oxford University demonstrated in laboratory experiments.

That’s why Noffke and her colleagues corroborated their story by measuring the carbon that makes up the textured rocks. About 99 percent of carbon in non-living stuff is carbon-12, a lighter version of the element than the carbon-13 that accounts for most of the remaining 1 percent. Microbes that use photosynthesis to make their food contain even more carbon-12 and less carbon-13. That bias, a signature of “organic” carbon that comes from a living being, showed up in the Australian rock.

“It’s always nice to have a number of different lines of evidence, and you definitely want to see organic carbon,” says geomicrobiologist John Stolz of Duquesne University in Pittsburgh.

What wasn’t preserved: any proteins or fats or body fossils that would clinch the case for life and identify what types of bacteria left behind this organic carbon. Most microbial mats today contain lots of photosynthetic cyanobacteria, which make the food that sustains the other bacteria. Named after the blue-green pigment they use for this process, called phycocyanin, cyanobacteria also make oxygen and are given the credit for creating Earth’s atmosphere about 2.4 billion years ago.

Cyanobacteria living in microbial mats nearly 3.5 billion years ago could shake up the history of the air we all breathe.

“Studying this kind of past life is really about learning how the Earth got to be the way it is today,” says Michael Tice, a geobiologist at Texas A&M University.

Ultimately, the fossils found on Earth could help those looking for the building blocks of life on Mars, where NASA’s Curiosity rover has recently found evidence for ancient waterways. Remnants of life on the Red Planet might even be better preserved than they are here on Earth, says Harvard University paleontologist Andrew Knoll. That’s because old terrestrial rocks tend to get banged around by the movement of tectonic plates and cooked by the extreme heat of the planet’s depths. Mars, a planet that’s nearly dead geologically, lacks such tectonic activity.

Though no signs of ancient Martian microbes have been found, fossil hunters may now have something new to start looking for.

Powell is a Washington-based freelance science reporter.

<http://www.guardian.co.uk/science/2013/jan/01/higgs-boson-large-hadron-collider>

Higgs boson was just a start for Cern’s atom smasher – other mysteries await

When it comes to shutting down the most powerful atom smasher ever built, it’s not simply a question of pressing the off switch.

By Ian Sample, The Guardian

In the French-Swiss countryside on the far side of Geneva, staff at the Cern particle physics laboratory are taking steps to wind down the Large Hadron Collider. After the latest run of experiments ends next month, the huge superconducting magnets that line the LHC’s 27km-long tunnel must be warmed up, slowly and gently, from -271 Celsius to room temperature. Only then can engineers descend into the tunnel to begin their work. The machine that last year helped scientists snare the elusive Higgs boson – or a convincing subatomic impostor – faces a two-year shutdown while engineers perform repairs that are needed for the collider to ramp up to its maximum energy in 2015 and beyond. The work will beef up electrical connections in the machine that were identified as weak spots after an incident four years ago that knocked the collider out for more than a year.

The accident happened days after the LHC was first switched on in September 2008, when a short circuit blew a hole in the machine and sprayed six tonnes of helium into the tunnel that houses the collider. Soot was scattered over 700 metres. Since then, the machine has been forced to run at near half its design energy to avoid another disaster.

The particle accelerator, which reveals new physics at work by crashing together the innards of atoms at close to the speed of light, fills a circular, subterranean tunnel a staggering eight kilometres in diameter. Physicists will not sit around idle while the collider is down. There is far more to know about the new Higgs-like particle, and clues to its identity are probably hidden in the piles of raw data the scientists have already gathered, but have had too little time to analyse.

But the LHC was always more than a Higgs hunting machine. There are other mysteries of the universe that it may shed light on. What is the dark matter that clumps invisibly around galaxies? Why are we made of matter, and not antimatter? And why is gravity such a weak force in nature? "We're only a tiny way into the LHC programme," says Pippa Wells, a physicist who works on the LHC's 7,000-tonne Atlas detector. "There's a long way to go yet."

The hunt for the Higgs boson, which helps explain the masses of other particles, dominated the publicity around the LHC for the simple reason that it was almost certainly there to be found. The lab fast-tracked the search for the particle, but cannot say for sure whether it has found it, or some more exotic entity.

"The headline discovery was just the start," says Wells. "We need to make more precise measurements, to refine the particle's mass and understand better how it is produced, and the ways it decays into other particles." Scientists at Cern expect to have a more complete identikit of the new particle by March, when repair work on the LHC begins in earnest.

By its very nature, dark matter will be tough to find, even when the LHC switches back on at higher energy. The label "dark" refers to the fact that the substance neither emits nor reflects light. The only way dark matter has revealed itself so far is through the pull it exerts on galaxies.

Studies of spinning galaxies show they rotate with such speed that they would tear themselves apart were there not some invisible form of matter holding them together through gravity. There is so much dark matter, it outweighs by five times the normal matter in the observable universe.

The search for dark matter on Earth has failed to reveal what it is made of, but the LHC may be able to make the substance. If the particles that constitute it are light enough, they could be thrown out from the collisions inside the LHC. While they would zip through the collider's detectors unseen, they would carry energy and momentum with them. Scientists could then infer their creation by totting up the energy and momentum of all the particles produced in a collision, and looking for signs of the missing energy and momentum.

One theory, called supersymmetry, proposes that the universe is made from twice as many varieties of particles as we now understand. The lightest of these particles is a candidate for dark matter.

Wells says that ramping up the energy of the LHC should improve scientists' chances of creating dark matter: "That would be a huge improvement on where we are today. We would go from knowing what 4% of the universe is, to around 25%."

Teasing out the constituents of dark matter would be a major prize for particle physicists, and of huge practical value for astronomers and cosmologists who study galaxies.

"Although the big PR focus has been on the Higgs, in fact looking for new particles to provide clues to the big open questions is the main reason for having the LHC," says Gerry Gilmore, professor of experimental philosophy at the Institute of Astronomy in Cambridge.

"Reality on the large scale is dark matter, with visible matter just froth on the substance. So we focus huge efforts on trying to find out if dark matter is a set of many elementary particles, and hope that some of those particles' properties will also help to explain some other big questions.

"So far, astronomy has provided all the information on dark matter, and many of us are working hard to deduce more of its properties. Finding something at the LHC would be wonderful in helping us in understanding that. Of course one needs both the LHC and astronomy. The LHC may find the ingredients nature uses, but astronomy delivers the recipe nature made reality from."

Another big mystery the Large Hadron Collider may help crack is why we are made of matter instead of antimatter. The big bang should have flung equal amounts of matter and antimatter into the early universe, but today almost all we see is made of matter. What happened at the dawn of time to give matter the upper hand? The question is central to the work of scientists on the LHCb detector. Collisions inside LHCb produce vast numbers of particles called beauty quarks, and their antimatter counterparts, both of which were common in the aftermath of the big bang. Through studying their behaviour, scientists hope to understand why nature seems to prefer matter over antimatter.

“Unlike supersymmetry or the Higgs, there’s no theory of antimatter that we can test,” says Tara Shears, a physicist who works on the LHCb detector. “We don’t know why antimatter behaves a little differently to normal matter, but perhaps that difference can be explained by a deeper underlying theory of particle physics, which includes new physics that we haven’t found yet.”

Turning up the energy of the LHC may just give scientists an answer to the question of why gravity is so weak. The force that keeps our feet on the ground may not seem puny, but it certainly is. With just a little effort, we can jump in the air, and so overcome the gravitational pull of the whole six thousand billion tonnes of the planet. The other forces of nature are far stronger.

One explanation for gravity’s weakness is that we experience only a fraction of the force, with the rest acting through microscopic, curled up extra dimensions of space. “The gravitational field we see is only the bit in our three dimensions, but actually there are lots of gravitational fields in the fourth dimension, the fifth dimension, and however many more you fancy,” says Andy Parker, professor of high energy physics at Cambridge University. “It’s an elegant idea. The only price you have to pay is that you have to invent these extra dimensions to explain where the gravity has gone.”

The rules of quantum mechanics say that particles behave like waves, and as the LHC ramps up to higher energies the wavelengths of the particles it collides become ever shorter. When the wavelengths of the particles are small enough to match the size of the extra dimensions, they would suddenly feel gravity much more strongly.

“What you’d expect is that as you reach the right energy, you suddenly see inside the extra dimensions, and gravity becomes big and strong instead of feeble and weak,” says Parker. The sudden extra pull of gravity would cause particles to scatter far more inside the machine, giving scientists a clear signal that extra dimensions were real.

Extra dimensions may separate us from realms of space we are completely oblivious to. “There could be a whole universe full of galaxies and stars and civilisations and newspapers that we didn’t know about,” says Parker. “That would be a big deal.”

<http://phys.org/news/2013-01-software-text-video-searchable.html>

Software detects and extracts text from within video frames, makes it searchable

Text written on signs captured within video frames can now be detected and extracted using software that will make video footage searchable.

As video recording technology improves in performance and falls in price, ever-more events are being captured within video files. If all of this footage could be searched effectively, it would represent an invaluable information repository. One option to help catalogue large video databases is to extract text, such as street signs or building names, from the background of each recording. Now, a method that automates this process has been developed by a research team at the National University of Singapore, which also included Shijian Lu at the A*STAR Institute for Infocomm Research.

Previous research into automated text detection within images has focused mostly on document analysis. Recognizing background text within the complex scenes typically captured by video is a much greater challenge: it can come in any shape or size, be partly occluded by other objects, or be oriented in any direction. The multi-step method for automating text recognition developed by Lu and co-workers overcomes these challenges, particularly the difficulties associated with multi-oriented text. Their method first processes video frames using 'masks' that enhance the contrast between text and background. The researchers developed a process to combine the output of two known masks to enhance text pixels without generating image noise. From the contrast-enhanced image, their method then searches for characters of text using an algorithm called a Bayesian classifier, which employs probabilistic models to detect the edges of each text character. Even after identifying all characters in an image, a key challenge remains, explains Lu. The software must detect how each character relates to its neighbors to form lines of text—which might run in any orientation within the captured scene. Lu and his co-workers overcame this problem using a so-called 'boundary growing' approach. The software starts with one character and then scans its surroundings for nearby characters, growing the text box until the end of the line of text is found. Finally, the software eliminates false-positive results by checking that identified 'text boxes' conform to certain geometric rules.

Tests using sample video frames confirmed that the new method is the best yet at identifying video text, especially for text not oriented horizontally within the image, says Lu. However, there is still room for refinement, such as adapting the method to identify text not written in straight lines. "Document analysis methods achieve more than 90% character recognition," Lu adds. "The current state-of-the-art for video text is around 67–75%. There is a demand for improved accuracy."

More information: Shivakumara, P., Sreedhar, R. P., Phan, T. Q., Lu, S. & Tan, C. L. Multioriented video scene text detection through Bayesian classification and boundary growing. *IEEE Transactions on Circuits and Systems for Video Technology* 22, 1227–1235 (2012). [dx.doi.org/10.1109/TCSVT.2012.2198129](https://doi.org/10.1109/TCSVT.2012.2198129)

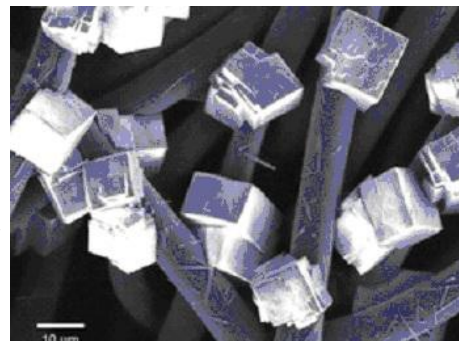
Provided by Agency for Science, Technology and Research (A*STAR), Singapore

<http://phys.org/news/2013-01-sodium-air-battery-rechargeable-advantages-li-air.html>

Sodium-air battery offers rechargeable advantages compared to Li-air batteries

Replacing a battery's lithium anode with one made of sodium may offer a path toward making metal-air batteries rechargeable but a relatively high energy density

Phys.org - Over the past few years, Li-air batteries (more precisely, Li-oxygen batteries) have become attractive due to their theoretical ability to store nearly as much energy per volume as gasoline. The key to this high energy density is the "air" part, since the batteries capture atmospheric oxygen to use in the cathode reaction instead of storing their own oxidizing agent. However, Li-air batteries have conventionally been single-use cells since they cannot be recharged, which significantly limits their applications. Now in a new study, scientists have found that replacing the lithium anode with a sodium anode may offer an unexpected path toward making metal-air batteries rechargeable while still offering a relatively high energy density.



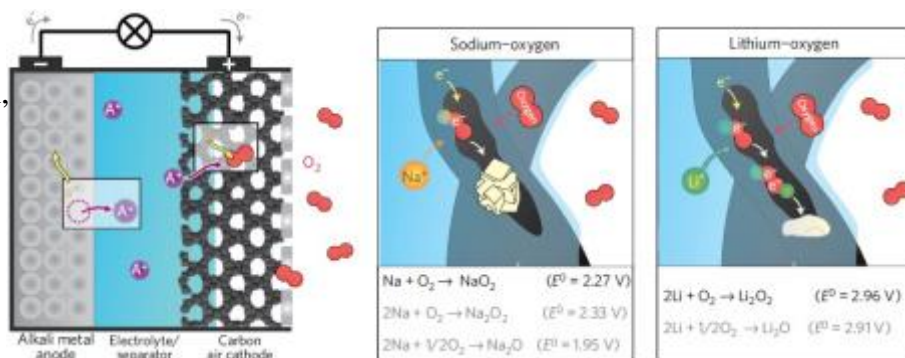
Scanning electron microscopy image of cubic Na₂O₂ particles on the cathode after cell discharge. Image credit: P. Hartmann

The researchers, led by Professor Jürgen Janek and Dr. Philipp Adelhelm at the Institute of [Physical Chemistry](#) at Justus-Liebig-University Gießen in Gießen, Germany, have published their paper on rechargeable sodium-air batteries in a recent issue of [Nature Materials](#).

Li-air batteries' greatest appeal is their high theoretical [energy density](#) (about 3,458 Wh kg⁻¹), which is several times higher than that of Li-ion batteries, the most commonly used [battery](#) in [electric vehicles](#) today. However, whereas Li-ion batteries can be recharged many times while retaining most of their capacity, most Li-air batteries cannot be recharged at all. In 2011, several international groups discovered that this irreversibility is due to the instability of the Li-air battery's [electrolyte](#) and other [cell components](#) in the presence of the reactive superoxide radical O₂⁻, which forms as a first step during cell discharge. Only recently, improvements in rechargeability have been achieved by using gold electrodes, but the system still suffers from poor energy efficiency and large overpotentials in which some energy is lost as heat.

In the new study, the researchers demonstrated that a sodium-air (Na-air) cell does not suffer from the same negative effects on the electrolyte and energy efficiency as a Li-air cell does. This is because, while lithium and sodium are closely related chemically,

they each react very differently with oxygen. When lithium reacts with oxygen, it forms LiO₂ (lithium oxide), which is highly unstable and found only as an intermediate species in Li-air batteries, after which it turns into Li₂O₂. On the other hand, sodium and oxygen form NaO₂ (sodium superoxide), a more stable compound. Since NaO₂ doesn't decompose, the reaction can be reversed during charging.



(Left) When a metal-oxygen battery is discharged, metal A (e.g., lithium or sodium) is oxidized at the anode/electrolyte interface, and the resulting electron is transferred to the outer circuit. At the cathode, oxygen is reduced to a superoxide species that may form a metal superoxide in the presence of the oxidized metal A. (Right) The metal superoxide in a Li-oxygen cell is highly unstable and reacts further. (Center) The metal superoxide in a Na-oxygen cell is much more stable and doesn't decompose further, allowing the reaction to be reversed. Image credit: P. Hartmann, et al. ©2012 Macmillan Publishers Limited.

The scientists demonstrated the reversibility of Na-air cells in their experiments. Using several techniques, including Raman spectroscopy and X-ray diffraction, the scientists confirmed that NaO₂ is indeed produced during discharge, that Na and O₂ are separated during charging, and that the cycle can be repeated.

"We could demonstrate that by replacing lithium with sodium, the cell reaction proceeds in an unexpected and beneficial manner," Adelhelm told *Phys.org*. "The cell discharge and charge process is kinetically favored, which means that the formation and decomposition of NaO₂ is very energy-efficient."

