PARAGRAPH READING STUDY II

(Advanced Reading Skill)

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Acknowledge

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(1)
A COSMOS, DARKLY

After eight decades, most of the universe is still missing from view, forcing astronomers to abandon the notion that seeing is believing.Often in science it takes a long time to understand exactly how confused you are. Nobody knew to wonder how the dinosaurs went extinct, for instance, until 19th-century fossil diggers realized that dinosaurs had existed in the first place. In the case of dark matter -the unseen something that seems to make up about five-sixths of the matter in the universe-the confusion has been building for a good 84 years, and shows no sign of going away.

That's not how it was supposed to be. A few years ago, various instruments seemed hot on the trail of the unseen cosmic component. In space, the orbiting Fermi Gamma-ray Space Telescope detected possible hints of dark matter particles breaking down into visible components. In an Italian laboratory, an international team claimed provocative evidence of a seasonal "wind" of dark matter blowing through its specially designed detector, called DAMA. And4,850 feet underground, in an abandoned South Dakota gold mine, the enormous Large Underground Xenon (LUX) dark matter detector geared up to collect the definitive data on the long-sought dark particles.

But instead of enlightenment, what followed was a new wave of confusion. The Fermi signal looked like a mix of known astrophysical processes and random galactic noise. The DAMA results did not match up with data from other detectors, and so aroused widespread skepticism. As for LUX, it was a huge success -just in a negative way. It delivered a high-quality null result, thescientists' way of saying that they found exactly zero evidence for a great many of the hypothesized or allegedly detected dark matter particles.

Science, like nature, abhors a vacuum, so a variety of new theories have whooshed into the void. Perhaps dark matter is bunched together into large, elusive clumps; perhaps it interacts with ordinary matter even less than physicists expected. Dark matter is so peculiar and puzzling that it has inspired far-grasping speculations even from sober-minded researchers. Harvard physicist Lisa Randall has just published an entire book exploring the argument that dark matter might have indirectly killed the dinosaurs.This all sounds a bit like chasing unicorns -indeed, cheeky grad students have placed little paper unicorns all around the LUX facility- except for one huge, exciting, maddening fact: Dark matter really exists.

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EVIDENCE OF INVISIBILITY

You may well ask how I can say that with such certainty. In fact, many ofyou doask, on Twitter, Facebook and online comments sections. The question deserves a serious answer.

The case for dark matter began in the 1930s with a pair of papers by two very different kinds of geniuses, the buttoned-down Dutch astronomer Jan Oort (who also hypothesized the Oort Cloud of comets) and the explosive Swiss-American cosmologist Fritz Zwicky. Oort noted that the motions of stars within our galaxy imply the presence of a great deal of additional unseen, dark material. Zwicky took the argument further, noting that entire clusters of galaxies would scatter unless bound together by the gravitational pull of more invisible stuff.

Oort and Zwicky were working with limited data, yet their conclusions proved remarkably robust. In the 1970s, astronomers Vera Rubin and Kent Ford used the same basic arguments to show, in much more convincing detail, that spiral galaxies appear to keep their shapes because of the gravitational glue from nearby dark matter.

Once their colleagues started taking the idea seriously, they saw dark matter everywhere: Almost every aspect of the formation, motion and clustering of galaxies indicates the presence of far more mass than can be accounted for by the visible stars and nebulas.

At this point, the case turns even more interesting and complicated. Theoretical models of the Big Bang allow precise calculations of the composition of the early universe. Those calculations, in turn, indicate the precise amount of ordinary matter expected in the universe. During the 1980s, researchers plugged the numbers into their computers and out came a hard prediction: Only about one-sixth of the deduced mass of the galaxy clusters can consist of atoms. Not only is most of their matter dark, then, but the dark matter simply cannot be the same kind of stuff we are made of.

