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March 3, 2008

Gadget Calculates Carbon Footprint

A student competition-winning project automatically calculates your carbon footprint while traveling. Cynthia Graber reports.

It's popular today for people and companies to try to offset their carbon footprint. But there's a lot of debate about just how to measure that footprint. Now a new program called Carbon Hero may have one solution. The device was invented by a graduate student at the Royal College of Art in London and recently won the 2007 European Satellite Navigation Competition. The idea is to get an accurate read on how much carbon you use as you travel. It's a hand-held unit, about the size of a key chain. It automatically identifies the form of transportation the carrier is taking by measuring the speed, location, and pattern of the movement. Then the information is automatically downloaded to a cellphone, which immediately displays the carbon generated and the impact of the user's actions.

Of course, the device doesn't measure other aspects of a carbon footprint, such as the size of your house. And it's not yet available to consumers. But the inventor hopes to develop the device, and that the immediate feedback will convince people to change their transportation. Maybe to walking. Which leaves a tiny footprint.

—Cynthia Graber

SCIENTIFIC AMERICAN

March 4, 2008

Pavement Changes Weeds Seeds

The urban environment can influence the type of seeds a plant produces, increasing the chance for the seed to land in soil. Karen Hopkin reports.

For worse or for better, humans are changing the course of evolution. On February 26, we talked about how fishing practices may be driving the evolution of smaller, harder-to-catch trout. This week brings news that urbanization has changed the way weeds make seeds. The results appear in the current online edition of the Proceedings of the National Academy of Sciences. Scientists in the South of France were studying the sort of weed you see cropping up around the base of trees planted along city sidewalks. The weed, called Crepis sancta, can make two different kinds of seed: one that's light like a dandelion seed with a feathery little parachute that gets carried by the wind; and another that's heavy and just drops to the ground.

The scientists compared weeds that were growing in these small urban patches to ones growing in an open field. They found that the urban weeds produced fewer of the fluffy seeds than their country cousins, which makes evolutionary sense because in a city setting, drifting seeds are more likely to hit pavement than soil. In the long run, though, that strategy might not be healthy. Because plants benefit from spreading their seeds. So that's bad news for the weeds. But maybe not so bad news for the sidewalks.

—Karen Hopkin

SCIENTIFIC AMERICAN

March 5, 2008

This Is Your Brain On Arts

A three-year, multi-institutional study finds that early training in performing arts is really good for the brain. Steve Mirsky reports. For more info, go to www.dana.org

Are smarter people drawn to music, theater and dance? Or does arts training in childhood change the brain in positive ways? In 2004, the philanthropic Dana Foundation created a consortium of neuroscientists from seven universities to address those questions. On March 4, the group released a report, Learning, Arts, and the Brain, available at dana.org. Some of the findings:

An interest in performing arts helps develop sustained attention spans, which can improve other areas of cognition. Links exist between training in music and the ability to manipulate information in both short-term and long-term memory. Music training also appears to improve kids' capacity for geometric representation, as well as the acquisition of reading skills. Acting classes lead to improved memory, via better language skills. Dance learning is done through observation and mimicry, and that training appears to improve other cognitive skills. So science says that dance, theater and music can make life full of sound and glory, signifying something.

—*Steve Mirsky*

SCIENTIFIC AMERICAN

March 6, 2008

Electric Gold

At the nanoscale, gold wire can act as either a conductor or insulator, making it a candidate as a sensor. Steve Mirsky explains, with reporting by Harvey Black.

The lure of gold can be electric to some people, even though the element is chemically inert—on the large scale. But researchers from Georgia Tech report that, down at the level of atoms, gold can conduct electricity and act as an insulator as well.

When an oxygen molecule is embedded into six atom-long gold wire, the wire can conduct electricity. But, when the wire is longer than six atoms, the oxygenated gold becomes an insulator. The scientists reported their discovery in the journal Physical Review Letters.

The researchers say these properties mean that gold nanowires might be used as sensors to detect motion in nanoscale situations such as neurons or nanomachnes (futuristic devices built from individual atoms that might enter cells and fight disease). The wire could be a sensor because when it's extended even slightly, it could switch from a conductor to an insulator. Using gold as a sensor in this way could never have been predicted from what is known about gold in bulk. But being very small can lead to some big changes.

—Steve Mirsky, with reporting by Harvey Black

SCIENTIFIC AMERICAN

March 7, 2008

Pythons Warm to the U.S.

Discarded pet Burmese pythons are breeding in the Everglades--and climate change could make a third of the US potential python habitat. Steve Mirsky reports.