Although this evidence of reversibility is a promising step, the reaction is far from ideal. While Na-air batteries have a theoretical energy density of $1,605 \text{ Wh kg}^{-1}$, which is significantly higher than that of Li-ion batteries, it is still only about half that of Li-air batteries. And even though the Na-air batteries can be charged and discharged several times, the capacity decreases after each cycle, with negligible energy storage after eight cycles. The researchers are currently investigating the processes that limit battery lifetime.

Still, Na-air batteries have some attractive characteristics. One advantage of the Na-air battery demonstrated here is its very low overpotential, which is three or four times lower than for any Li-air or Na-air battery previously reported, resulting in fewer losses. In addition, sodium is the sixth most abundant element on Earth, while lithium resources are much more limited.

"Our results are also important from another perspective," Adelhelm said. "NaO₂ is chemically very difficult to synthesize. High temperatures, pressures and long reaction times are needed. In our battery, NaO₂ forms instantly at room temperature and ambient pressure. Possibly, also other chemical compounds could be prepared this way."

Overall, Adelhelm hopes that Na-air batteries may serve as one more option to turn to for future energy storage applications.

"A broad variety of electrochemical [energy storage](#) devices with different properties is needed for future mobile and stationary applications," he said. "In short, sodium's abundance could be an important cost advantage over lithium; however, for otherwise identical batteries, the 'lithium version' will always provide the higher energy density. But any working metal/air battery will provide a higher energy density than current Li-ion batteries."

More information: Pascal Hartmann, et al. "A rechargeable room-temperature sodium superoxide (NaO₂) battery." *Nature Materials*. DOI: [10.1038/NMAT3486](https://doi.org/10.1038/NMAT3486)

http://www.eurekalert.org/pub_releases/2013-01/pp-sdt010213.php

Scientists discover that for Australia the long-beaked echidna may not be a thing of the past

The western long-beaked echidna, one of the world's five egg-laying species of mammal, became extinct in Australia thousands of years ago...or did it?

Smithsonian scientists and colleagues have found evidence suggesting that not only did these animals survive in Australia far longer than previously thought, but that they may very well still exist in parts of the country today. The team's findings are published in the Dec. 28, 2012 issue of the journal *ZooKeys*.

With a small and declining population confined to the Indonesian portion of the island of New Guinea, the western long-beaked echidna (*Zaglossus bruijnii*) is listed as "Critically Endangered" on the International Union for Conservation of Nature's Red List of Threatened Species. It is also considered extinct in Australia, where fossil remains from the Pleistocene epoch demonstrate that it did occur there tens of thousands of years ago.



Scientist Kristofer Helgen, Smithsonian Institution, examines a long-beaked echidna in the wild on the island of New Guinea, where a small and declining population of the species is still known to exist. Tim Laman

Ancient Aboriginal rock art also supports the species' former presence in Australia. However, no modern record from Australia was known to exist until scientists took a closer look at one particular specimen stored in cabinets in the collections of the Natural History Museum in London. Previously overlooked, the specimen's information showed that it was collected from the wild in northwestern Australia in 1901—thousands of years after they were thought to have gone extinct there.

"Sometimes while working in museums, I find specimens that turn out to be previously undocumented species," said Kristofer Helgen of the Smithsonian Institution, the lead author and the scientist to first report the significance of the echidna specimen. "But in many ways, finding a specimen like this, of such an iconic animal, with such clear documentation from such an unexpected place, is even more exciting."

Long-beaked echidnas are known as monotremes—a small and primitive order of mammals that lay eggs rather than give birth to live young. The platypus, the short-beaked echidna, and the three species of long-beaked echidna (Western, Eastern and Sir David Attenborough's) are the only monotremes that still exist. The platypus is found only in eastern Australia, the short-beaked echidna is found in Australia and New Guinea, and the long-beaked echidnas were previously known as living animals only from the island of New Guinea. Long-beaked echidnas, which grow to twice the size of the platypus or the short-beaked echidna, are beach-ball sized mammals covered in coarse blackish-brown hair and spines. They use their long, tubular snout to root for invertebrates in the forests and meadows of New Guinea. Among many peculiar attributes, reproduction is one

of the most unique—females lay a single leathery egg directly into their pouch where it hatches in about 10 days.

The re-examined specimen in London reveals that the species was reproducing in Australia at least until the early 20th century. It was collected in the West Kimberley region of Western Australia by naturalist John T. Tunney in 1901, on a collecting expedition for the private museum of Lord L. Walter Rothschild in England. Despite collecting many species of butterflies, birds and mammals (some new to science at the time), no full report on his specimens has ever been published. The collection, including the long-beaked echidna specimen, was then transferred to the Natural History Museum in London in 1939 after Rothschild's death. It was another 70 years before Helgen visited the museum in London and came across the specimen with the original Tunney labels, which both challenged previous thinking about the species' recent distribution and offered insight into where it may still occur.

"The discovery of the western long-beaked echidna in Australia is astonishing," said Professor Tim Flannery of Macquarie University in Sydney, referring to the new study. "It highlights the importance of museum collections, and how much there is still to learn about Australia's fauna."

Learning whether the western long-beaked echidna still exists in Australia today will take time. "The next step will be an expedition to search for this animal," Helgen said. "We'll need to look carefully in the right habitats to determine where it held on, and for how long, and if any are still out there." To find it, Helgen hopes to draw on his experience with the species in New Guinea and to interview those who know the northern Australian bush best. "We believe there may be memories of this animal among Aboriginal communities, and we'd like to learn as much about that as we can," he said.

With the species in danger of extinction, finding Australian survivors or understanding why and when they vanished is an important scientific goal. "We hold out hope that somewhere in Australia, long-beaked echidnas still lay their eggs," said Helgen.

*Helgen KM, Miguez RP, Kohen JL, Helgen LE (2012) Twentieth century occurrence of the Long-Beaked Echidna *Zaglossus bruijnii* in the Kimberley region of Australia. ZooKeys 255: 103–132. doi: 10.3897/zookeys.255.3774*

<http://www.sciencedaily.com/releases/2013/01/130102140158.htm>

Giant Planets Seen Guzzling Gas as They Grow: Key Stage of Birth of Giant Planets Seen for First Time

Astronomers have seen a key stage in the birth of giant planets for the first time

Astronomers using the Atacama Large Millimeter/submillimeter Array (ALMA) telescope have seen a key stage in the birth of giant planets for the first time. Vast streams of gas are flowing across a gap in the disc of material around a young star. These are the first direct observations of such streams, which are expected to be created by giant planets guzzling gas as they grow. The result is published on 2 January 2013 in the journal *Nature*.

The international team of astronomers studied the young star HD 142527, over 450 light-years from Earth, which is surrounded by a disc of gas and cosmic dust -- the remains of the cloud from which the star formed.



Artist's impression of the disc and gas streams around HD 142527. Credit: Image courtesy of ESO

The dusty disc is divided into an inner and an outer part by a gap, which is thought to have been carved by newly forming gas giant planets clearing out their orbits as they circle the star. The inner disc reaches from the star out to the equivalent of the orbit of Saturn in the Solar System, while the outer disc begins about 14 times further out. The outer disc does not surround the star uniformly; instead, it has a horseshoe shape, probably caused by the gravitational effect of the orbiting giant planets.

According to theory, the giant planets grow by capturing gas from the outer disc, in streams that form bridges across the gap in the disc. "Astronomers have been predicting that these streams must exist, but this is the first time we've been able to see them directly," says Simon Casassus (Universidad de Chile, Chile), who led the new study. "Thanks to the new ALMA telescope, we've been able to get direct observations to illuminate current theories of how planets are formed!"

Casassus and his team used ALMA to look at the gas and cosmic dust around the star, seeing finer details, and closer to the star, than could be seen with previous such telescopes. ALMA's observations, at submillimetre wavelengths, are also impervious to the glare from the star that affects infrared or visible-light telescopes. The gap in the dusty disc was already known, but they also discovered diffuse gas remaining in the gap, and two denser streams of gas flowing from the outer disc, across the gap, to the inner disc.

"We think that there is a giant planet hidden within, and causing, each of these streams. The planets grow by capturing some of the gas from the outer disc, but they are really messy eaters: the rest of it overshoots and feeds into the inner disc around the star" says Sebastián Pérez, a member of the team, who is also at Universidad de Chile.

The observations answer another question about the disc around HD 142527. As the central star is still forming, by capturing material from the inner disc, the inner disc would have already been devoured, if it was not somehow topped up. The team found that the rate at which leftover gas streams onto the inner disc is just right to keep the inner disc replenished, and to feed the growing star.

Another first is the detection of the diffuse gas in the gap. "Astronomers have been looking for this gas for a long time, but so far we only had indirect evidence for it. Now, with ALMA, we can see it directly," explains Gerrit van der Plas, another team member at Universidad de Chile.

This residual gas is more evidence that the streams are caused by giant planets, rather than even larger objects such as a companion star. "A second star would have cleared out the gap more, leaving no residual gas. By studying the amount of gas left, we may be able to pin down the masses of the objects doing the clearing." adds Pérez.

What about the planets themselves? Casassus explains that, although the team did not detect them directly, he is not surprised. "We searched for the planets themselves with state-of-the-art infrared instruments on other telescopes. However, we expect that these forming planets are still deeply embedded in the streams of gas, which are almost opaque. Therefore, there may be little chance of spotting the planets directly."

Nevertheless, the astronomers aim to find out more about the suspected planets by studying the gas streams as well as the diffuse gas. The ALMA telescope is still under construction, and has not yet reached its full capabilities. When it is complete, its vision will be even sharper, and new observations of the streams may allow the team to determine properties of the planets, including their masses.

<http://www.sciencedaily.com/releases/2013/01/130102172945.htm>

For Those Short On Time, Aerobic, Not Resistance, Exercise Is Best Bet for Weight And Fat Loss

When it comes to weight- and fat loss, aerobic training is better than resistance training

A new study led by North Carolina researchers has found that when it comes to weight- and fat loss, aerobic training is better than resistance training. The study is believed to be the largest randomized trial to directly compare changes in body composition induced by comparable amounts of time spent doing aerobic and resistance training, or both in combination, among previously inactive overweight or obese non-diabetic adults. The study is entitled "Effects of aerobic and/or resistance training on body mass and fat mass in overweight or obese adults". It is published in the December 2012 edition of the Journal of Applied Physiology published by the American Physiological Society.

Methodology

A total of 234 previously sedentary overweight or obese males and females, age 18-70 years of age, were enrolled in one of three eight-month supervised protocols: aerobic training (AT), resistance training (RT), or a combination (AT/RT). Of the total, 119 participants completed the trials and had complete data for the variables of interest in the article.

Those assigned to aerobic training exercised vigorously, at about 70-85% of maximum heart rate. They exercise approximately 45 minutes three days per week throughout the study period.

Individuals assigned to resistance training also exercised three days a week, completing three sets of 8-12 reps on eight resistance machines that targeted all major muscle groups. Resistance was increased throughout the study to maintain a steady level of challenge as the participants gained strength.

Individuals who were assigned to AT/RT performed all the exercises assigned to both AT and RT groups. At the end of study each enrollee was assessed for weight, body composition, waist circumference, cardiopulmonary fitness and strength compared to their baseline.

Key Findings and Conclusions

The researchers found:

- The groups assigned to aerobic training and aerobic plus resistance training lost more weight than those that did resistance training only. In fact, those who did resistance training only actually gained weight due to an increase in lean body mass.
- Fat mass and waist circumference significantly decreased in the AT and AT/RT groups, but were not altered in RT. However, measures of lean body mass significantly increased in RT and AT/RT, but not in AT. The findings suggest that aerobic exercise is more effective in reducing these measures.

• Lean body mass increased with both RT and AT/RT, but not AT. Having the benefit to of both modes of exercise allowed AT/RT to decrease body fat percent significantly more than either AT or RT due to decreased fat mass combined with increased lean body mass.

Importance of the Findings

According to Leslie H. Willis, an exercise physiologist at Duke University Medical Center and the study's lead author, "Given our observations, it may be time to seriously reconsider the conventional wisdom that resistance training alone can lead to weight and fat loss."

Willis added, "If increasing muscle mass and strength is a goal, then resistance training is required. However, the majority of Americans could experience health benefits due to weight and fat loss. The best option in that case, given limited time for exercise, is to focus on aerobic training. When you lose fat, it is likely you are losing visceral fat, which is known to be associated with cardiovascular and other health benefits."

In addition to Leslie Willis, the study was conducted by Cris A. Slentz, Lori A. Bateman, Lucy W. Piner, Connie W. Bales and William E. Kraus of the Duke University Medical Center; and Joseph A Hourmard and A. Tamlyn Shields of East Carolina University.

L. H. Willis, C. A. Slentz, L. A. Bateman, A. T. Shields, L. W. Piner, C. W. Bales, J. A. Houmard, W. E. Kraus. Effects of aerobic and/or resistance training on body mass and fat mass in overweight or obese adults. Journal of Applied Physiology, 2012; 113 (12): 1831 DOI: 10.1152/jappphysiol.01370.2011

<http://www.universetoday.com/99248/new-images-show-a-living-mars/>

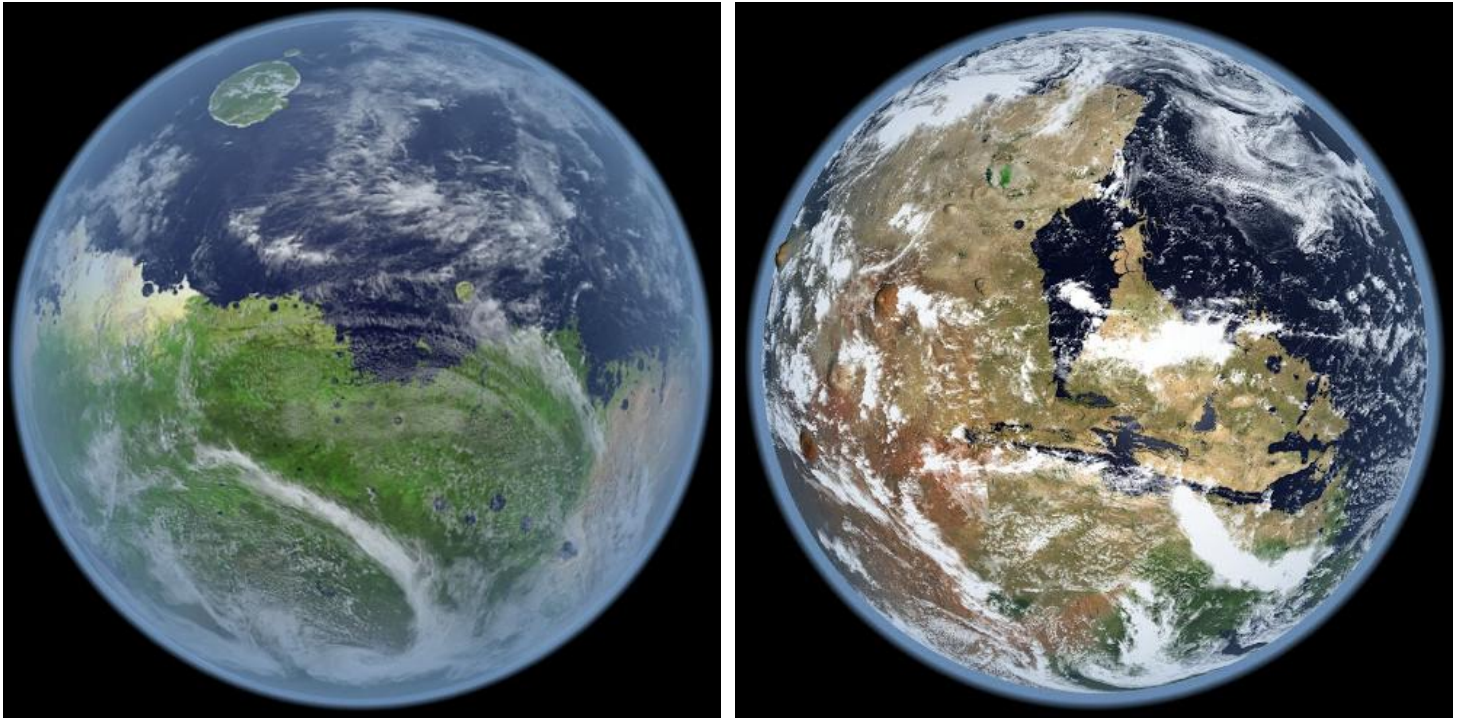
New Images Show a "Living" Mars

Using elevation data from NASA's Mars Reconnaissance Orbiter, software engineer Kevin Gill was inspired to create a virtual version of the red planet with a difference.

by Nancy Atkinson on January 2, 2013

Over the years, scientists have found evidence revealing that an ocean may have covered parts of the Red Planet billions of years ago. Others suggest that a future terraformed Mars could be lush with oceans and vegetation. In either scenario, what would Mars look like as a planet alive with water and life? By combining data from several sources — along with a bit of creative license — software engineer Kevin Gill has created some gorgeous images showing concepts of what a "living Mars" might look like from orbit, turning the Red Planet into its own version of the Blue Marble.