Starting in the 1990s, studies of the cosmic microwave background (the afterglow of the Big Bang) offered a different test of this startling idea. Reverberations in the very young universe imprinted onto that background a discernible pattern, which depends on the mix of ordinary matter to dark matter. In 2013, the Planck satellite gave the definitive reading on that mix. The result, again: one-sixth ordinary matter, five-sixths dark matter.

But wait, there's more! Because dark matter does not interact with radiation (if it did, we could see its light), it can clump together more efficiently than atoms, which tend to heat up and get agitated. The efficient clumping of dark matter allowed it to create dense patches that spurred the formation of the first galaxies. Put dark matter into the models, and they can pretty much explain the structure of the modern universe. Without dark matter, the models fail miserably.

A few researchers, most notably Mordehai Milgrom at the Weizmann Institute in Israel, have perceived a possible flaw in these deductions. Almost all the evidence for dark matter ultimately depends on its gravitational effects. Perhaps the reason the universe looks strange is not because of dark matter, but because the standard theory of gravity is slightly wrong, Milgrom suggests.

The problem with his argument is that no single modification of gravity can explain all the different phenomena outlined above. Making everything fit requires a new theory of gravity, plus additional undiscovered long-range forces, and still requires some exotic dark matter on top of that. There is no escaping the dark truth.

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FROM DARKNESS, LIGHT

Dark matter is not a hunch, nor is it some kind of scientific sleight of hand. It is an actual, physical thing discovered indirectly but definitively based on multiple independent lines of evidence.That evidence leaves astronomers in an uncomfortable place, with the vast majority of the cosmos missing. Fortunately, the current situation still leaves a lot more places to investigate. After the LUX experiment completes its run, the affiliated researchers will regroup to build an upgraded version called LUX- ZEPLIN (nerd band name alert), or LZ, which will be 10 times as large and sensitive. In the meantime, a competing team is upgrading a device called the Axion Dark Matter experiment (ADMX), which will search for axions, a hypothetical dark particle so slight that it would sail right through LUX undetected.

It's possible that both approaches will fail. Then the process of finding dark matter becomes exponentially harder, though not necessarily impossible. Dark matter particles might occasionally destroy each other, creating a visible signal (like the now-discredited Fermi observation). Or they might interact with each other to produce organized structures, such as a thin, dark disk embedded within our galaxy. A dark disk could have an ominous effect, gravitationally destabilizing our solar system every 30 million years or so and setting loose arain of comets. Such a comet shower could potentially trigger a mass extinctionhence Randall's link between dark matter and dinosaurs.

A variety of sky surveys, from both space and terrestrial observatories, are seeking dark structures in our galaxy and beyond. Whether or not they confirm Randall's specific model of dark matter, those surveys will provide a lot more information about how the dark stuff behaves and what it might consist of. They will provide a more accurate cosmic map of all matter, both the seen and the unseen. Above all, Randall says, the ongoing study of dark matter is a precious exercise in "exploring connections" not just between different fields of science, but also between humans and the cosmos.As much as it is a source of confusion, dark matter is also a source of illumination. It is all around us. It is almost surely passing through you right now. Our galaxy would not exist without it. We literally owe it our lives.

(4)
A WHALE OF A JOURNEY

A blue whale named Isabela has been caught making a 5,200-kilometer (3,200 mile) trek across the Pacific

The blue whale is the largest animal alive today. And one of these whales has been caught making an appropriately big journey through the South Pacific. The whale was first recorded near the Galapagos Islands, west of Costa Rica. Years later, that same whale was photographed off the coast of Chile in South America, a new study reports. The two spots are separated by some 5,200 kilometers (3,200 miles). That means it swam farther than the distance between New York and Los Angeles.

Scientists reported the whale's mammoth trek June 11 in Marine Mammal Science.

Blue whales are surprisingly difficult to study. They are found in all the world's oceans but live in deep waters. So there are few places where they can be found easily. Moreover, the species was nearly driven extinct by whaling a centuryago. Populations are recovering. But because there are so few of the animals, this species is still consideredendangered.