Here's another reason to stop global warming: to keep the Burmese pythons in Florida. Burmese pythons have been turning up in south Florida in recent years. Perhaps you've seen the famous photo of a python ripped apart by its efforts to ingest a large alligator. Apparently people with pythons as pets have been getting rid of the snakes when they get too big by dumping them in the Everglades. And in 2003, biologists confirmed the presence of a breeding population of the slithering serpents in Everglades National Park.

Which sceeves me out, because I spend a lot of time there. I'm not afraid of timid alligators, but hungry Burmese pythons give me the willies. Anyway, the US Geological Survey recently did an analysis of potential temperatures around the country by the end of this century. And then analyzed where Burmese pythons would be comfortable, based on their home territory, from Pakistan to Indonesia. The result: pythons could colonize a third of the US. Did I mention that they can be over 20 feet long and 250 pounds? Might be the best motivation to do something about climate change.

—Steve Mirsky

SCIENTIFIC AMERICAN

March 10, 2008

A Star Is Flung

The star called HE 0437-5439 looks like it was tossed out of the Large Magellenic Cloud by a hypothesized black hole. Steve Mirsky explains, with reporting by Harvey Black.

Astronomers have discovered a star that's running away from home. The star is speeding away at a blistering 2.6 million kilometers/hour, apparently after being cast out of a neighboring galaxy to us, the Large Magellenic Cloud—probably by a massive black hole. The speeding star is the first hint that there indeed may be a black hole in the LMC.

The astronomers, writing in an upcoming issue of Astrophysical Journal Letters, reckon that the flung fugitive was sent on its way much like a sling shot propels a stone. They think it was part of a two-star or binary system. Its companion got sucked into the black hole and this one, known as HE 0437-5439, was tossed on its way.

The astronomers say that the star cannot be one of our own Milky Way buddies, because the elements composing it are in different amounts from those in the Milky Way. HE 0437 is not the only star fleeing the Milky Way, though. The researchers say there are nine others beating it away from our galaxy, but they say it's clear that those are Milky Way natives.

—Steve Mirsky, with reporting by Harvey Black

SCIENTIFIC AMERICAN

March 11, 2008

Bad Smells and Why They're Good

Researchers have found new details about how we perceive bad odors, and it's a good thing we do. Karen Hopkin reports.

Anyone who's ever cut up an onion knows that some smells can actually be painful. Now researchers from Baltimore and Denver are closer to understanding why. Scientists used to think that odors that are irritating, like onions and ammonia, directly activate the trigeminal nerve. That nerve responds to touch, temperature and painful stimulation all over the head, and its fibers extend to the membranes that line the inside of the nose.

But the current study suggests that the trigeminal nerve doesn't act alone. Specialized chemosensory cells that line the nasal cavity are actually the first to detect irritating smells. They pass the news to the trigeminal nerve, which then lets your brain know that it's time to feel the burn. And to tear, or cough, or gag or just generally back off. The findings are described in the March issue of the Journal of Neurophysiology.

Having these special sensory cells as a go-between, the scientists say, might make our noses sensitive to a broader variety of irritating odors. That may not seem like such a bonus. But the system probably evolved to protect us, by giving us a heads up when we run into something noxious. It may also keep us from adding too many onions to the spaghetti sauce.

—Karen Hopkin

SCIENTIFIC AMERICAN

March 12, 2008

Counterproductive Cameras At Traffic Lights

Researchers in Florida contend that cameras for catching drivers who run red lights actually increase accidents and injuries. Steve Mirsky reports.

Cameras that catch drivers who blow through red lights are there to improve safety, by discouraging light running. But such cameras actually increase the likelihood of car crashes. Because more drivers jam on the breaks in an attempt to make a late stop at red-light camera intersections. That's the finding of a study done by researchers at the University of South Florida College of Public Health.

They decided to look into the issue because Florida officials are considering installing many more such cameras around the state. The researchers contend that other studies associating cameras with fewer crashes and injuries are flawed—those studies were linked with the Insurance Institute for Highway Safety, an industry group. But insurers may profit from red light cameras, because revenues go up with increased citations and accidents.

The new report notes that North Carolina, Virginia and Ontario all had increased crash rates and injuries associated with red light cameras. In Florida, injuries related to red light running are down anyway. So drivers needing to make a quick decision at a yellow light may be better off not seeing red.

—*Steve Mirsky*

SCIENTIFIC AMERICAN

March 13, 2008

Distant Sand May Be Planet's Birth

Sandy particles seen circling around a young binary star system 2,400 light years from us could be an early stage in the formation of a new earth-like planet. Steve Mirsky reports.