Left: Wet Mars - A conception of an ancient and/or future Mars, flush with oceans, clouds and life. Kevin Gill



Right: This is a conception view of the Western hemisphere of Mars with oceans and clouds. Olympus Mons is visible on the horizon beyond the Tharsis Montes volcanoes and the Valles Marineris canyons near the center. Kevin Gill

"This was something that I did both out of curiosity of what it would look like and to improve the software I was rendering this in," Gill said via email. "I am a software engineer by trade and certainly no planetary scientist, so with the exception of any parts derived from actual data, most of it is assumptions I made based on simply comparing the Mars terrain to similar features here on Earth (e.g. elevation, proximity to bodies of water,

physical features, geographical position, etc) and then using the corresponding textures from the Blue Marble images to paint the flat image layer in a graphics program.”

For example, the view below is of the western hemisphere of Mars, with Olympus Mons on the horizon beyond the Tharsis Montes volcanoes and the Valles Marineris canyons near the center. Gill said the height of the clouds and atmosphere are largely arbitrary and set for the sake of appearance. The terrain is also exaggerated by about 10 times. The orbital “eye” view is about 10,000 km (~6,200 miles) from the surface.

wet-mars-v6d-3

“This wasn’t intended as an exhaustive scientific scenario as I’m sure (and expect) some of my assumptions will prove incorrect,” Gill said on Google+. “I’m hoping at least to trigger the imagination, so please enjoy!” He outlined his steps in creating the images:

A two dimensional digital elevation model was first rendered in jDem846 (an open-source learning project of mine) using the MRO MOLA 128 pix/deg elevation dataset. In that model, I picked a sea level and scripted it such that terrain at or below that level was flat and blue.

The resulting model was then brought into GIMP where I painted in land features using a NASA Blue Marble Next Generation image for the source textures. There is no scientific reasoning behind how I painted it; I tried to envision how the land would appear given certain features or the effects of likely atmospheric climate. For example, I didn’t see much green taking hold within the area of Olympus Mons and the surrounding volcanoes, both due to the volcanic activity and the proximity to the equator (thus a more tropical climate). For these desert-like areas I mostly used textures taken from the Sahara in Africa and some of Australia. Likewise, as the terrain gets higher or lower in latitude I added darker flora along with tundra and glacial ice. These northern and southern areas textures are largely taken from around northern Russia. Tropical and subtropical greens were based on the rainforests of South America and Africa.

Finally, that image was brought back into jDem846 as a layer to be reapplied to the same MOLA dataset, but rendered as a spherical projection (like Google Earth). I scripted the model to apply a three-dimensional cloud layer, add an atmosphere, and dampen specular lighting on dry land and under clouds. There are some other scripted tweaks here and there.

Gill has also done other visualizations of Mars and also the Moon, which can be seen on his [G+](#) or [Flickr page](#).

<http://www.newscientist.com/article/dn23039-nasa-mulls-plan-to-drag-asteroid-into-moons-orbit.html>

NASA mulls plan to drag asteroid into moon's orbit

Who says NASA has lost interest in the moon? Along with rumours of a hovering lunar base, there are reports that the agency is considering a proposal to capture an asteroid and drag it into the moon's orbit.

15:15 02 January 2013 by Jeff Hecht

Researchers with the Keck Institute for Space Studies in California have confirmed that NASA is mulling over their plan to build a robotic spacecraft to grab a small asteroid and place it in high lunar orbit. The mission would cost about \$2.6 billion – slightly more than NASA's Curiosity Mars rover – and could be completed by the 2020s.

For now, NASA's only official plans for human spaceflight involve sending a crewed capsule, called Orion, around the moon. The Obama administration has said it also wants to send astronauts to a near-Earth asteroid. One proposed target, chosen because of its scientific value and favourable launch windows for a rendezvous, is a space rock called 1999 AO10. The mission would take about half a year, exposing astronauts to long-term radiation beyond Earth's protective magnetic field and taking them beyond the reach of any possible rescue.

Robotically bringing an asteroid to the moon instead would be a more attractive first step, the Keck researchers conclude, because an object orbiting the moon would be in easier reach of robotic probes and maybe even humans.

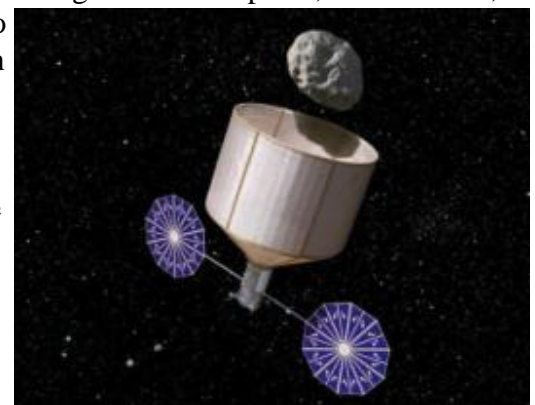


Illustration of an asteroid retrieval spacecraft in the process of capturing a 7-m, 500-ton asteroid .Rick Sternbach / KISS

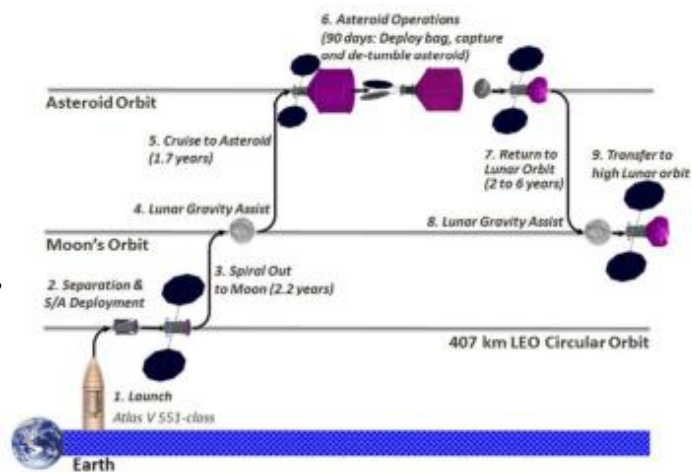
Catch and release

The Keck team envisions launching a slow-moving spacecraft, propelled by solar-heated ions, on an Atlas V rocket. The craft would then propel itself out to a target asteroid, probably a small space rock about 7 metres wide. After studying it briefly, the robot would catch the asteroid in a bag measuring about 10 metres by 15 metres and head back towards the moon. Altogether it would take about six to 10 years to deliver the asteroid to lunar orbit.

The project still needs some technical and scientific fine-tuning, says co-leader Louis Friedman of the Planetary Society, but he sees it as an important boost to exploration.

For instance, NASA has also expressed interest in putting astronauts on an outpost parked in orbit at the Earth-moon Lagrange point 2. From there they could study a captured asteroid using telepresence technology, or even practise human landings on its surface.

Such work could help develop ways to use asteroid material for construction or spaceship fuels, making the captured asteroid a stepping stone for human missions to larger asteroids and eventually to Mars.



Asteroid return mission concept. Return flight time of 2 to 6 years depending on the asteroid mass.

A moon-orbiting asteroid would probably also be of interest to private companies proposing human missions to the lunar surface for scientific exploration and mining studies.

<http://www.sciencedaily.com/releases/2013/01/130103073236.htm>

Repeated Miscarriage: Scientists Pinpoint Molecular Signals That Make Some Women Prone to Miscarriage

Scientists have identified molecular signals that control whether embryos are accepted by the womb, and that appear to function abnormally in women who have suffered repeated miscarriages.

The research, carried out at Imperial College London and the University of Warwick, suggests these signals could be targets for drugs that would help prevent miscarriage in women who are particularly vulnerable.

At the start of pregnancy, the fertilised embryo must embed itself in the lining of the uterus. The uterus is only receptive to embryos for a few days in each menstrual cycle, ensuring that embryos can only implant at the right stage of development. Currently scientists know only a few details about the biological processes that control when an embryo can be implanted.

In the latest study, published in the journal PLOS ONE, researchers studied chemical signals produced by human cells, taken from the lining of the uterus and grown in the lab. They identified a key role for a molecule called IL-33, which the cells secrete during the receptive phase and which influences the activity of nearby cells. Normally, the effects of IL-33 and other chemical signals in the lining of the womb are short-lived, which helps to ensure that woman can only conceive during a narrow window. In cells from women who had suffered three or more miscarriages however, high levels of IL-33 continued to be secreted for 10 days, suggesting that the receptivity of the uterus was not being controlled properly in these women.

The study also looked at the effects of these molecular signals on fertility in mice. The researchers treated the uteruses of the mice with chemicals secreted by cells from the human womb lining. They found that chemicals produced by cells from women with repeated miscarriages extended the time during which mice could become pregnant, but also made miscarriages more likely. The researchers conclude that a prolonged window of fertility increases the risk of abnormal embryos implanting. In addition, it is associated with inflammation in the lining of the womb, which compromises the development of healthy embryos.

Dr Madhuri Salker, a study author from the Department of Surgery and Cancer at Imperial College London, said: "Our study suggests that in women who have had successive miscarriages, the mechanisms that control whether the womb can accept and support an embryo don't work properly. This might mean they can become pregnant with poor quality embryos or that the embryo implants in an unsupportive environment, which would seriously compromise the chances of a successful pregnancy."

The senior author of the study, Professor Jan Brosens from the University of Warwick, said: "The molecular signals we identified are known to be involved in a range of diseases, including Alzheimer's, asthma and heart disease. Our findings suggest that targeting these molecules might also be a promising strategy for developing treatments that would prevent miscarriages in women who are especially vulnerable."

The research was supported the Biomedical Research Unit in Reproductive Health, a joint initiative between the University Hospitals Coventry and Warwickshire NHS Trust and Warwick Medical School, and the Genesis Research Trust.

Madhuri S. Salker, Jaya Nautiyal, Jennifer H. Steel, Zoe Webster, Sandra Šućurović, Marilena Nicou, Yogesh Singh, Emma S. Lucas, Keisuke Murakami, Yi-Wah Chan, Sean James, Yazan Abdallah, Mark Christian, B. Anne Croy, Biserka Mulac-Jericevic, Siobhan Quenby, Jan J. Brosens. Disordered IL-33/ST2 Activation in Decidualizing Stromal Cells Prolongs Uterine Receptivity in Women with Recurrent Pregnancy Loss. PLoS ONE, 2012; 7 (12): e52252 DOI: 10.1371/journal.pone.0052252

<http://www.sciencedaily.com/releases/2013/01/130103073238.htm>

Cup Color Influences the Taste of Hot Chocolate

Hot chocolate tastes better in an orange coloured cup

Two researchers from the Polytechnic University of Valencia and the University of Oxford have demonstrated that hot chocolate tastes better in an orange or cream coloured cup than in a white or red one. The study adds to recent research demonstrating how our senses perceive food in a different way depending on the characteristics of the container from which we eat and drink.

"The colour of the container where food and drink are served can enhance some attributes like taste and aroma," as explained by Betina Piqueras-Fiszman, researcher at the Polytechnic University of Valencia (Spain). Along with her colleague Charles Spence, from the University of Oxford (UK), the scientist has come to the conclusion in the case of drinking chocolate. Both conducted an experiment in which 57 participants had to evaluate samples of hot chocolate served in four different types of plastic cup. They were the same size but of different colours: white, cream, red and orange with white on the inside. Published in the Journal of Sensory Studies, the results reveal that the flavour of chocolate served in orange or cream coloured cups was better for the tasting volunteers.

However, the sweetness (not the flavour of the cocoa) and the aroma (the smell) were hardly influenced by the colour of the cup, despite the participants mentioning that the chocolate was slightly sweeter and more aromatic in a cream coloured cup. "There is no fixed rule stating that flavour and aroma are enhanced in a cup of a certain colour or shade," recognised Piqueras-Fiszman. "In reality this varies depending on the type of food, but the truth is that, as this effect occurs, more attention should be paid to the colour of the container as it has more potential than one could imagine."

According to the study, these results are relevant for those scientists interested in understanding how the brain integrates visual information not just from the food itself but from the receptacle or container from which it is consumed. In addition, this information could encourage chefs, catering professionals and even the packaging industry to think more about the colour of crockery and packaging. As the researcher explains, "it is a case of experimenting to understand how the container itself affects the perceptions that the consumers have on the product."

In the same article the conclusions of previous studies are brought together that also confirm the effect of the container on the sensory characteristics of the food or beverage. There are many examples, from yellow tins to improve the flavour of lemon to soft drinks in cold colours, like blue, to seem more thirst-quenching than warm colours like red. Furthermore, if drinks come in pink, they are even perceived as being more sugary.

In other cases, it has been demonstrated that a strawberry mousse appears to be sweeter and more intense on a white plate compared to a black plate. And as for coffee, the majority of those surveyed associated brown packaging to a stronger flavour and aroma, whereas reds seem to accentuate this sensation and blues and yellows make the drink seem softer.

Betina Piqueras-Fiszman, Charles Spence. The Influence of the Color of the Cup on Consumers' Perception of a Hot Beverage. Journal of Sensory Studies, 2012; 27 (5): 324 DOI:

http://www.eurekalert.org/pub_releases/2013-01/foas-sgb010313.php

Smile: Gingivitis bacteria manipulate your immune system so they can thrive in your gums

New research published in the Journal of Leukocyte Biology suggests that Porphyromonas gingivalis causes excess IL-10 production, which inhibits the immune cells interferon gamma leading to infection

A new research report published in the Journal of Leukocyte Biology shows how the bacteria known for causing gum disease--*Porphyromonas gingivalis*--manipulates the body's immune system to disable normal processes that would otherwise destroy it. Specifically, the report shows that this pathogen prompts the production of the anti-inflammatory molecule Interleukin-10 (IL-10). This, in turn, inhibits the function of T-cells, which would otherwise help to protect the host from this particular microbial infection.

"Since greater than 50 percent of the U.S. population over 50 years-of-age develop adult periodontal disease, we hope that the results of our study will ultimately help in the development of novel treatments that could prevent or ameliorate the chronic infection caused by the pathogen *P. gingivalis*," said Jannet Katz, D.D.S., Ph.D., a researcher involved in the work from the Department of Pediatric Dentistry at the University of Alabama in Birmingham.

To make this discovery, scientists used cells from mice that were exposed to *P. gingivalis*. One portion of the cells was treated with an inhibiting antibody against IL-10 and the other portion of cells was not treated. All of the cells were then tested for interferon gamma production. An increase of interferon gamma production was

seen in the treated cells, but no increase was found in the untreated cells. These findings suggest that the damage done by *P. gingivalis* happens when the immune cells of the host are first exposed to this pathogen, and further implies that for treatment to be successful, it must be started as early as possible. This study highlights the mechanism by which *P. gingivalis* can establish a chronic infection in the form of periodontal disease and provides insight into how the disease develops. Results also demonstrate the importance of very early intervention either by eradication of the bacterium with specifically designed therapeutics or by prevention via the development of an effective vaccine.

"Gum diseases and the infections that cause them can be incredibly stubborn and difficult to treat," said John Wherry, Ph.D., Deputy Editor of the Journal of Leukocyte Biology. "What isn't as well known is why these infections are so difficult to eradicate. These new studies now demonstrate that these bacteria go beyond merely evading our body's defenses and actually manipulate our immune systems for their own survival."