To aid the species' recovery, scientists need to know more about where theytravel, explains study leader Juan Pablo Torres-Florez. He is a whale researcher at Austral University of Chile in Valdivia. Understanding the whales' migrations could help guide conservation measures, hesays.

In 1998, a group of scientists surveyed blue whales in the waters off islands known as the Galápagos. They photographed the whales they spotted. And, without hurting the animals, they also collected samples of some of the whales' flesh. That let them later to look at the animals' DNA. A different group of scientists collected similar data from whales off of the coast of Chile from 2002 to 2013. Torres-Florez's team recently compared these data to see if the groups were connected.

One blue whale may look like any other to the untrained eye. But each animal has a distinctive pattern of spots. "We use those patterns as the fingerprint of bluewhales," Torres-Florez says. To make the comparison job easier, scientists focus on the area around a whale's dorsal fin, which is on its back. "Comparing those patterns we are able to identify if a whale is the same whale we saw in differentplaces or if the same whale is sighted during different years in the same place," he says.

One whale showed up in the Galapagos on November 6, 1998, among a group of nine animals. It appeared again off of Chile on February 23, 2006. The photographs and the DNA matched. The whale was nicknamed “Isabela,” after both Torres- Florez’s daughter and the Galapagos island near to where this animal had been sighted. The whale’s journey was at least 5,200 kilometers (3,200 miles). That makes it the longest north-south journey ever recorded for a member of her species.

Isabela is probably not the only blue whale to travel so far, the researchers say. Members of her population likely migrate regularly from Chile to the Galapagos. In summer months, Torres-Florez notes, waters in the far southern Pacific are loaded with krill -tiny crustaceans on which these whales dine. But that food disappears in winter. That’s when the whales travel north to warm, tropical waters near the Galapagos.

There, “instead of feeding, the whales breed,” he says. Scientists don’t yet know why whales prefer to breed in tropical locations. But the ocean there may be warmer and calmer and have fewer orcas that would prey on baby blue whales, Torres-Florez says.

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ALCOHOL CAN REWIRE THE TEENAGE BRAIN

Binge drinking may harm a teen's brain now -and forever- a mouse study suggests

Alcohol is a drug. And every day, more than 4,750 American kids aged 15 and younger take their first full drink of this drug. That's according to the U.S. Substance Abuse and Mental Health Services Administration, or SAMHSA. And the problem is not just that this consumption is illegal. Kids who start drinking before age 15 also are five times more likely to become alcoholics or abuse alcohol than are people who wait until adulthood for their first sip. Another big problem for kids who experiment with this drug is that they are more likely than adults are to consume too much alcohol over a short period of time. This is known as *binge drinking*.

What few people realize is that binge drinking poses many risks that go well beyond getting drunk and acting irresponsibly. That's why an organization of doctors has just issued a new report laying out those risks. It appeared in the August 30 issue of *Pediatrics.*

Lorena Siqueira is a pediatrician at Florida International University and Nicklaus Children's Hospital in Miami. She studies teen alcohol use and helped write the new *Pediatrics* report. "When kids drink, they tend to do heavy drinking," she notes. Unfortunately, she adds, "Their bodies are not ready to handle that kind of alcohol."

Long-term effects on the brain

People forget what happens when they are drunk because alcohol makes it harder for the brain to turn short-term memories into long-term ones. But for teens,
alcohol's dangers go well beyond impairing memory. A new rodent study finds that alcohol can lead to long-term -and harmful- changes to the brain.

"We used to think that brain development was done by the time you're a teenager," Siqueira says. "Now we know that's not true." The brain keeps developing into a person's 20s and even early 30s, she explains.

In the new study, scientists gave 10 doses of alcohol to adolescent rats over 16 days. The amounts led to blood-alcohol levels that might model a binge-drinkingteen. After these exposures, the rats never tasted alcohol again. Later, in adulthood, the scientists attached electrical equipment to a part of each animal's brain. Called the *hippocampus*, this region controls memory and learning.