Orbiting around stars far, far away is…sand. Astronomers have found sandy particles circling a pair of stars about 2400 light years from us. And they think they might be seeing the very beginnings of the formation of an earth-like planet. The researchers reported their findings online in the journal Nature.

The sandy stuff is orbiting the stars at about the same distance from them as the earth orbits around the sun. The stars are babies themselves. They're called KH-15D and they're only 3 million years old, compared with our sun's mature 4.5 billion years. They're in the constellation Monoceros in the Cone Nebula. Other studies of particles around distant stars relied on infrared heat data. But astronomers in this research were able to observe reflected light from the sand itself.
Study coauthor Christopher Johns-Krull, from Rice University said, "Precisely how and when planets form is an open question. We believe the disk-shaped clouds of dust around newly formed stars condense, forming microscopic grains of sand that eventually go on to become pebbles, boulders and whole planets."

—Steve Mirsky

SCIENTIFIC AMERICAN

March 14, 2008

Gators Move Lungs To Maneuver

Alligators can slice silently through the water by shifting the location of their air-filled lungs. Karen Hopkin reports.

If you've ever been to the Everglades, or tuned into the Animal Planet, you know that 'gators can move through the water oh so silently, barely creating a ripple. It almost looks like they surface and sink, twist and turn, without so much as moving a muscle.

Well, it turns out they are moving some muscles. Just ones you can't see. According to a study from the University of Utah, American alligators navigate gracefully through the murky water by shifting the location of their lungs. You see, the lungs act like internal flotation devices. And using a set of four muscles, including the alligator equivalent of our diaphragm, a gator can basically steer just by moving those floats around. When they want to surface, they shift their lungs forward. To dive, they push 'em back. And to roll off in another direction, they just shift those babies to one side or the other. The findings will appear in the April issue of the Journal of Experimental Biology.

This ability to slice silently through the water without actually having to swim no doubt helps alligators sneak up on unsuspecting prey. Who never knew what hit them. And so will never have a chance to say: [song] "See you later, alligator…after a while, crocodile."

—Karen Hopkin

SCIENTIFIC AMERICAN

March 17, 2008

Next Up For NASA

At a conference last week, NASA administrator Michael Griffin outlined the space agency's next phase of planetary and lunar science research. Steve Mirsky reports.

Podcast Transcript: After its ongoing Mars missions, NASA will concentrate less on the red planet and more on the solar system's other planets and moons, including our own. That's what NASA administrator Mike Griffin told an audience of researchers last week at the 39th Lunar and Planetary Conference in Texas.

The Mars Science Laboratory lands in 2010. Griffin said that NASA is now planning in earnest for an outer planets flagship mission to Europa, Titan or Ganymede. Europa and Ganymede are moons of Jupiter. Titan is a moon of Saturn.

The reorientation of NASA's planetary exploration programs is in response to a recent National Research Council report card. The NRC gave NASA an A for its Mars work but only a C for its overall research and analysis program and a dismal D for outer planets efforts.

Griffin also noted that NASA is now planning seven different small and medium class missions to the moon by 2014. And the Messenger spacecraft goes into orbit around Mercury in 2011.

—Steve Mirsky

SCIENTIFIC AMERICAN

March 18, 2008

Smoking Can't Buy Happiness

Smokers tend to be less happy than nonsmokers, and the effect is heighened the lower their economic status. Karen Hopkin reports.

Podcast Transcript: For someone who smokes, there's nothing like that first nicotine rush of the day. But though taking a puff may bring smokers pleasure, it doesn't make them happy. Or so say scientists at the Peninsula Medical School in the UK. The scientists assessed the wellbeing of nearly 10,000 people age 50 or over who signed up for something called the English Longitudinal Study of Aging. They found that the smokers in that group reported lower average levels of pleasure and less satisfaction with their lives than the non-smokers. And for smokers in the lower socioeconomic groups, the situation was even more grim.

According to Iain Lang, the lead researcher on the team, smokers may feel pleasure when they light up. But that's because they're feeding their addiction. Overall, they're not any happier than nonsmokers. In fact, they're less so. Maybe because cigarettes cost, at least here in the US, like seven bucks a pack. So, next time you see one of those cigarette ads filled with beautiful young people having the time of their lives, remember, those people are models. They're getting paid buckets of money to look like they're having fun. A nice big bucket of cash would probably make you happy, too.

—Karen Hopkin

SCIENTIFIC AMERICAN

March 19, 2008

Sly Male Ants Carry Queen Genes

A few male ants in a colony have genes that allow them to sire the next queen. But they keep their royal genetics under wraps. Cynthia Graber reports.