Dalia E. Gaddis, Craig L. Maynard, Casey T. Weaver, Suzanne M. Michalek, and Jannet Katz. Role of TLR2-dependent IL-10 production in the inhibition of the initial IFN- γ T cell response to Porphyromonas gingivalis. J. Leukoc. Biol. January 2013 93:21-31; doi:10.1189/jlb.0512220 ; http://www.jleukbio.org/content/93/1/21.abstract.

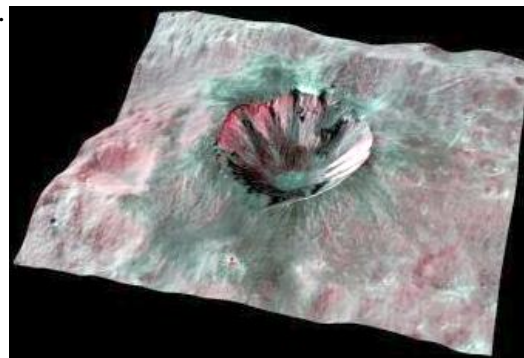
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Carbon in Vesta's craters

Large impacts of asteroids may have transferred carbonaceous material to the protoplanet and the inner solar system

The protoplanet Vesta has been witness to an eventful past: images taken by the framing camera onboard NASA's space probe Dawn show two enormous craters in the southern hemisphere. The images were obtained during Dawn's year-long visit to Vesta that ended in September 2012.

These huge impacts not only altered Vesta's shape, but also its surface composition. Scientists under the lead of the Max Planck Institute for Solar System Research in Katlenburg-Lindau in Germany have shown that impacting small asteroids delivered dark, carbonaceous material to the protoplanet. In the early days of our solar system, similar events may have provided the inner planets such as Earth with carbon, an essential building block for organic molecules. These results were published in the November-December issue of the journal *Icarus*.



In this three-dimensional image of one of Vesta's smaller craters, the dark material can be seen within the crater.

NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Vesta is remarkable in many respects. With a diameter of approximately 530 kilometres, Vesta is the one of the few protoplanets in our solar system still in-tact today. Like other protoplanets, Vesta underwent complete melting approximately 4.5 billion years ago. However, most of the volcanic activity on Vesta is thought to have ceased within a few million years making it a time capsule from the early solar system. Dawn observations of Vesta have shown a surface with diverse brightness variations and surface composition. There is bright material on Vesta that is as white as snow and dark material on Vesta as black as coal.

The enigmatic dark material holds the key to understanding the impact environment around Vesta early in its evolution. Research led by scientists at the Max Planck Institute in Katlenburg-Lindau has shown that this dark material is not native to Vesta but was delivered by impacting asteroids. "The evidence suggests that the dark material on Vesta is rich in carbonaceous material and was brought there by collisions with smaller asteroids," explains Vishnu Reddy from the Max Planck Institute for Solar System Research and the University of North Dakota, the lead author of the paper. In the journal *Icarus*, he and his colleagues now present the most comprehensive analysis of this material so far. Compositional analysis, mapping, and modelling of dark material distribution on Vesta suggest that it was delivered during the formation of giant impact basins on Vesta. The dark material arrived with the first impact on the protoplanet

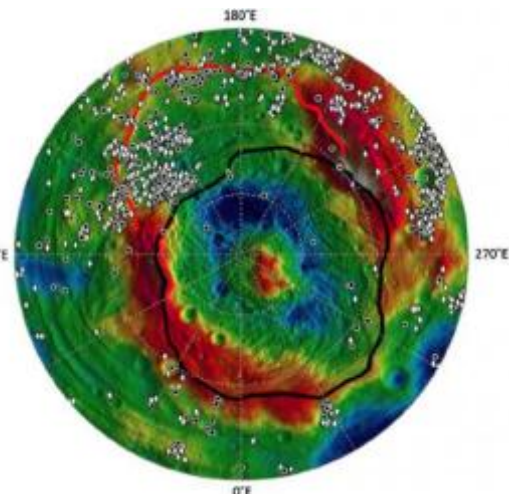
"First, we created a map showing the distribution of dark material on Vesta using the framing camera data and found something remarkable," explains Lucille Le Corre from the Max Planck Institute for Solar System Research one of the lead authors of the study. Dark material was preferentially spread around the edges of the giant impact basins in the southern hemisphere of Vesta suggesting a link to one of the two large impact basins. A closer examination showed that the dark material was most probably delivered during the formation of the older Veneneia basin when a slow impacting asteroid collided with Vesta. Dark material from this two to three billion year old basin was covered up by the impact that subsequently created the Rheasilvia basin. "We believe that the Veneneia basin was created by the first of two impacts two to three billion years ago," says Reddy. In

fact, impact modelling presented in the paper reproduces the distribution of dark material from such a low velocity impact.

HED meteorites are fragments of Vesta

Evidence for dark material is also found in the HED meteorites that come from Vesta. Some of the meteorites show dark inclusions that are carbon-rich. Colour spectra of dark material on Vesta are identical to these carbon-rich inclusions in HED meteorites. The link between dark material on Vesta and dark clasts in HED meteorites provides us with direct evidence that these meteorites are indeed from Vesta. "Our analysis of the dark material on Vesta and comparisons with laboratory studies of HED meteorites for the first time proves directly that these meteorites are fragments from Vesta", says Le Corre.

"The aim of our efforts was not only to reconstruct Vesta's history, but also to understand the conditions in the early solar system," says Holger Sierks, co-investigator of the Dawn mission at the Max Planck Institute for Solar System Research.



This is an overview map of Vesta's southern hemisphere. The circles, diamonds, and stars show where the dark material occurs. The red line depicts the rim of the Veneneia basin, the black line the rim of the younger Rheasilvia basin. NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

The Dawn mission was launched approximately five years ago and entered orbit around Vesta on July 16th, 2011. In 2015, Dawn will arrive at its second destination, the dwarf planet Ceres, that like Vesta orbits the Sun between the orbits of Mars and Jupiter within the so-called asteroid belt. The Dawn mission to Vesta and Ceres is managed by NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, for NASA's Science Mission Directorate, Washington. The University of California, Los Angeles, is responsible for overall Dawn mission science. The Dawn framing cameras have been developed and built under the leadership of the Max Planck Institute for Solar System Research, Katlenburg-Lindau, Germany, with significant contributions by DLR German Aerospace Center, Institute of Planetary Research, Berlin, and in coordination with the Institute of Computer and Communication Network Engineering, Braunschweig. The Framing Camera project is funded by the Max Planck Society, DLR, and NASA/JPL.

Vishnu Reddy, Lucille Le Corre et al Delivery of dark material to Vesta via carbonaceous chondritic impacts Icarus, November – December 2012

http://www.eurekalert.org/pub_releases/2013-01/ci-fm123112.php

First meteorite linked to Martian crust

After extensive analyses by a team of scientists led by Carl Agee at the University of New Mexico, researchers have identified a new class of Martian meteorite that likely originated from the Mars's crust.

Washington, D.C.- It is also the only meteoritic sample dated to 2.1 billion years ago, the early era of the most recent geologic epoch on Mars, an epoch called the Amazonian. The meteorite was found to contain an order of magnitude more water than any other Martian meteorite. Researchers from the Carnegie Institution (Andrew Steele, Marilyn Fogel, Roxane Bowden, and Mihaela Glamoclija) studied carbon in the meteorite and have shown that organic carbon (macromolecular) similar to that seen in other Martian meteorites is also found in this meteorite. The research is published in the January 3, 2013, issue of Science Express.

The unique meteorite, dubbed Northwest Africa (NWA) 7034, has some similarities to, but is very different from other Martian meteorites known as SNC (for three members of the group: Shergotty, Nakhla, and Chassigny). SNC meteorites currently number 110. And so far they are the only meteoritic samples from Mars that scientists have been able to study. However, their point of origin on the Red Planet is not known. In fact, recent data from lander and orbiter missions suggest that they are a mismatch for the Martian crust.

As co-author Andrew Steele, who led the carbon analysis at the Carnegie Institution's Geophysical Laboratory explained: "The texture of the NWA meteorite is not like any of the SNC meteorites. It is made of cemented fragments of basalt, rock that forms from rapidly cooled lava, dominated with feldspar and pyroxene, most likely from volcanic activity. This composition is common for lunar samples, but not from other Martian meteorites. This unusual meteorite's chemistry suggests it came from the Martian crust. It is first link thus far of any meteorite to the crust. Our carbon analysis also showed that the meteorite likely underwent secondary processing at the Martian surface, explaining the macromolecular organic carbon. "

Lead author Agee, of the Institute of Meteoritics at the University of New Mexico, remarked: "The basaltic rock in this meteorite is consistent with the crust or upper mantle of Mars based on findings from recent

Martian rovers and orbiters. Our analysis of the oxygen isotopes shows that NWA 7034 is not like any other meteorites or planetary samples. The chemistry is consistent with a surface origin and an interaction with the Martian atmosphere. The abundance of water, some 6000 parts per million, suggests that the meteorite interacted with the Martian surface some 2.1 billion years ago."

"Perhaps most exciting, is that the high water content could mean there was an interaction of the rocks with surface water either from volcanic magma, or from fluids from impacting comets during that time," said Steele.

"It is the richest Martian meteorite geochemically and further analyses are bound to unleash more surprises."

The research was supported by NASA's Cosmochemistry Program, a NASA ASTEP and NAI grant to Steele, the New Mexico Space Grant Consortium, and NSF award ATM0960594.

<http://www.scientificamerican.com/article.cfm?id=meteorite-carries-ancient-water-from-mars>

Meteorite Carries Ancient Water from Mars

Rock is among the oldest known from the planet and matches findings from NASA rovers

By Ron Cowen and [Nature magazine](#)

It may just look like your average rock, but in fact it's an extra-special delivery from the red planet. Laboratory analysis has revealed that a specimen bought from a Moroccan meteorite dealer in 2011 is the first sample of Martian origin that is similar to the water-rich rocks examined by NASA's rovers.

The meteorite, dubbed Northwest Africa (NWA) 7034, contains a concentration of water by weight about ten times higher than in any of the other 100 or so known Martian meteorites — those rare rocks that get ejected from the Martian surface into space when an asteroid hits the planet, and eventually find their way to Earth. It's also the only known Martian sample on Earth that hails from a critical period, about 2 billion years ago, when Mars is thought to have become colder and drier than it was originally.

Carl Agee of the University of New Mexico in Albuquerque and his colleagues report their findings from samples of the meteorite in Science online today.

Water clues

"Agee and his collaborators have thrown open the door to a whole new part of Mars," says planetary scientist Munir Humayun at Florida State University in Tallahassee, who was not involved in the study. The meteorite, he adds, is "the first of a new class of Martian meteorites that provides more direct clues to the surface history of Mars."

Moreover, Humayun says, NWA 7034 may provide the only direct corroboration for the rovers' observations for some time to come, as the fate of a long-delayed mission to bring samples of Mars back to Earth is still uncertain.

The elemental composition of the meteorite strongly resembles that of rocks examined in 2005 by NASA's Spirit rover at Gusev Crater. Those rocks showed evidence of chemical alteration by interactions with liquid water, notes Agee. The composition of NWA 7034 also matches that of rocks studied by Curiosity, NASA's newest rover, as described in preliminary reports from members of that mission.



The rock, found in the Sahara Desert, has a higher water content than any Martian meteorite previously analysed.

Image: Carl Agee

Missing link

Dating from 2.1 billion years ago, NWA 7034 is the second-oldest Martian meteorite, and provides a "missing link" in the planet's geological record, according to Agee. (The oldest prospective Martian meteorite, ALH 84001, is 4.5 billion years old, whereas all other Martian meteorites are 1.3 billion years old or younger.) Several lines of evidence indicate that parts of Mars were warmer and wetter, and therefore a possible haven for carbon-based life, some 4 billion years ago. The relatively high water content of NWA 7034, which could be as much as 0.6% by weight, suggests that "crustal or surface processes involving water may have lasted" well beyond the 4-billion-year mark, Agee adds.

That is not a surprise, given the map of hydrogen (a stand-in for water) generated by an instrument on the Mars Odyssey orbiting spacecraft and the presence of small amounts of water in younger Martian meteorites, notes Harry McSween at the University of Tennessee in Knoxville.

The meteorite is made of volcanic rock, and the presence of water in it suggests that crustal rocks on Mars interacted with surface water that was delivered by volcanic activity, near-surface reservoirs or by impacting comets, Agee says. But Jeffrey Taylor of the University of Hawaii in Honolulu says that whether that water content truly reveals an abundance of surface water on Mars 2.1 billion years ago awaits further study.

<http://www.bbc.co.uk/news/health-20898931>

Immune system 'booster' may hit cancer

Vast numbers of cells that can attack cancer and HIV have been grown in the lab, and could potentially be used to fight disease.

By James Gallagher Health and science reporter, BBC News

The cells naturally occur in small numbers, but it is hoped injecting huge quantities back into a patient could turbo-charge the immune system. The Japanese research is published in the journal Cell Stem Cell. Experts said the results had exciting potential, but any therapy would need to be shown to be safe. The researchers concentrated on a type of white blood cell known as a cytotoxic T-cell, which can recognise telltale markings of infection or cancer on the surfaces of cells. If a marking is recognised, it launches an attack. Teams at the University of Tokyo and the Riken Research Centre for Allergy and Immunology used advances in stem cell technology to make more T-cells.

One group extracted T-cells which targeted a patient's skin cancer. Another group did the same for HIV. These T-cells were converted into stem cells, which could dramatically increase in number when grown in the laboratory. These were converted back into T-cells which should also have the ability to target the cancer or HIV.

New weapon?

The groups have proved only that they can make these cells, not that they can be safely put back into patients or that it would make a difference to their disease if they did.

Dr Hiroshi Kawamoto, who worked on the cancer immune cells at Riken, said: "The next step will be to test whether these T-cells can selectively kill tumour cells, but not other cells in the body. "If they do, these cells might be directly injected into patients for therapy. This could be realized in the not-so-distant future."

Dr Hiromitsu Nakauchi from the University of Tokyo said it was "unclear" whether this technique would help in treating HIV and that other infections and cancer may be a better place to start.

'Very exciting'

Experts in the field said the findings were encouraging.

Prof Alan Clarke, the director of the European Cancer Stem Cell Research Institute at Cardiff University, said: "This is a potentially very exciting development which extends our capacity to develop novel cell therapies." He said it was important that cells could be tailored for each patient so there would be no risk of rejection. Other experts said the findings were still at an early stage, but were still very promising and represented a strong foundation for future research. However, Cancer Research UK said it was still too early to know if any therapy would be safe.

Prof Sir John Burn, from the Institute of Genetic Medicine at Newcastle University, said: "This is a very appealing concept and the research team are to be congratulated on demonstrating the feasibility of expanding these killer cells. However he added: "Even if these T cells are effective, it could prove very challenging to produce large quantities safely and economically.

"Nevertheless, there is real promise of this becoming an alternative when conventional therapies have failed."

<http://www.sciencedaily.com/releases/2013/01/130103131200.htm>

How Deadly Skin Cancer Spreads Into Other Parts of the Body

Scientists have made an important discovery in understanding the process by which a gene contributes to metastasis in melanoma and possibly other cancers

After recently announcing success in eliminating melanoma metastasis in laboratory experiments, scientists at Virginia Commonwealth University Massey Cancer Center have made another important discovery in understanding the process by which the gene mda-9/syntenin contributes to metastasis in melanoma (the spread of skin cancer) and possibly a variety of other cancers.

Published in the journal Cancer Research, the study demonstrated that mda-9/syntenin is a key regulator of angiogenesis, the process responsible for the formation of new blood vessels in tumors. Mda-9/syntenin was originally cloned in the laboratory of the study's lead author Paul B. Fisher, M.Ph., Ph.D., Thelma Newmeyer Corman Endowed Chair in Cancer Research and program co-leader of Cancer Molecular Genetics at Virginia Commonwealth University Massey Cancer Center, chairman of VCU's Department of Human and Molecular Genetics and director of the VCU Institute of Molecular Medicine.