Nerve cells in that part of the brain communicated abnormally, the scientists found. The cells also looked more immature than usual. Branches coming off of nerve cells should look like short mushrooms. Instead, here they looked long and thin.
Again, this damage showed up in that part of the brain linked with learning and memory.

"For humans, this means binge drinking during adolescence may permanently change brain functioning," says the NIAAA's Faden. What's more, she adds, these changes "appear to be irreversible."

Mary-Louise Risher of Duke University in Durham, N.C., led that new rodent study. Her team published it in the June issue of Alcoholism: Clinical and Experimental Research.

Other research has shown that teens who drink heavily lose more white matter in their brain over time than do teens who don't, Faden says. White matter acts a bit like the brain's superhighway system. It connects areas of the brain's so-called gray matter, which processes information. The white matter allows messages to shuttle quickly, even over relatively long distances in the brain. Alcohol also can hurt a portion of gray matter in a region known as the *prefrontal cortex*, Faden says. This area is used for attention, concentration, self-control and making decisions.

Those kinds of skills work together to create what brain scientists refer to as*executive function*. Poor executive function makes it harder for individuals to control their behavior. And it makes it more difficult for them to stop doing something that know could hurt them. A person with poor executive function may be less likely to turn down the chance to drink alcohol or may get behind the wheel of a car when it would be dangerous to drive.

As alcohol makes a teen less likely to turn down alcohol, the risk of binging grows. This drinking can create a cycle of inappropriate behavior. Worst of all, this cycle may lead to alcoholism in some teens, Faden notes.The bottom line, she says: When it comes to the developing adolescent brain, "There is no known safe level of binge drinking."

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ANALYZE THIS: CLIMATE CHANGE COULD MAKE FOOD LESS HEALTHY

Levels of nutrients fell as plants breathed in more carbon dioxide

As levels of carbon dioxide - CO_2- in the atmosphere have been rising in recent decades, Earth has been warming. That's because as a greenhouse gas, CO_2 traps heat in Earth's atmosphere. That warming is one symptom of climate change. And it has the potential to affect food in many ways. Rising temperatures and the changes in rainfall that it will bring should impact how much and where crops grow. Data now show that rising levels of CO_2also can affect how nutritious a crop will be. Some of those data were reported last year in *Annual Review of Public Health.* Indeed, it noted that several studies have come to this conclusion.

Samuel Myers is an environmental health scientist at Harvard University in Cambridge, Mass. He was part of a team that has studied the potential effects of climate change on nutrition. In one 2014 study, his group looked at six major food crops: wheat, rice, field peas, soybeans, maize (corn) and sorghum. They exposed plants to different amounts of CO_2. Some got levels of between 363 and 386 parts per million (ppm). Such concentrations were typical at that time. (CO_2 levels have since risen.) Other plants were exposed to more of that greenhouse gas as they grew- 546 to 586 ppm. Such levels are expected to develop within the next 50 years or so.

After harvesting the plants, the researchers measured their levels of vitamins, minerals and other nutrients. And plants grown with more CO_2 were less nutritious. For instance, wheat and rice had lower protein levels. They also had less zinc and iron, as did the peas and soybeans. Some two *billion* people worldwide already don't get enough of these minerals. Most people depend on cereal crops, such as wheat and rice, to meet their dietary needs for both zinc and iron. If crop levels of such nutrients fall, people may face an even greater risk of falling ill.

People who substitute sugars and starches for protein face a greater risk of high blood pressure and heart disease, U.S. studies have shown.Scientists don't yet know why CO_2 impacts levels of these nutrients. But the new findings suggest scientists may want to try breeding new varieties of crops that are less affected by CO_2. That way people will still get the most benefits from their greens and grains.