Podcast Transcript: Ants are known for working together, operating as a unit for the good of the colony. But not so fast, say researchers from the Universities of Leeds and Copenhagen. It turns out that ants can scheme like a stage mom.

Scientists say that some ants hide out to ensure that their offspring become child-bearing queens instead of barren workers. The accepted hypothesis had been that random ants were fed certain foods that would allow them to develop into queens. But DNA tests on five colonies of leaf-cutting ants revealed that certain males have a better genetic chance of producing royal progeny.

Scientists believe these rare males stay anonymous, and thus avoid any problems with other ants that might otherwise lose their “one-for-all, all-for-one” attitude. In fact, the number of males carrying royal genes to those who aren’t may have settled at a low ratio through evolution—which cobbled together the best way for the ant gene pool to expand, while at the same time keeping the lucky males hidden from their possibly jealous rivals.

—Cynthia Graber

SCIENTIFIC AMERICAN

March 20, 2008

One-Eyed Depth Perception

Eye movements combined with the motion of objects in the field of vision enable some depth perception even with only a single eye. Cynthia Graber reports.

Podcast Transcript: You probably take your depth perception for granted. It allows you to easily judge distances. Each eye sends a different signal to the brain, and the brain compares the two pictures. But even using just one eye, the world doesn't suddenly appear flat. So how can just one eye provide depth perception? A team at the University of Rochester recently published a possible answer to that question on-line in the journal Nature. It has to do with a small part of our brain called the middle temporal area. This region processes information both from visual cues and from the motion of our eyes.

Researchers examined macaque monkeys watching virtual reality. Basically, the eye moves when something crosses the path of vision. This middle temporal area picks up the speed of the objects relative to these eye movements. Neurons in that brain region showed activity that signaled depth perception even in the absence of other cues. This new information may be useful for creating better virtual reality. And scientists also hope that it leads to better tools to assist children born with misaligned eyes.

—Cynthia Graber

SCIENTIFIC AMERICAN

March 21, 2008

Hermaphrodites Avoid Self-Fertilization

Molecules on the sperm and eggs of hermaphroditic organisms ensures that they mate with others. Karen Hopkin reports.

Podcast Transcript: If you've ever given any thought to the lifestyle of the hermaphrodite, it's probably occurred to you that being both male and female doubles your chances of having a date on a Saturday night. Yeah, it's an old joke, but it's sort of true. Because most hermaphrodites do have to date. In other words, they can't simply fertilize themselves. (If they could, I'm sure they would.) So what actually stops them? I mean, what keeps a hermaphrodite from mixing together its own sperm and eggs, and then staying home to watch TV?

In the March 20 online issue of Science, researchers from Japan reveal the answer. They were studying the sea squirt, an animal that reproduces by spewing sperm and eggs into the water and leaving the rest to chance. Combing through the sea squirt's genome, the Japanese scientists discovered two sets of genes. One produces a protein found on the egg's surface; the other makes a similar protein on sperm. When these molecular calling cards hail from different animals, the proteins come together and allow fertilization to occur. When they're from the same animal, they politely shake hands and go their separate ways. Now if only humans had such a simple system for figuring out who to bring home to mother.

—Karen Hopkin

SCIENTIFIC AMERICAN

March 24, 2008

Money Can Buy Happiness

One surefire way for money to provide happiness appears to be to spend it on other people. Karen Hopkin reports.

Podcast Transcript: On March 18th, we told you that smoking doesn't make people happy. Well, we hear you ask, what will make me happy? What? What?! Ok, first, relax. Then, take out your wallet. Because according to a study published in the March 21st issue of Science, giving money to other people is what brings us joy.

Scientists from Boston and British Columbia got to wondering whether money really can buy happiness. They were bothered by the fact that over the past 20 or 30 years, people in the US and other developed countries have been making much more money—yet our happiness has pretty much flatlined. What they found is that money can buy happiness. But only when you spend it on someone else. In one experiment, the scientists asked volunteers to rate their happiness. Then they gave each subject some cash, either 5 or 20 dollars. Half the participants were told to spend the money on themselves. The others were asked to give it away. At the end of the day, the folks who got the biggest boost were the ones who spread the wealth, even if it was only five bucks. So if you want to be happy, here's a big tip: always leave a big tip.

—Karen Hopkin

SCIENTIFIC AMERICAN

March 25, 2008

Home Visits Improve AIDS Outcomes

In rural areas of developing countries, home visits can vastly lower AIDS and all-cause mortality rates. Cynthia Graber reports.