"Our research brings us one step closer to understanding precisely how metastatic melanoma, a highly aggressive and therapy-resistant cancer, spreads throughout the body," says Fisher. "Additionally, analysis of the human genome has indicated that mda-9/syntenin is elevated in the majority of cancers, which means novel drugs that target this gene could potentially be applicable to a broad spectrum of other deadly cancers."

Fisher's team discovered that mda-9/syntenin regulates the expression of several proteins responsible for promoting angiogenesis, including insulin growth factor binding protein-2 (IGFBP-2) and interleukin-8 (IL-8). The study is the first to provide proof of the pro-angiogenic functions of IGFBP-2 in human melanoma. In in vivo and in vitro experiments, the scientists confirmed that mda-9/syntenin binds with the extracellular matrix (ECM) to start a series of biological processes that eventually cause endothelial cells to secrete IGFBP-2. The ECM is the substance that cells secrete and in which they are embedded. Endothelial cells are the cells that line the interior surface of blood vessels throughout the entire circulatory system. The secretion of IGFBP-2, in turn, caused the endothelial cells to produce and secrete vascular endothelial growth factor-A (VEGF-A), a protein that mediates the development of and formation of new blood vessels. The researchers also noted that IGFBP-2 could potentially serve as a novel biomarker to monitor for disease progression in melanoma patients.

"This is a major breakthrough in understanding angiogenesis and its impact in melanoma metastasis," says Fisher. "We are now focusing on developing novel small molecules that specifically target mda-9/syntenin and IGFBP-2, which could be used as drugs to treat melanoma and potentially many other cancers."

Fisher collaborated on this study with Devanand Sarkar, M.B.B.S., Ph.D., Harrison Scholar and research member of the Cancer Molecular Genetics program at VCU Massey, Blick Scholar and assistant professor in the Department of Human and Molecular Genetics and member of the VCU Institute of Molecular Medicine at VCU School of Medicine; Swadesh K. Das, Ph.D., Santanu Dasgupta, Ph.D., and Luni Emdad, M.B.B.S., Ph.D., from the Department of Human and Molecular Genetics at VCU Massey; Sujit K. Bhutia, Ph.D., Belal Azab, Ph.D., Upneet K. Sokhi, Timothy P. Kegelman, Leyla Peachy, Prasanna K. Santhekadur, Ph.D., and Rupesh Dash, Ph.D., all from the Department of Human and Molecular Genetics; Paul Dent, Ph.D., Universal Corporation Distinguished Professor for Cancer Cell Signaling and Developmental Therapeutics program member at VCU Massey, and professor and vice chair of research in the Department of Neurosurgery at VCU School of Medicine; Steven Grant, M.D., Shirley Carter Olsson and Sture Gordon Olsson Chair in Oncology Research, associate director for translational research, program co-leader of the Developmental Therapeutics program and Cancer Cell Signaling program member at VCU Massey; and Maurizio Pellecchia, Ph.D., from Sanford-Burnham Medical Research Institute.

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<http://bit.ly/RwenKc>

Cloud of atoms goes beyond absolute zero

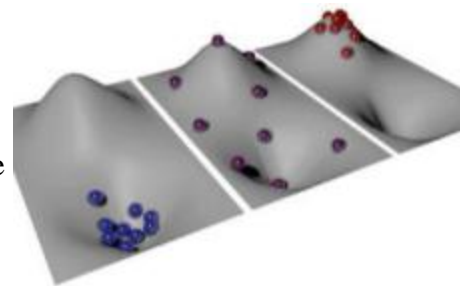
Temperature depends on the energy landscape

19:00 03 January 2013 by Jacob Aron

Nothing is colder than absolute zero, so it seems nonsensical to talk about negative temperature – but now there is a substance that must have just that. The revelation could shake up our ideas about temperature and help us understand strange entities such as dark energy, as well as the interactions of subatomic particles.

Although we're used to talking about negative temperatures, such as -10°C , all temperatures on an ordinary thermometer are actually positive when measured in kelvin, the scientific temperature scale that starts at absolute zero (-273.15°C).

On the kelvin scale, temperature is determined by the kinetic energy of particles, so a gas of slow particles is colder than a gas of fast-moving ones. Absolute zero corresponds to the point at which particles stop moving completely, which is why nothing can be colder. That does not tell the whole story, however. Temperature also depends on the way in which the particle energies are distributed within the gas, which determines their entropy, or disorder.



Temperature depends on the energy landscape (Image: Ludwig Maximilian University of Munich)

Energy landscape

Above absolute zero, adding more energy corresponds to an increase in entropy. Picture a hill next to a valley (see image) with the height of the landscape corresponding to the energy of a particle – and the chance of finding a particle at a certain height representing entropy. At absolute zero, particles are motionless and all have no energy so are all at the bottom of the valley, giving a minimum entropy.

As the gas heats up, the average energy of the particles increases, with some gaining lots of extra energy but most just a small amount. Spread along the side of the hill, now the particles have different energies, so entropy is higher.

According to temperature's entropic definition, the highest positive temperature possible corresponds to the most disordered state of the system. This would be an equal number of particles at every point on the landscape. Increase the energy any further and you'd start to lower the entropy again, because the particles wouldn't be evenly spread. As a result, this point represents the end of the positive temperature scale.

In principle, though, it should be possible to keep heating the particles up, while driving their entropy down. Because this breaks the energy-entropy correlation, it marks the start of the negative temperature scale, where the distribution of energies is reversed – instead of most particles having a low energy and a few having a high, most have a high energy and just a few have a low energy. The end of this negative scale is reached when all particles are at the top of the energy hill.

The resulting thermometer is mind-bending with a scale that starts at zero, ramps up to plus infinity, then jumps to minus infinity before increasing through the negative numbers until it reaches negative absolute zero, which corresponds to all particles sitting at the top of the energy hill.

Cold atoms

"The temperature scale as we know it starts at zero and goes up to infinity, but it doesn't stop there," says Ulrich Schneider of the Ludwig Maximilian University of Munich in Germany.

To enter the negative realm, Schneider and his colleagues began by cooling atoms to a fraction above absolute zero and placing them in a vacuum. They then used lasers to place the atoms along the curve of an energy valley with the majority of the atoms in lower energy states. The atoms were also made to repel each other to ensure they remained fixed in place.

Schneider's team then turned this positive temperature system negative by doing two things. They made the atoms attract and adjusted the lasers to change the atoms' energy levels, making the majority of them high-energy, and so flipping the valley into an energy hill. The result was an inverse energy distribution, which is characteristic of negative temperatures.

The atoms can't lose energy and "roll down" this hill because doing so would require them to increase their kinetic energy and this is not possible because the system is in a vacuum and there is no outside energy source.

"We create a system with a lot of energy, but the particles cannot redistribute their energy so they have to stay on top of the hill," says Schneider.

Dark temperature

Cold atoms are already used to simulate the interactions of some subatomic particles. The new negative temperature set-up could be used to create simulated interactions that are not possible with positive temperatures. "They are a new technical tool in the business of quantum simulations," says Schneider. Negative temperature may also have implications for cosmology. Dark energy, thought to explain the accelerating expansion of the universe, exerts negative pressure, which suggests it might have negative temperature – Schneider is currently discussing the idea with cosmologists.

"It is amazing experimental work," says Allard Mosk of the University of Twente in the Netherlands, who originally outlined the theory behind the experiment in 2005. Learning more about how negative temperature systems interact both with themselves and with positive temperatures might allow us to build ultra-efficient heat engines, but these are far off, he says. "I don't think this will immediately give us new devices, but it will give us a deeper understanding about what temperature really is."

Journal reference: Science, 10.1126/science.1227831

http://www.eurekalert.org/pub_releases/2013-01/uoa-bev121312.php

Best evidence yet that dinosaurs used feathers for courtship

Some feathered dinosaurs used tail plumage to attract mates, much like modern-day peacocks and turkeys

Edmonton - A University of Alberta researcher's examination of fossilized dinosaur tail bones has led to a breakthrough finding: some feathered dinosaurs used tail plumage to attract mates, much like modern-day peacocks and turkeys.

U of A Paleontology researcher Scott Persons followed a chain of fossil evidence that started with a peculiar fusing together of vertebrae at the tip of the tail of four different species of dinosaurs, some separated in time and evolution by 45 million years.

Persons says the final vertebrae in the tails of a group of dinosaurs called oviraptors were fused together forming a ridged, blade-like structure. "The structure is called a pygostyle" says Persons. "Among modern animals only birds have them."

Researchers say fossils of Similicaudipteryx, an early oviraptor, reveals feathers radiating from the fused bones at the tail tip. Similicaudipteryx was not known to be a flying dinosaur and Persons contends its tail feathers evolved as a means of waving its feathered tail fans.

No direct fossil evidence of feathers has been found with the fossils of the oviraptors that followed *Similicaudipteryx*, but Persons says there is still strong evidence they had a feathered tail.

Persons reasons that because the later oviraptor had the same tail structure as the feathered *Similicaudipteryx*, the tails of later oviraptors' still served the same purpose, waving feathered tail fans. Persons says the hypothesis of oviraptor tail waving is supported by both the bone and muscle structure of the tail.

Individual vertebrae at the base of an oviraptor's tail were short and numerous, indicating great flexibility. Based on dissections of modern reptile and bird tails, Persons reconstruction of the dinosaur's tail muscles revealed oviraptors had what it took to really shake their tail feathers.



Oviraptor (here, "Ingenia" yanshini) courtship display. Sydney Mohr, University of Alberta

Large muscles extended far down the tail and had a sufficient number of broad connection points to the vertebrae to propel oviraptor's tail feathers vigorously from side to side and up and down.

Oviraptors were two-legged dinosaurs that had already gone through major diversifications from the iconic, meat eating dinosaur family. Oviraptors were plant eaters that roamed parts of China, Mongolia, and Alberta during the Cretaceous period, the final age of the dinosaur.

"By this time a variety of dinosaurs used feathers for flight and insulation from the cold," said Persons. "This shows that by the Late Cretaceous dinosaurs were doing everything with feathers that modern birds do now," said Persons.

In addition to feathered-tail waving, oviraptors also had prominent bone crests on their head, which Persons says the dinosaur also may have used in mating displays.

"Between the crested head and feathered-tail shaking, oviraptors had a propensity for visual exhibitionism," said Persons.

Persons, a U of A PhD candidate in paleontology was the lead researcher on the paper which was published Jan. 4 in the international journal Acta Palaeontologica Polonica

<http://slate.me/Wq6Z09>

That Is Not an Ear Infection

Why are doctors so quick to prescribe antibiotics to your (wailing) toddler?

By Melinda Wenner Moyer | Posted Thursday, Jan. 3, 2013, at 12:53 PM ET

Last March, while on vacation in Florida, my 11-month-old came down with a fever. We took him to a local pediatrician who quickly diagnosed him with a middle ear infection and prescribed him a 10-day course of antibiotics. Two days later, back home in New York, our pediatrician said our son probably never had an ear infection, and that regardless, he should stop taking the drugs.

At the time, I was exceptionally annoyed—goddamn Podunk doctor. What irked me wasn't just the misdiagnosis; it was that he had recommended unnecessary drugs that may have upset my baby's stomach and potentially, research suggests, increased his risk for asthma and irritable bowel disease. But it turns out Dr. Florida's actions were less the exception than the rule: Many U.S. pediatricians overdiagnose and overtreat ear infections, in part because of how difficult it is to accurately perform ear exams and in part because doctors feel you breathing down their stethoscope-adorned necks for the meds.

To make things even more complicated, the microbes that cause ear infections are changing: Vaccines have shifted the microbial flora blooming in American children, and thanks in part to routine antibiotic overuse, some bugs have become much harder to treat.

Advertisement

Common in the wintertime, middle ear infections—technically called acute otitis media, not to be confused with outer ear infections (swimmer's ear) or rare inner ear infections—aren't a big deal. Nearly 80 percent of American kids have had one by the time they turn 3; many seem to battle them constantly—perhaps yours? No one knows why some kids are more prone to them than others, but some research suggests that genetics plays a role, and environmental factors such as day care, exposure to tobacco smoke, and formula feeding are known to boost the risk as well. Ear infections can, however, be more than just a painful, oozing nuisance: They sometimes cause fluid to build up in the middle ear, leading to long-term hearing loss and language and literacy problems (and maybe even picky eating, as I discussed in my last column). Serious infections, left untreated, can also cause meningitis or mastoiditis, an infection of the mastoid bone in the skull, which requires surgery. So, no, ear infections should not just be ignored. But a 2008 French study reported that one-fifth of ear infections diagnosed by general practitioners are in reality something else, like minor ear inflammation; 7

percent of the time, doctors deem perfectly healthy ears infected. Why is ear health such a medical mystery? Fevers, ear pulling, and ear pain don't necessarily predict the presence of an infection, so doctors have to examine the middle ear to be sure—and that's really hard to do to a sick child. Doctors typically have to insert an instrument into the kid's ear, establish an airtight seal, squeeze a rubber bulb to release several bursts of air, and then watch to see how the child's eardrum responds. Oh, and if there's any earwax, the doc has to pluck it out with tweezers and try the whole thing again. As you can imagine, this doesn't always go well, so many pediatricians end up just peering into your kid's ear, seeing a little redness and guessing at a diagnosis instead. Even if a doctor is certain of an infection, there's the problem of knowing what kind of ear infection it is. Some are caused by viruses, which are immune to antibiotics, whereas others arise because a respiratory virus like the cold or flu made it easier for pre-existing bacteria to grow in the middle ear canal. (During a cold, mucus can block one or both Eustachian tubes, creating negative pressure inside the middle ear that pulls nearby bacteria in; at the same time, the plugged tube stops draining middle ear secretions into the throat, so the moisture-loving bacteria overgrow.) The only way a doctor can tell an infection's microbial origin is by inserting a needle into a child's eardrum and aspirating out some of the middle ear fluid, which (thankfully) few doctors do. Problem is, without knowing what's causing an infection, it's very difficult to know how best to treat it. Since 2004, the American Academy of Pediatrics has advised doctors against giving antibiotics to kids over the age of 2 if their ear infections are not severe. (All children under 6 months should get antibiotics, and kids between 6 months and 2 years should get them only if the doctor is absolutely certain of the infection, which is apparently only half the time.) Under this "watchful waiting" approach, doctors are supposed to re-examine the child a few days later to see if the infection is getting better; if it's not, drugs then might be in order. (The AAP is expected to release new treatment guidelines sometime this year.)

There's a good reason for this conservative approach: No matter what their cause, most ear infections go away on their own. In a 2011 clinical trial, University of Pittsburgh researchers reported that 74 percent of children under 2 who were suffering from ear infections got better after one week when they weren't given any treatment; 80 percent of those who got antibiotics got better in the same time frame. Yet half of the kids treated with antibiotics in the study got bouts of diarrhea, compared with only 27 percent of the kids who didn't take anything. (Ear tubes, which are sometimes surgically inserted in children who have recurring infections, can help but research suggests for only about six months.) So, yes, after a week on amoxicillin your son finally stopped wailing, waking in the night, and tugging at his ear. But that could very well have been just because time had passed and his immune system fought the bug off.

Unfortunately, most doctors prescribe antibiotics anyway. In a 2010 study, Boston University researchers surveyed 300 pediatricians and found that 85 percent of the time, when infections were minor, doctors ignored the AAP's guidelines and prescribed drugs. Most of the doctors said they thought that the guidelines made good sense, but they felt pressured by parents to give out drugs anyway. This reckless overuse of antibiotics isn't just expensive; it is believed to drive antibiotic resistance, too. In 2007, scientists at the U.S. Centers for Disease Control and Prevention identified a new form of *Streptococcus pneumoniae* called 19A that causes childhood ear infections and is resistant to every FDA-approved antibiotic. Now that's a bug you don't want your child to get.

Ear infections are changing in other ways, too. In 2000, a vaccine called PCV7, which protects kids against seven (out of a total of 93) subtypes of *Streptococcus pneumoniae*, became part of the standard U.S. vaccine schedule; in 2010, it was replaced with PCV13, which protects against five additional subtypes, including the drug-resistant 19A. As a result of these vaccines, overall ear infection numbers have dropped by 6 percent since 2000, but the types have now shifted in that more infections are now caused by *Haemophilus influenzae* or *Moraxella catarrhalis* than they used to be. Doctors disagree about what these changes mean, clinically speaking: On the one hand, the new vaccine protects against 19A and should therefore reduce the number of resistant 19A infections, but on the other hand, some strains of the now more common *H. influenzae* do not respond to first-line antibiotics.