(7)
AVICENNA (IBN SINA) (C. 980-1037)

Abu ‘Ali al-Husayn ibn Sina is better known in Europe by the Latinized name “Avicenna.” He is probably the most significant philosopher in the Islamic tradition and arguably the most influential philosopher of the pre-modern era. Born in Afshana near Bukhara in Central Asia in about 980, he is best known as a polymath, as a physician whose major work the *Canon* (*al-Qanun fi’l-Tibb*) continued to be taught as a medical textbook in Europe and in the Islamic world until the early modern period, and as a philosopher whose major *summa* the *Cure* (*al-Shifa’*) had a decisive impact upon European scholasticism and especially upon Thomas Aquinas (d. 1274).

Primarily a metaphysical philosopher of being who was concerned with understanding the self’s existence in this world in relation to its contingency, Ibn Sina’s philosophy is an attempt to construct a coherent and comprehensive system that accords with the religious exigencies of Muslim culture. As such, he may be considered to be the first major Islamic philosopher. The philosophical space that he articulates for God as the Necessary Existence lays the foundation for his theories of the soul, intellect and cosmos. Furthermore, he articulated a development in the philosophical enterprise in classical Islam away from the apologetic concerns for establishing the relationship between religion and philosophy towards an attempt to make philosophical sense of key religious doctrines and even analyse and interpret the Qur’an. Late 20th century studies have attempted to locate him within the Aristotelian and Neoplatonic traditions. His relationship with the latter is ambivalent: although accepting some keys aspects such as an emanationist cosmology, he rejected Neoplatonic epistemology and the theory of the pre-existent soul.

However, his metaphysics owes much to the "Amonnian" synthesis of the later commentators on Aristotle and discussions in legal theory and *kalam* on meaning, signification and being. Apart from philosophy, Avicenna’s other contributions lie in the fields of medicine, the natural sciences, musical theory, and mathematics. In the Islamic sciences (*'ulum*), he wrote a series of short commentaries on selected Qur’anic verses and chapters that reveal a trained philosopher’s hermeneutical method and attempt to come to terms with revelation. He also wrote some literary allegories about whose philosophical value 20th and 21st century scholarship is vehemently at odds.

His influence in medieval Europe spread through the translations of his works first undertaken in Spain. In the Islamic world, his impact was immediate and led to what Michot has called "*la pandémie avicennienne."* When al-Ghazali led the theological attack upon the heresies of the philosophers, he singled out Avicenna, and a generation later when the Shahrastani gave an account of the doctrines of the philosophers of Islam, he relied upon the work of Avicenna, whose metaphysics he later attempted to refute in his *Struggling against the Philosophers (Musari‘at al-falasifa).* Avicennan metaphysics became the foundation for discussions of Islamic philosophy and philosophical theology. In the early modern period in Iran, his metaphysical positions began to be displayed by a creative modification that they underwent due to the thinkers of the school of Isfahan, in particular Mulla Sadra.

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BLOWFLIES KEEP THEIR COOL WITH DROOL

SAN FRANCISCO, Calif. - Blowflies don't sweat. However, they have raised cooling by drooling to a high art. In hot times, these sturdy, big-eyed flies repeatedly release - and then retract -a drop of cooling saliva. Denis Andrade reported the trick January 4. He was speaking at the annual meeting of the Society for Integrative and Comparative Biology. He studies ecology and

evolution at the Universidade Estadual Paulista. That's in Rio Claro, Brazil.

The fly's technique isn't sweating. That is what keeps people cool. Sweat evaporates taking a tiny amount of body heat with it. Blowfly droplets put the cooling power of their natural fluids to use in a different way, explains Andrade.

The saliva hangs on a fly's mouthparts. There, the droplet starts to lose some of its heat to the air. When the droplet has cooled a bit, the fly then slurps it back in, Andrade and colleagues showed.