Podcast Transcript: When it comes to saving lives, a personal touch can sometimes work better than drugs alone. That's what researchers in Uganda found, in a study published in the journal the Lancet. Scientists studied the efficacy of home visits to AIDS patients in rural areas that aren't served by clinics. Lay workers with no clinical training visited patients weekly to provide potent anti-AIDS drugs.

The thousand study participants also received supporting interventions including insecticide-treated bed nets to avoid malaria infection and a safe water system. After two years, researchers compared the results of the rural home visits to urban clinics that only administer drugs. In the rural homes, AIDS-related mortality was reduced by more than ninety percent. There was also a sharp decline in child mortality from all causes. Additional cost for these results—25 cents per patient per day.

Researchers caution that the dramatic benefits can't be attributed to home visits alone and may have been aided by the additional measures, for example, bed nets. But the results are in line with similar conducted in other countries, such as Haiti.

—Cynthia Graber

SCIENTIFIC AMERICAN

March 26, 2008

Researchers Heart Yak Cheese

Cheese made from the milk of yaks, shaggy beasts from Tibet and Nepal, has some heart-healthy qualities. Steve Mirsky explains, with reporting from Harvey Black.

Podcast Transcript: Here's something that might cow Wisconsin farmers into abandoning their prize Holsteins. Turns out cheese from yaks may be heart healthy. Researchers writing in the Journal of Agricultural and Food Chemistry report that the shaggy beasts from Tibet and Nepal produce cheese that is high in polyunsaturated fat. It also has four times more conjugated linoleic acid than dairy cattle cheese. Linoleic acid may help ward off heart disease.

The secret seems to be that the yaks graze on grass. While cows in the US and Canada mostly eat grain. Brian McBride, of the University of Guelph in Ontario, says that yak cheese tastes like a medium cheddar with a smooth, uniform texture. Yak cheese is made and sold in Nepal and is in high demand—it could be part of the fuel that helps power Nepalese sherpas up Mt. Everest—but you can find it some gourmet food stores in the US. It may be a while before these beasts from the roof of Asia populate places like America's Dairyland, but the idea could have farmers yakking.

—Steve Mirsky, with reporting from Harvey Black

SCIENTIFIC AMERICAN

March 27, 2008

Sensing Sweets Without Taste

Mice that cannot taste sugar can still tell when sugar is in what they ingest. Cynthia Graber reports.

Podcast Transcript: Brains can register a food's caloric value independent of our taste buds, say scientists from Duke University and from Portugal. First the scientists engineered mice without taste receptors for sweets. They compared the so-called sweet-blind mice to normal mice. Both were offered plain water or water with sucrose. And within about ten minutes, even the sweet-blind mice preferred the sugar water. The same test was repeated with sucralose, a calorie-free sweetener. The mice that could taste the sweetener preferred, but the mice without the taste receptors never developed a preference for the fake stuff.

Then the researchers looked at the brains of the sweet-blind mice. Sucrose turned on neurons in the brain's food-reward system. And the brain chemical dopamine was elevated—dopamine is a crucial part of the brain's reward circuitry. These changes show that the brain's reward system can detect internal physiological changes even independent of taste—maybe through the digestive system. The work appears in the March 27 issue of the journal Neuron. Scientists are calling this nutrient awareness the brain's sixth sense for calories. They say teasing out these mechanisms could have implications in understanding and combating obesity.

—*Cynthia Graber*

SCIENTIFIC AMERICAN

March 28, 2008

Solar Energy Via Balloons

An array of collecting balloons could be a new way to capture solar energy without using vast tracts of land. Cynthia Graber reports.

Podcast Trascript: One of the problems with large-scale solar power plants is that they require a huge amount of space. To rise above that problem, Israeli researchers recently patented a system of solar-collecting balloons. The helium-filled globes will be covered with thin-film, flexible photovoltaic panels to capture sun's rays. Designs have been proposed before that include floating or flying solar arrays. But this is a modular system, tethered to the ground through a system of cables. Some cables will deliver helium to the balloons, others will carry the solar energy back to earth. The researchers are testing the arrays on a few sites in Israel.

A benefit of this system is that the arrays won't cover a huge parcel of land. And the system can be easily expanded. Need more power? Hook up another balloon. Of course, there are still challenges, such as reducing the weight of the balloons, dealing with wind, and designing the optimal system for transporting the energy down to the surface. But developers say that thin-film solar technology advances every month. And they hope that breakthroughs will make solar balloons realistic and economically viable in the not-too-distant future.

—Cynthia Graber