The bottom line is that ear infections are beguiling, yet they are also less common than you might have been led to believe and more innocuous as well. This doesn't mean you shouldn't take your shrieking, ear-clawing child to the pediatrician. You should. But don't pitch a fit while you're there—what do you mean you're not giving Lola antibiotics? She's been screaming for 17 hours!—and if your doctor prescribes drugs without skipping a beat, consider asking if a watchful waiting approach might work instead. Then, pick up some pain relievers on the way home—a bottle of children's Tylenol for her, and some chardonnay for you.

The Kids would like to thank Melinda Pettigrew at Yale University, Tumaini Coker at UCLA, and Itzhak Brook at Georgetown University.

<http://phys.org/news/2013-01-geologists-theorize-early-earth-hydrogen-nitrogen.html>

Geologists theorize early Earth was kept warm by hydrogen-nitrogen collisions

Geologists suggest that early Earth was kept warm enough for life to develop by collisions between hydrogen and nitrogen molecules in the atmosphere

Phys.org - Geologists Robin Wordsworth and Raymond Pierrehumbert of the University of Chicago, suggest in a paper published in the journal *Science* that early Earth was kept warm enough for life to develop by collisions between hydrogen and nitrogen molecules in the atmosphere.

In a perspective piece in the same journal, fellow geologist James Kasting of Pennsylvania State University comments on the work Wordsworth and Pierrehumbert have been doing and suggests their theories seem plausible.

During the first two billion years of Earth's existence, something helped keep the planet warm enough for life to develop, but it wasn't heat from the sun.

Scientists have put forth many theories to explain why the planet wasn't covered with ice despite receiving just 70 percent of the solar radiation it gets today. Most have centered on the idea that methane from hydrogen eating organisms likely served as a greenhouse gas, helping trap the small amount of heat that did come from the sun.

In this new research, Wordsworth and Pierrehumbert suggest an entirely different source – collisions between hydrogen and nitrogen molecules that resulted in the creation of "dimer" molecules that would wobble in response to being struck by infrared light from the sun. That wobbling, they say, would have allowed for heat capture providing the planet with a warm blanket.

For this theory to stand up, there would have had to have been more hydrogen gas in the atmosphere than there is today and the researchers point to new work by others that suggests that this might in fact have been the case – some calculations show that during Earth's formative years, its atmosphere might have been made up of 30 percent hydrogen.

Wordsworth and Pierrehumbert suggest that if it was even as much as 10 percent, that would have been enough to cause the planet to heat by as much as 18 to 27 degrees Fahrenheit.

Because of their findings and theories, the researchers suggest that other planets may be experiencing similar warming effects and thus scientists searching for life outside of our solar system might consider revising the criteria they use for determining if a planet or other body is worthy of further research, particularly those known as super-Earth's – those considered to be of the right size, but more distant from their star than our planet is from the sun. If they have a lot of hydrogen, they might be worth a closer look.

More information: Hydrogen-Nitrogen Greenhouse Warming in Earth's Early Atmosphere, Science 4 January 2013: Vol. 339 no. 6115 pp. 64-67 DOI: 10.1126/science.1225759

ABSTRACT

Understanding how Earth has sustained surface liquid water throughout its history remains a key challenge, given that the Sun's luminosity was much lower in the past. Here we show that with an atmospheric composition consistent with the most recent constraints, the early Earth would have been significantly warmed by H₂-N₂ collision-induced absorption. With two to three times the present-day atmospheric mass of N₂ and a H₂ mixing ratio of 0.1, H₂-N₂ warming would be sufficient to raise global mean surface temperatures above 0°C under 75% of present-day solar flux, with CO₂ levels only 2 to 25 times the present-day values. Depending on their time of emergence and diversification, early methanogens may have caused global cooling via the conversion of H₂ and CO₂ to CH₄, with potentially observable consequences in the geological record.

http://www.eurekalert.org/pub_releases/2013-01/uoc--pap010313.php

Pesticides and Parkinson's: UCLA researchers uncover further proof of a link

Study suggests potential new target in fight against debilitating disease

For several years, neurologists at UCLA have been building a case that a link exists between pesticides and Parkinson's disease.

To date, paraquat, maneb and ziram — common chemicals sprayed in California's Central Valley and elsewhere — have been tied to increases in the disease, not only among farmworkers but in individuals who simply lived or worked near fields and likely inhaled drifting particles.

Now, UCLA researchers have discovered a link between Parkinson's and another pesticide, benomyl, whose toxicological effects still linger some 10 years after the chemical was banned by the U.S. Environmental Protection Agency.

Even more significantly, the research suggests that the damaging series of events set in motion by benomyl may also occur in people with Parkinson's disease who were never exposed to the pesticide, according to Jeff Bronstein, senior author of the study and a professor of neurology at UCLA, and his colleagues.

Benomyl exposure, they say, starts a cascade of cellular events that may lead to Parkinson's. The pesticide prevents an enzyme called ALDH (aldehyde dehydrogenase) from keeping a lid on DOPAL, a toxin that naturally occurs in the brain. When left unchecked by ALDH, DOPAL accumulates, damages neurons and increases an individual's risk of developing Parkinson's.

The investigators believe their findings concerning benomyl may be generalized to all Parkinson's patients. Developing new drugs to protect ALDH activity, they say, may eventually help slow the progression of the disease, whether or not an individual has been exposed to pesticides.

The research is published in the current online edition of Proceedings of the National Academy of Sciences. Parkinson's disease is a debilitating neurodegenerative disorder that affects millions worldwide. Its symptoms — including tremor, rigidity, and slowed movements and speech — increase with the progressive degeneration of neurons, primarily in a part of the mid-brain called the substantia nigra. This area normally produces dopamine, a neurotransmitter that allows cells to communicate, and damage to the mid-brain has been linked to the disease. Usually, by the time Parkinson's symptoms manifest themselves, more than half of these neurons, known as dopaminergic neurons, have already been lost.

While researchers have identified certain genetic variations that cause an inherited form of Parkinson's, only a small fraction of the disease can be blamed on genes, said the study's first author, Arthur G. Fitzmaurice, a postdoctoral scholar in Bronstein's laboratory.

"As a result, environmental factors almost certainly play an important role in this disorder," Fitzmaurice said.

"Understanding the relevant mechanisms — particularly what causes the selective loss of dopaminergic neurons — may provide important clues to explain how the disease develops."

Benomyl was widely used in the U.S. for three decades until toxicological evidence revealed it could potentially lead to liver tumors, brain malformations, reproductive effects and carcinogenesis. It was banned in 2001.

The researchers wanted to explore whether there was a relationship between benomyl and Parkinson's, which would demonstrate the possibility of long-lasting toxicological effects from pesticide use, even a decade after chronic exposure. But because a direct causal relationship between the pesticide and Parkinson's can't be established by testing humans, the investigators sought to determine if exposure in experimental models could duplicate some of the pathologic features of the disease.

They first tested the effects of benomyl in cell cultures and confirmed that the pesticide damaged or destroyed dopaminergic neurons.

Next, they tested the pesticide in a zebrafish model of the disease. This freshwater fish is commonly used in research because it is easy to manipulate genetically, it develops rapidly and it is transparent, making the observation and measurement of biological processes much easier. By using a fluorescent dye and counting the neurons, the researchers discovered there was significant neuron loss in the fish — but only to the dopaminergic neurons. The other neurons were left unaffected.

Until now, evidence had pointed to one particular culprit — a protein called α -synuclein — in the development of Parkinson's. This protein, common to all Parkinson's patients, is thought to create a pathway to the disease when it binds together in "clumps" and becomes toxic, killing the brain's neurons. (See UCLA research using "molecular tweezers" to break up these toxic aggregations.)

The identification of ALDH activity now gives researchers another target to focus on in trying to stop this disease.

"We've known that in animal models and cell cultures, agricultural pesticides trigger a neurodegenerative process that leads to Parkinson's," said Bronstein, who directs the UCLA Movement Disorders Program. "And epidemiologic studies have consistently shown the disease occurs at high rates among farmers and in rural populations. Our work reinforces the hypothesis that pesticides may be partially responsible, and the discovery of this new pathway may be a new avenue for developing therapeutic drugs."

Other authors of the study included Lisa Barnhill, Hoa A. Lam, Aaron Lulla, Nigel T. Maidment, Niall P. Murphy, Kelley C. O'Donnell, Shannon L. Rhodes, Beate Ritz, Alvaro Sagastig and Mark C. Stahl, all of UCLA; John E. Casida of UC Berkeley; and Myles Cockburn of the University of Southern California. The authors declare no conflict of interest.

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<http://www.sciencedaily.com/releases/2013/01/130104083103.htm>

Breast Milk Contains More Than 700 Species of Bacteria, Spanish Researchers Find

Spanish researchers have traced the bacterial microbiota map in breast milk, which is often the main source of nourishment for newborns.

The study has revealed a larger microbial diversity than originally thought: more than 700 species. The breast milk received from the mother is one of the factors determining how the bacterial flora will develop in the newborn baby. However, the composition and the biological role of these bacteria in infants remain unknown.

A group of Spanish scientists have now used a technique based on massive DNA sequencing to identify the set of bacteria contained within breast milk called microbiome. Thanks to their study, pre- and postnatal variables influencing the microbial richness of milk can now be determined.

Colostrum is the first secretion of the mammary glands after giving birth. In some of the samples taken of this liquid, more than 700 species of these microorganisms were found, which is more than originally expected by experts. The results have been published in the American Journal of Clinical Nutrition.

"This is one of the first studies to document such diversity using the pyrosequencing technique (a large scale DNA sequencing determination technique) on colostrum samples on the one hand, and breast milk on the other, the latter being collected after one and six months of breastfeeding," explain the coauthors, María Carmen Collado, researcher at the Institute of Agrochemistry and Food Technology (IATA-CSIC) and Alex Mira, researcher at the Higher Public Health Research Centre (CSISP-GVA).

The most common bacterial genera in the colostrum samples were Weissella, Leuconostoc, Staphylococcus, Streptococcus and Lactococcus. In the fluid developed between the first and sixth month of breastfeeding, bacteria typical of the oral cavity were observed, such as Veillonella, Leptotrichia and Prevotella.

"We are not yet able to determine if these bacteria colonise the mouth of the baby or whether oral bacteria of the breast-fed baby enter the breast milk and thus change its composition," outline the authors.

The heavier the mother, the fewer the bacteria. The study also reveals that the milk of overweight mothers or those who put on more weight than recommended during pregnancy contains a lesser diversity of species. The type of labour also affects the microbiome within the breast milk: that of mothers who underwent a planned caesarean is different and not as rich in microorganisms as that of mothers who had a vaginal birth. However, when the caesarean is unplanned (intrapartum), milk composition is very similar to that of mothers who have a vaginal birth.

These results suggest that the hormonal state of the mother at the time of labour also plays a role: "The lack of signals of physiological stress, as well as hormonal signals specific to labour, could influence the microbial composition and diversity of breast milk," state the authors.

Help for the food industry

Given that the bacteria present in breast milk constitute one of initial instances of contact with microorganisms that colonise the infant's digestive system, the researchers are now working to determine if their role is metabolic (it helps the breast-fed baby to digest the milk) or immune (it helps to distinguish beneficial or foreign organisms).

For the authors, the results have opened up new doors for the design of child nutrition strategies that improve health. "If the breast milk bacteria discovered in this study were important for the development of the immune system, its addition to infant formula could decrease the risk of allergies, asthma and autoimmune diseases," conclude the authors.

R. Cabrera-Rubio, M. C. Collado, K. Laitinen, S. Salminen, E. Isolauri, A. Mira. *The human milk microbiome changes over lactation and is shaped by maternal weight and mode of delivery. American Journal of Clinical Nutrition, 2012; 96 (3): 544 DOI: 10.3945/ajcn.112.037382*

http://www.eurekalert.org/pub_releases/2013-01/uoc--hpc010413.php

How prostate cancer therapies compare by cost and effectiveness

Surgery ranks as the most cost-effective type of treatment, according to UCSF-led study

The most comprehensive retrospective study ever conducted comparing how the major types of prostate cancer treatments stack up to each other in terms of saving lives and cost effectiveness is reported this week by a team of researchers at the University of California, San Francisco (UCSF).

Appearing in the British Journal of Urology International, the work analyzed 232 papers published in the last decade that report results from clinical studies following patients with low-, intermediate- and high-risk forms of prostate cancer who were treated with one or more of the standard treatments – radiation therapy, surgery, hormone therapies and brachytherapy.

The analysis shows that for people with low-risk prostate cancer, the various forms of treatment vary only slightly in terms of survival – the odds of which are quite good for men with this type of cancer, with a 5-year cancer-specific survival rate of nearly 100 percent. But the cost of radiation therapy is significantly more expensive than surgery for low-risk prostate cancer, they found.

For intermediate- and high-risk cancers, both survival and cost generally favored surgery over other forms of treatment – although combination external-beam radiation and brachytherapy together were comparable in terms of quality of life-adjusted survival for high-risk prostate cancer.

"Our findings support a greater role for surgery for high-risk disease than we have generally seen it used in most practice settings," said urologist Matthew Cooperberg, MD, MPH who led the research. Cooperberg is an assistant professor of urology and epidemiology and biostatistics in the UCSF Helen Diller Family Comprehensive Cancer Center.

The UCSF Helen Diller Family Comprehensive Cancer Center is one of the country's leading research and clinical care centers, and it is the only comprehensive cancer center in the San Francisco Bay Area.

Many Treatment Options, but Few Cost Analyses

Localized prostate cancer accounts for about 81 percent of the quarter-million cases of prostate cancers that occur in the United States every year, according to the National Cancer Institute. It is defined by tumors that have not metastasized and spread outside the prostate gland to other parts of the body.

There are multiple types of treatment for this form of the disease, including various types of surgery (open, laparoscopic or robot-assisted); radiation therapy (dose-escalated three-dimensional conformal radiation therapy, intensity-modulated radiation therapy and brachytherapy); hormone therapies; and combinations of each of these.

Many men with low-risk prostate cancer do not need any of these treatments, and can be safely observed, at least initially.

Treatment plans for localized prostate cancer often vary dramatically from one treatment center to another. As Cooperberg put it, one person may have surgery, while someone across town with a very similar tumor may have radiation therapy, and a third may undergo active surveillance. All treatment regimens may do equally well.

"There is very little solid evidence that one [approach] is better than another," said Cooperberg. The motivation for the new study, however, was that there are also few data examining the differences in terms of cost-effectiveness – the price to the health care system for every year of life gained, with adjustment for complications and side effects of treatments.

The new study was the most comprehensive cost analysis ever, and it compared the costs and outcomes associated with the various types of treatment for all forms of the disease, which ranged from \$19,901 for robot-assisted prostatectomy to treat low-risk disease, to \$50,276 for combined radiation therapy for high-risk disease.

The study did not consider two other approaches for dealing with prostate cancer: active surveillance, where patients with low-risk cancer are followed closely with blood tests and biopsies and avoid any initial treatment; and proton therapy, which is much more expensive and has already been shown in multiple studies not to be cost-effective, said Cooperberg.

The article, "Primary treatments for clinically localised prostate cancer: a comprehensive lifetime cost-utility analysis" is authored by Matthew R. Cooperberg, Naren R. Ramakrishna, Steven B. Duff, Kathleen E. Hughes, Sara Sadownik, Joseph A. Smith and Ashutosh K. Tewari. It was published online on Dec. 28, 2012 by the British Journal of Urology International. The article can be accessed at: <http://dx.doi.org/10.1111/j.1464-410X.2012.11597.x>

In addition to UCSF, authors on the study are affiliated with Veritas Health Economics Consulting, Inc. in Carlsbad, CA; MD Anderson Cancer Center in Orlando, FL; Avalere Health LLC, in Washington, DC; Vanderbilt University in Nashville, TN; and Cornell University in New York.

In addition to UCSF and Kaiser Permanente, authors on this study are affiliated with the University of Washington in Seattle, the University of Michigan, Ann Arbor Veterans Affairs Health Care System in Michigan and the California Department of Public Health.