X-ray images showed the sucked-up droplet in the fly's throatlike passage near the animal's brain. The same droplet seemed to be released, cooled, drawn back in and then drooled again. The insect repeated this several times in a row. This may prevent dangerous overheating, Andrade proposes. After several droolings, the fly's body temp can drop up to 4 degrees Celsius (7 degrees Fahrenheit) below that of the surrounding air.

Andrade had never seen a report of this saliva droplet in-and-out technique before he and a colleague noticed it. They had been watching blowfly temperatures for other reasons. But in 2012, Chloé Lahondère and a colleague described something similar - in mosquitoes.

These blood suckers let their body temperature rise and fall with what's around them. But they can get a heat rush when drinking from warm-blooded mammals, like us. So while drinking, the insects release a blood-tinged drop of urine from their rear ends. That droplet sheds some of their body heat. There's some fluid movement within the droplet, saysLahondère. (She's now at Virginia Tech in Blacksburg.) However, she can't say whether any of the liquid gets recaptured by the body the way fly drool is.

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CHEMISTS LOOK TO MINE SILVER FROM LAUNDRY WASTEWATER

Laundering can release the toxic metal, which often is added to fabrics to retard bacterial growth believe it or not, laundry wash water can hold a mother lode of silver. And scientists are looking for ways to recover this precious metal. Their main goal is not to make big bucks selling it to people who make jewelry, coins or pricey flatware.Silver is toxic. So researchers want to catch it before it threatens wildlife. Now, two environmental engineers report preliminary success doing just that.They have developed a way to extract silver from wash water. If the technique proves affordable and reliable, that silver could be recycled for a host of uses. The researchers have just shared their innovation in the January 2 ACS Sustainable Chemistry & Engineering.For years, companies have added nano-sized bits of silver to all types of products - especially fabrics. Their main aim has been to fight the growth of odor-causing bacteria. That's why this treatment has been especially popular for athletic wear, such as socks.

Studies soon showed, however, that nanosilver doesn't stay put. It soon starts washing away in the laundry. Because that wash water ultimately makes its way into rivers, lakes and the ocean, so can the silver. And that could pose risks to wildlife.

"Researchers are walking a fine line between silver's desirable properties and its potential toxicity to the environment," argues science journalist Silke Schmidt. "Products embedded with nano-silver," she notes, "tend to lose some of their silver coating every time they're laundered."And stinky germs are not the only things that metal can poison. "Silver is harmful to humans, rats and aquatic species such as zebrafish and rainbow trout," notes Tabish Nawaz. He's an environmental engineer who works at the University ofMassachusetts in Dartmouth. That same silver also can harm the growth of aquatic embryos, he notes, such as those of developing fish.To protect all these creatures, he says, that silver needs to be removed from the laundry water before it spills out of a community's waste-treatment plant. With thatin mind, Nawaz teamed up with Sukalyan Sengupta, also at the University of Massachusetts. Together they are fine-tuning a technique to mine that nuisance silver from the laundry.

(10)
CLIMATE AT THE CROSSROADS

In the hottest year yet, nations vow to kick the carbon habit.From a climate change perspective, 2015 had all the elements of a good drama: suspense, a surprise twist and a (somewhat) happy ending. It turned out to be the hottest year on record, but ended with new hope for turning down the thermostat: In December, nations are expected to enter into negotiations for a plan to cut greenhouse gas emissions. Throughout the year, a series of scientific revelations underscored its necessity - and overturned some long-standing assumptions.Two reports, published in February and July, upended the widespread belief that warming had stalled the past 15 years. They revealed that Earth had continuedwarming as quickly as ever - shifts in ocean circulation had simply cloaked this trend by pulling some extra heat into deep waters for a few years. “This year will be the warmest - it’s so far ahead of any other year,” Phil Jones, a climatologist at the University of East Anglia in England, said in July. He predicted that by year’s end, the average global temperature would exceed the previous record by 0.2 degreesFahrenheit.Against this gloomy backdrop, large nations vowed to curb their carbon habit.