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<http://www.sciencedaily.com/releases/2013/01/130104101423.htm>

Induction of Adult Cortical Neurogenesis by an Antidepressant

Report of production of new neurons in the adult normal cortex in response to fluoxetine

The production of new neurons in the adult normal cortex in response to the antidepressant, fluoxetine, is reported in a study published online this week in *Neuropsychopharmacology*.

The research team, which is based at the Institute for Comprehensive Medical Science, Fujita Health University, Aichi, has previously demonstrated that neural progenitor cells exist at the surface of the adult cortex, and, moreover, that ischemia enhances the generation of new inhibitory neurons from these neural progenitor cells. These cells were accordingly named "Layer 1 Inhibitory Neuron Progenitor cells" (L1-INP). However, until now it was not known whether L1-INP-related neurogenesis could be induced in the normal adult cortex. Tsuyoshi Miyakawa, Koji Ohira, and their colleagues employed fluoxetine, a selective serotonin reuptake inhibitor, and one of the most widely used antidepressants, to stimulate the production of new neurons from L1-INP cells. A large percentage of these newly generated neurons were inhibitory GABAergic interneurons, and their generation coincided with a reduction in apoptotic cell death following ischemia. This finding highlights the potential neuroprotective response induced by this antidepressant drug. It also lends further support to the postulation that induction of adult neurogenesis in cortex is a relevant prevention/treatment option for neurodegenerative diseases and psychiatric disorders.

Koji Ohira, Rika Takeuchi, Hirotaka Shoji and Tsuyoshi Miyakawa. Fluoxetine-Induced Cortical Adult Neurogenesis Open. Neuropsychopharmacology, 2013 DOI: 10.1038/npp.2013.2

<http://news.discovery.com/tech/mussels-inspire-sensitive-tooth-treatment-130104.html#mkcpgn=rssnws1>

Mussels Inspire Sensitive Tooth Treatment

If you have sensitive teeth, it's usually because the enamel and dentin on the surface is worn away, exposing the tissues -- and nerves.

Analysis by Jesse Emspak

Going sugar-free can help a bit, and there are toothpastes and mouth rinses that help alleviate the sensitivity. But enamel isn't made up of living cells, so once it's gone from a tooth, it's gone for good. Quan-Li Li, Chun Hung Chu and a team at the Anhui Medical University and University of Hong Kong may have hit on a way to rebuild enamel and dentin even after enamel wears away completely. They used a substance similar to the one mussels use to stick onto rocks - dopamine.

Teeth are layered. The outer part is the enamel and underneath is the dentin, which is the white part. To restore enamel that has worn off, it's necessary to get minerals to stick to the dentin. That's where the dopamine comes in. Most people think of dopamine as a chemical in the brain, but it also works as a strong glue for mussels. The researchers dipped bits of human teeth in an acid solution to wear away the enamel. Then they put them in a solution of dopamine. After they dried them off, they immersed the tooth bits in a solution of calcium carbonate, phosphate and fluoride.

The result was restoration of the enamel surface after a week of immersion in the calcium carbonate mixture. The dopamine, as it happened, allowed the minerals to bond to the dentin better and restored some of the hardness of the teeth, though not all of it.

There is still some work to do on checking whether there is any toxicity -- the researchers say it shouldn't be too much of a problem, though, since the amounts are small. Thus far the tests have been on pieces of tooth in the lab rather than in a mouth. But if it works it could end up being a relatively simple treatment for all those folks for whom drinking hot tea or eating sugar is painful. The team's results were published in the journal *ACS Applied Materials & Interfaces*.

<http://bit.ly/TSU9sM>

DUD: The Nightmarish Dangers of Drowsy Driving

As many as a third of all fatal car crashes might involve fatigued drivers

By Katherine Harmon | January 4, 2013

Driving under the influence of alcohol or drugs is known to increase the chances of causing an accident. For instance, marijuana can impair drivers' reaction time. But what about drowsiness? As many as a third of all fatal car crashes might involve fatigued drivers, according to research by the National Highway Traffic Safety Administration.

And a new study finds that driving while under the influence—of drowsiness—is exceedingly common.

More than one in 25 people report actually having fallen asleep behind the wheel at least once within the past month, according to a new study from the U.S. Centers for Disease Control and Prevention (CDC).

Unsurprisingly, drivers who are at risk of dozing are more likely to cause crashes that result in injuries or death

than are alert drivers. "Drowsiness slows reaction time, makes drivers less attentive and impairs decision-making skills," the report authors noted.

The researchers, led by Anne Wheaton, an epidemiologist at the CDC, analyzed responses from more than 147,000 adults who participated in the Behavioral Risk Factor Surveillance System phone survey. Respondents hailed from 19 states and the District of Columbia; within these areas, Texas—with its 3,200-plus miles of interstates—had the highest rate of severely tired drivers, with 6.1 percent of respondents saying they had slumbered at the wheel, and Oregon had the lowest, with just 2.5 percent.

Not surprisingly, people who reported having zoned out while driving were more likely to say they most often got six or fewer hours of shuteye and/or snored, which can be a sign of sleep apnea. Older drivers—those 65 and up—were the least likely to report having caught some winks while driving (just 1.7 percent had), whereas those ages 25 to 34 and 35 to 44 were the most likely (6.3 percent and 5.5 percent, respectively). Those in these age categories might be more likely to be working shifts or slogging through long commutes, while those who are retired were by far the least likely to have reported falling asleep (1 percent), suggesting they might be getting ample rest and not feel compelled to drive when they are not up for it.

These numbers are likely to be below the actual rate of somnolent automobilists because they rely on self-reported responses; many people who nod off for just a second or so don't even realize it has happened. Additionally, these stats represent those who have actually dozed at the wheel; more than a quarter of adults report driving while they feel bushed in a given month, according to a recent poll by the National Sleep Foundation.

Those most at risk for being severely sleepy at the wheel included commercial drivers, people with sleep disorders who are not being properly treated, people who take sedatives, people who generally do not get enough sleep, and people who work long or night shifts.

Shift workers often operate short on sleep. Research published last year by the CDC also showed that those working in dangerous industries—including transportation jobs such as commercial driving. In fact, that study found that nearly 70 percent of people who worked overnight shifts in transportation or warehousing industries often got fewer than six hours of z's.

Most fatigue-induced accidents occur in the afternoon and nighttime. The best thing to do to avoid dangerous drowsiness is to pull over and rest. Common "techniques to stay awake while driving, such as turning up the radio, opening the window, and turning up the air conditioner, have not been found to be effective," the authors of the new CDC study reported. It remains to be seen whether new car technology to sense and alert drowsy drivers can help. In the meantime, hopefully the road safety worries aren't enough to cause any more lost sleep.

<http://news.discovery.com/human/should-the-pill-be-sold-over-the-counter-130104.html#mkcpgn=rssnws1>

Should the Pill Be Sold Over the Counter?

After the American College of Obstetricians and Gynecologists said recently that birth control pills should be available without a prescription, a new survey shows that in most countries, they are.

Analysis by Sheila Eldred

After obtaining information from 147 countries, researchers found that prescriptions for birth control pills are needed in only 31 percent (including the U.S., Canada, and many European countries). In 38 percent of countries, the pill is available over the counter despite formal laws to the contrary. In 24 percent of countries, it's legally available without a prescription, and in 8 percent of countries, a screening is required instead of a prescription. The research will be published in the journal *Contraception*.

Advocates of over-the-counter birth control are hoping that the data will show that women can screen themselves for risk factors for the Pill.

"We can start to use this information to... get a sense of the safety of women having access to this method where no prescription is required," Kari White, who studies birth control at the University of Alabama in Birmingham but was not involved in the study, told Reuters.

Despite the opinion of ACOG, getting access to over-the-counter birth control in the U.S. is a long way off, experts say. Although the Pill is generally considered safe (arguably it has a similar set of risks as aspirin and acetaminophen), the FDA would first have to approve it. And Dr. Daniel Grossman, who worked on the survey and is an advocate for over-the-counter access, told USA Today that he doesn't know of any drug companies that have started that process.

In the meantime, Grossman hopes that the data will be helpful to countries interested in wider access to birth control.

"Will this information about the availability of pills being over-the-counter in other countries influence policy here? Probably not," Grossman told Reuters Health. "But I do think it helps to put it in perspective that this is not something revolutionary."

<http://bit.ly/TDY0v3>

Do The Bacteria Behind Cat Scratch Fever Cause Chronic Fatigue?

The bacteria behind cat scratch fever remain cloaked in mystery

By Marissa Fessenden | Friday, January 4, 2013 | 2

A question that has been simmering for years in the veterinarian community is now attracting the interest of physicians as well: Do the bacteria that cause cat scratch disease—a typically mild illness with flulike symptoms—also cause chronic fatigue syndrome? Decades of case reports hint at associations between fatigue, chronic headaches, numbness, pain and cognitive impairment and infection with Bartonella. Yet researchers still do not have clear answers.

Recent research found fragments of Bartonella species' DNA in 41 percent of 296 patients examined by a rheumatologist. Many of them had visited multiple specialists without finding relief from their symptoms. The findings, published in May 2012 in *Emerging Infectious Diseases*, drew criticism in two letters to the editor, published last November, which expressed concerns with patient inclusion criteria and a low threshold cited as evidence of infection. “We must be cautious before attributing illnesses X, Y and Z to Bartonella infection without solid evidence,” says Christina Nelson, a medical epidemiologist at the U.S. Centers for Disease Control and Prevention, who adds that the study results were difficult to interpret.

Complicating matters is the pathogen's elusive biology: it evades detection within hosts by changing proteins on its surface and by hiding inside blood vessels. In addition, the organism can shift strategies depending on whether it is in a mammalian host, such as a cat or dog, or an insect vector, such as a flea or tick. “We are not even at the tip of the iceberg” when it comes to understanding Bartonella, says Jane Koehler, a professor of medicine at the University of California, San Francisco.

<http://news.discovery.com/tech/electrical-current-releases-happiness-130105.html#mkcpgn=rssnws1>

Electrical Current Releases Happiness

Neuroscientists released natural opiate-like substances from the brain using a constant low electrical current

Analysis by Alyssa Danigelis

Totally trippy: A group of neuroscience researchers succeeded in releasing natural opiate-like substances from the brain using a constant low electrical current. This gives self-medicating a new meaning.

A group from the University of Michigan, Harvard, and CUNY led by senior researcher Alexandre DaSilva and Dr. Jon-Kar Zubieta, experimented with an application called “transcranial direct current stimulation” or tDCS. They studied a patient with severe chronic facial pain, first administering a radiotracer and then applied electrodes that stimulated a specific area of the skull with a very small current for 20 minutes.

That current released the brain's natural painkillers known as endogenous opioids. One session improved the patient's pain threshold by 36 percent, according to an article (full article link) the researchers published recently in the journal *Frontiers in Neuropsychiatric Imaging and Stimulation*. A PET scan during the session showed what was happening.

While that first session didn't alleviate the clinical pain, the researchers think that repeated sessions would have a lasting effect. According to Michigan University's news service, another study on more patients was just completed and initial results showed that more tDCS did help.

Brain stimulation might have crazy uses beyond treating pain. The BBC's Tom Feilden reported last year that tDCS has the potential to enhance overall cognitive performance, depending on where the current is applied. Try that one on for size.

For now, though, I think it's good that scientists are focusing on tDCS for people who have mind-melting pain. Imagine being able to book tDCS sessions instead of taking strong medications, which have all kinds of side effects and can be addicting. Maybe our brains already contain the cure.

<http://www.bbc.co.uk/news/health-20898935>

Totally blind mice get sight back

Totally blind mice have had their sight restored by injections of light-sensing cells into the eye, UK researchers report.

By James Gallagher Health and science reporter, BBC News

The team in Oxford said their studies closely resemble the treatments that would be needed in people with degenerative eye disease. Similar results have already been achieved with night-blind mice.

Experts said the field was advancing rapidly, but there were still questions about the quality of vision restored. Patients with retinitis pigmentosa gradually lose light-sensing cells from the retina and can become blind.

The research team, at the University of Oxford, used mice with a complete lack of light-sensing photoreceptor cells in their retinas. The mice were unable to tell the difference between light and dark.

Reconstruction

They injected "precursor" cells which will develop into the building blocks of a retina once inside the eye. Two weeks after the injections a retina had formed, according to the findings presented in the Proceedings of the National Academy of Sciences journal.

Prof Robert MacLaren said: "We have recreated the whole structure, basically it's the first proof that you can take a completely blind mouse, put the cells in and reconstruct the entire light-sensitive layer."

Previous studies have achieved similar results with mice that had a partially degenerated retina. Prof MacLaren said this was like "restoring a whole computer screen rather than repairing individual pixels".

The mice were tested to see if they fled being in a bright area, if their pupils constricted in response to light and had their brain scanned to see if visual information was being processed by the mind.

Vision

Prof Pete Coffee, from the Institute of Ophthalmology at University College London, said the findings were important as they looked at the "most clinically relevant and severe case" of blindness.

"This is probably what you would need to do to restore sight in a patient that has lost their vision," he said.

However, he said this and similar studies needed to show how good the recovered vision was as brain scans and tests of light sensitivity were not enough. He said: "Can they tell the difference between a nasty animal and something to eat?"

Prof Robin Ali published research in the journal Nature showing that transplanting cells could restore vision in night-blind mice and then showed the same technique worked in a range of mice with degenerated retinas.

He said: "These papers demonstrate that it is possible to transplant photoreceptor cells into a range of mice even with a severe level of degeneration.

"I think it's great that another group is showing the utility of photoreceptor transplantation."

Researchers are already trialling human embryonic stem cells, at Moorfields Eye Hospital, in patients with Stargardt's disease. Early results suggest the technique is safe but reliable results will take several years.

Retinal chips or bionic eyes are also being trailed in patients with retinitis pigmentosa.

<http://arstechnica.com/science/2013/01/profits-over-your-dead-body/>

Profits over your dead body

Health regulatory and advocacy groups are deliberately corrupted.

by Chris Lee - Jan 6 2013, 1:00am TST

Imagine living in a world where visiting the doctor was an experience fraught with danger. Where the drugs you were prescribed may or may not be effective—and may or may not be safe. Imagine having a medical procedure recommended that wasn't known to work.

Up until the beginning of the 20th century, that was the case. People feared doctors, and rightly so, as bringers of death. But now, medicines and medical practice are tightly regulated, and a visit to the doctor is unlikely to result in septicaemia, or some other -emia that results in green goo bursting out of a limb. Nevertheless, certain practices have crept into healthcare that, on aggregate, have led to the early deaths of a large numbers of people. Now, the conspiracy minded among you might be thinking of cartoon villains covering up dastardly poison pills, but this is not actually the case.

Ben Goldacre, a physician who writes the Bad Science blog, has now made a comprehensive catalog of these practices published in a book called Bad Pharma. In examining the healthcare industry, he paints a complicated picture in which almost all the actors are both bad guys and good guys. It can be read as a stinging rebuke, but more than anything it's criticism from someone who appreciates everything modern medicine has done—but wants to see it do even better.

Your GP is your friend, right?

Goldacre takes the medical community apart piece by piece. Take, for example, your friendly general practitioner. How old are they? When did they leave medical school? How up to date is their medical knowledge? Typically, a doctor's continuing education is an ad hoc thing, until recently, driven by their own motivation to stay current. Now, let's compound the problem: as a doctor, you are offered this very expensive week-long course on, say, the latest in blood pressure control medication. Alternately you can go on a free course. It just so happens that the free course is funded by a drug company, and guess whose drugs take center stage at that course?

Most GPs will take the free course. From the time your GP leaves medical school, they are likely to be given biased information on the effectiveness of drugs, making it difficult for them to make good clinical decisions. And, demonstrating a wonderful lack of self-awareness, most will insist that these sponsored courses and visits

by drug representatives do not influence their own prescribing decisions. Even funnier, they do believe that the events influence the doctor next door.

But drugs work, don't they?

Surely the drugs on the market have been shown to work, you cry. Unfortunately, the story is not so simple, and Bad Pharma explains why. To get a drug on the market, you only have to show that it is better than a placebo. Drugs are almost never compared against the current best treatment. And when you do make such a comparison, it can sometimes seem like it is pretty close to random chance that decides whether the older or newer treatment is more effective.

To ensure that their drug makes it on to the market, drug companies can run multiple trials, and then simply present the data from the trial that shows a positive result—the rest never sees the light of day. Well, okay, it is not quite that simple, but it is true that negative results aren't put forward for public scrutiny, and that drug companies have a history of misleading regulatory authorities with trial data. The companies work to ensure that a drug stays on the market for as long as its patent is valid.

It is even worse than that though. Often you want to know whether the drug treats the underlying condition. But that can be very difficult to measure, so we end up using proxies. For instance, if you are treating a heart condition, then what you want to measure is whether the drug extends the life of the patient. But that takes years to test so a proxy like blood pressure is substituted. If a treatment lowers blood pressure, it must be doing good. That conclusion, however, should be regarded as tentative. To make certain that a drug actually works, those long-term mortality studies must be conducted.

That means that the drugs that you are prescribed are usually not known to be the best treatment. Some may be, but others are, at best, better than doing nothing. Bad enough? Wait, because Goldacre has more. The other side of the coin are a drug's side effects. Before a drug goes on the market, it gets tested in up to a few thousand people. This is actually not enough to detect side effects that are either rare, or common within sub-populations. This comes as no surprise to many people. The problem, however, lies in the lack of follow-through. Often a drug is allowed on the market under the condition that there will be follow up studies that will examine side effects and confirm its effectiveness. Yet those studies are likely to vanish without trace. Indeed, even though medical journals now explicitly welcome negative findings, studies that find a treatment doesn't work are about five times less likely to be published.

This publication bias is important. Imagine that you were a doctor who kept up to date by reading the medical literature—as every good doctor should. No doctor, however, can read all the literature, so they are likely to read systematic reviews, like those offered by Cochrane. However, a systematic review is only as good as the data the reviewers can get hold of—and, as we've just said, that's distorted.

The regulator knows what's best

Amazingly enough, regulatory bodies often have information on safety and efficacy they do not share with the likes of Cochrane. Indeed, they are just as likely to keep the results of studies secret. The European regulatory authority withheld data for a set of drugs for several years on spurious grounds, before getting smacked down by its ombudsman.

It is truly shocking that such poor behavior is simply accepted as normal. The authorities are the only people who can compel a drug company to release data, yet they often don't—and if they won't do it, you can imagine that the drug companies won't volunteer it.

The unhappy situation, according to Goldacre, is that the regulators in the US and Europe have been captured by the pharmaceutical industry. Which is not to say that they don't do their job in determining if a drug should go on to the market. But they have become extremely reluctant to take a drug off the market when it has been found to be harmful or not beneficial.

One of the issues that makes this possible is that the same body of people that make the decision to allow a drug onto the market are the ones who must take it off. Essentially, they have to admit that they are wrong. You try standing up in front of 300 million people and saying "Yeah, sorry that painkiller you have been taking and believe is fantastic? It could give you a heart attack and you aren't going to be able to purchase it anymore."

Patients with no patience

You might think that patient advocacy groups would remain your friend—surely the asthma society will advocate on behalf of asthma patients, right? But as Goldacre describes it, not necessarily. Patient advocacy groups also receive money from pharmaceutical companies, though they never declare this as explicitly as they do the donations from generous individuals or charity fundraisers.

It seems that there is sometimes a correlation between a patient advocacy group's position on a drug and its source of funding. If that is a coincidence, then I am in for some serious hat eating.

There is also the other side of this coin as well, where patients turn up demanding that insurance companies or national health providers fund a particular medication, even though the evidence for the medication's effectiveness might be extremely weak. Yet these patients seem driven to believe that this is the drug they need. The patients seem to get access to major newspapers and television programs, spurring these people on. Almost like the patients had PR agents.

And, as if that weren't enough

Then, of course, there is advertising. Drug companies love to complain about the cost of R&D. Yet advertising costs contribute more to the cost of a pill than R&D. That advertising gets combined with constant visits from drug company representatives, paid speaking engagements, free conference attendance, and sponsored workshops. Let's just say that the industry thinks it money well spent.

But advertising in the healthcare industry should not be thought of in the same way as car or computer advertising. When you get right down to it, buying the wrong computer is unlikely to shorten your life.

Treatment decisions truly effect quality and length of life. Doctors and patients need accurate and complete information about a treatment to make an informed decision.

If complete information were available, then doctors would have a much better sense of which treatments were most effective and what their side effects were. And, in this ideal world, treatment would take the patient into consideration. For instance, the most effective drug might have an elevated risk of heart attack—acceptable for a young fit person, but not for someone who already has heart problems—meaning that a slightly less effective drug might be safer for some.

Medical advertising is, in fact, aimed at subverting these sorts of informed decisions. Drug companies want their drug prescribed, independent of whether it actually works or not.

I know, this is obvious, and is the purpose of advertising. But this is advertising that you pay for in several ways. It increases the cost of medical insurance, because doctors prescribe more expensive and less effective treatments. It increases the cost of drugs directly, since that advertising has to be paid for. Most importantly, treatment decisions driven by advertising will sometimes reduce the length and quality of your life.

Nothing to see here, move along

The pharmaceutical industry will try and tell you that these problems are problems of the past. For example, there is now a clinical trial database that ensures that each trial is known about, so that it is possible to infer negative results based on the lack of publication. Indeed, several major medical journals have publicly stated that they will not publish results from clinical trials that haven't been registered. Yet, Goldacre reports that some 20 percent of trials published in these journals in 2010 (after the database was up and running and the agreement made) were not on the register: journals are not doing due diligence.

And in the ultimate dose of fail, there is no one group responsible for curating these databases. So, yes, most trials are registered, but no one checks to see if they have reported back. I think that might be referred to as hiding failure in plain sight.

On publishing *Bad Pharma*, Ben Goldacre wisely included an afterword in which he tried to anticipate how industry groups would respond. I must say that he has, sadly, anticipated them well. Industry associations have been particularly Orwellian in this regard, claiming that the failed attempts to fix these problems—the failures are documented in the book itself—have, in fact, worked. It is as if they only read the chapter headings and then grabbed a set of scripted responses without checking to see if anyone else had read and anticipated the script.

I guess, for them, this is an attack on the industry as a whole. Which it is, but it is an attack made by someone who deeply appreciates all the good that modern medicine has done, and wants it to get better. Goldacre is not a conspiracy minded nutcase who sees bad guys behind every garbage can. No, he sees a system that has, despite some really perverse incentives, produced some blindingly good products. But those incentives also allow life-threateningly poor decisions to be rewarded, and that needs to change.

Goldacre's encouraging outlook is why each chapter ends with a list of what you, personally, can do to help. Questions you can ask your doctor if you are a patient. Things you can do as a doctor. What academics can do, what pharmaceutical companies can do.

Read this book. It will make you mad, it will make you scared. And, hopefully, it will bring about some change.

http://www.spacedaily.com/reports/Whizzing_Asteroid_Turns_Rocket_Scientists_Heads_999.html

http://www.spacedaily.com/reports/Close-shave_asteroid_set_to_return_next_year_999.html

Whizzing Asteroid Turns Rocket Scientists' Heads

An asteroid spotted by amateur astronomers only after it had skimmed the Earth will come even closer in February, but without posing a threat

by Staff Writers

International leaders in asteroid and comet research are gathering at the University of Central Florida in Orlando Friday, Feb. 15, for a special "viewing party" that will climax with asteroid 2012 DA14 zipping between Earth and orbiting communication satellites (within 14,000 miles of Earth).

Next February 15, it will pass Earth at just 24,000 kilometres (15,000 miles), meaning it will zip between the planet and satellites in geostationary orbit, which is 35,800 kms (21,800 miles) above the equator, ESA said. It will be at its closest point at about 1926 GMT on February 15.

"This is a safe distance, but it is still close enough to make the asteroid visible in normal binoculars," said Detlef Koschny at ESA's Space Situational Awareness office.

Around 50 metres (150 feet) long, asteroid 2012 DA14 has stoked concern about planetary preparedness against rogue rocks. The asteroid, the size of a city block, will squeeze by Earth's atmosphere and the geostationary satellites orbiting the planet. It will be the closest fly by in history. According to calculations derived from NASA's Near Earth Object (NEO) Program website, 2012 DA14 has a mass of around 120,000 tonnes.

Experts say there is no chance the asteroid will hit Earth - this time. But with more than 4,700 asteroids NASA has identified as potential threats to Earth, some as big as 16 football fields, these objects are getting a lot of attention.

It was detected on February 22 only after it had flashed by at a gap of 2.5 million kilometres (1.6 million miles), or about seven times the distance between Earth and the Moon.

Preliminary calculations of 2012 DA14 show it orbits the Sun in 366 and a quarter days, which is a day more than Earth's year. It jumps inside and outside of the path of Earth twice a year, according to the team who discovered it.

Humberto Campins, a UCF physics professor who led the first team to discover water ice on an asteroid in 2010, says the asteroids provide clues to the early formation of the solar system and should interest the entire community because they can be hazards as well as resources.

A US-led mission is making inroads into counting the numbers of very large NEOs that can be a kilometre (half a mile) or more in length.

Monsters such as these are capable of apocalyptic damage, as was famously the case with the asteroid or comet that ended the long reign of the dinosaurs some 65 million years ago.

But a more arduous greater task is to spot the hundreds of thousands of smaller rocks measuring tens of metres (dozens of feet across), that -- if they remained as large chunks after entering the atmosphere -- could wipe out a city or cause a tsunami.

An object roughly the size of 2012 DA14 caused the so-called Tunguska Event in Siberia in 1908.

Heated by friction with the atmosphere, it exploded with the power of a thousand atomic bombs, flattening 80 million trees in a swath of more than 2,000 square kms (800 sq. miles).

Discovering 2012 DA14 was a coup for the La Sagra Sky Observatory, near Granada in southeastern Spain.

The telescope is located at an altitude of 1,700m (5,500 feet) in one of the least light-polluted places in Europe. Campins is working on NASA and European Space Agency missions launching in the next few years to recover asteroid samples

Should an asteroid be detected on a collision course with Earth, it will be critical to know its composition and structure in order to deflect it. The impact of a small asteroid like DA 14 would equal the destructive power of an atomic bomb. A larger asteroid could be catastrophic.

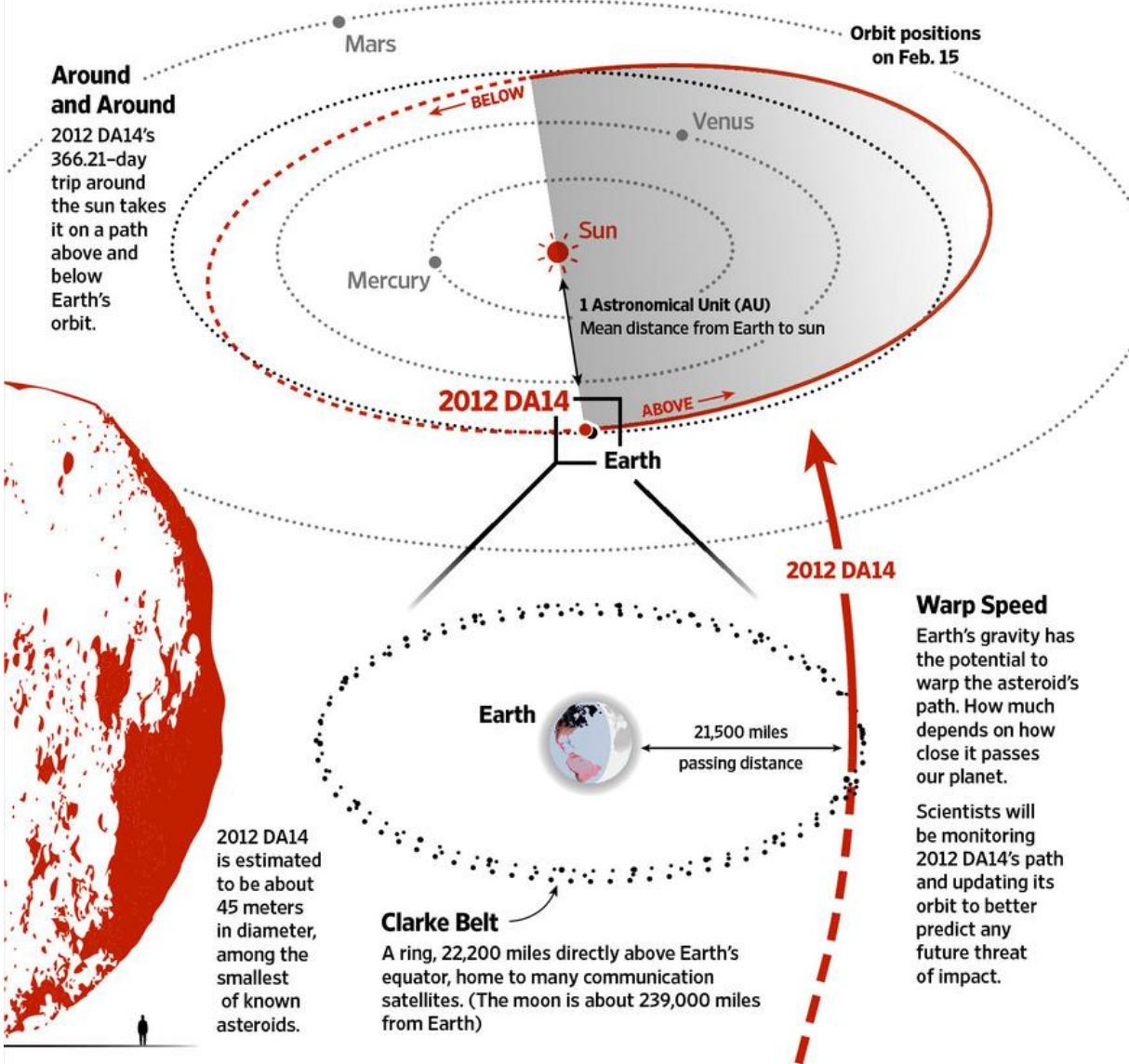
That's why Campins and the planetary scientists at UCF organized this free Viewing Party and invited leaders in this asteroid research to speak to the public about the reality and myths of these ancient rocks on Feb. 15.

UCF and the Florida Space Institute are sponsoring this event.

Confirmed speakers include Dr. Michael F. A'Hearn, the scientist who led NASA's Deep Impact mission, which launched the first man-made object into the nucleus of a comet, and Dr. Harold Reitsema, a former NASA scientist who is part of the B612 Foundation's private effort to launch a telescope that will locate and track asteroids that could hit Earth.

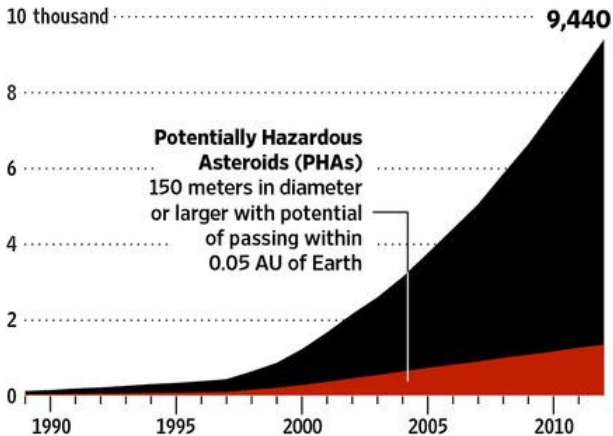
Close Shave

Asteroid 2012 DA14 will pass very close to Earth—much, much closer than the moon—on Feb. 15. Its path won't lead to a collision with Earth but it will pass close to a ring of orbiting communication satellites.



Join the Club

Total number of known near-Earth asteroids (NEAs)—those traveling within 1.3 AUs of Earth, as of Dec. 29, 2012



Packing a Punch

If there were an impact, energy generated from 2012 DA14 would be an estimated 120 times greater than that of the atomic bomb dropped on Hiroshima, Japan.

Energy equivalent in megatons (MT) of TNT

Atomic bomb dropped on Hiroshima:
0.02 MT

Asteroid 2012 DA14:
2.4 MT