In anticipation of the U.N. Climate Change Conference in Paris in December, the United States pledged that by 2025 it would cut greenhouse gas emissions by 26 to 28 percent below 2005 levels; the European Union committed to a 40 percent reduction by 2030; and China - the world’s biggest emitter - agreed to begin lowering its emissions by 2030. The U.S. also announced that, for the first time, it would regulate carbon pollution from power plants.Still, an ominous trend threatens to undermine this progress: Global reliance on coal, the highest-carbon fuel of all, is rapidly growing. Another July study found that cheap coal exports from the U.S., Australia and elsewhere are driving a“coal renaissance” in dozens of developing countries. Those nations are expected to build hundreds of new coal-fired power plants by 2030. Once up and running, “those coal capacities will stand there for the next 30 to 40 years,” contributing billions of tons of carbon emissions, says Jan Steckel, an economist at the Potsdam Institute for Climate Impact Research in Germany, who led the study.If these economies could be persuaded to shift to renewable energy, that scenario could be averted, but the window of opportunity is closing, saysSteckel. Negotiators at the Paris talks, which had not begun by press time, hope to figure out how to make that transition to renewables more affordable.The benefits of making these hard choices are clear. Some researchers say cutting carbon emissions enough to limit warming to 3.6 F (2 degrees Celsius) above pre-industrial levels could avert the worst impacts of climate change. The Amazon forest, which stores vast amounts of carbon, would survive, and according to a study published in September, staying within this threshold could stop sea level rise at 5 or 10 feet. While much of Florida would be sacrificed, many other coastal areas would remain intact.Meeting this goal would require capping humanity’s cumulative carbon emissions at about a trillion tons, and we’ve already burned through about two- thirds of that “allowed” carbon budget. We must choose wisely how we spend the rest.

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CLIMATE CHANGE THREATENS FUTURE WINTER OLYMPICS

Higher temps and reduced snow forecasted for former host cities, more than half of former host cities for the Winter Olympics will be literally too hot to handle such games by the end of this century. That's the prediction of a study published this week forecasting temperatures and snow cover for the 21 hostcities.And it's not just the Olympics that are at risk. "The world of winter sports is changing as the global climate continues to warm," says Daniel Scott. He is a climate-change researcher in Canada who works at the University of Waterloo in Ontario. He led a team of researchers who used math to predict how winter conditions will have changed by February 2050 and 2080. Why focus on February? That's the month in which the Olympic winter games are typically played."Winter sports and the cultural activities that go with them may go by the wayside for people living in some regions," he says. And ski tourism is no small issue. Across the globe, it brings in billions of dollars' worth of funds to communities large and small. But the biggest ski-tourism bonanzas may be those associated with the Olympics. Winter Olympics are usually held every four years. Scott and his team team considered projections for future weather in 21 cities. These included the 19 cities that already have hosted Winter Olympics. The team also looked at two additional cities.

The first is this year's host: PyeongChang, South Korea. The second is Beijing, China. That's where the 2022 Winter Olympics will take place.The good news: Both PyeongChang and Beijing should be cold enough in February to be available for winter Olympic games through 2080. It was 2014 when Scott's team first reported finding that "it would be difficult to imagine recent host cities/regions successfully delivering the diverse (Olympic)Games programme exclusively on natural ice and snow." They'd need tosupplement Mother Nature's white fluff with artificially made snow. That can be done. But it's costly and doesn't always supply the quantity and quality of snow that gold-medal-class athletes expect.Their new assessment appeared February 6 in the journal Current Issues in Tourism.

(12)
CRADLE OF CIVILIZATION IN PERIL

Militants wage war on the cultural heritage of an entire region. In the mid-13th century, a Mongol invasion cut a wide swath of cultural ruin through the Middle East, including the destruction of the great library of Baghdad. It took the region centuries to recover. Today, many Iraqi and Syrian archaeologists evoke this infamous chapter in medieval history to convey some sense of the devastation wrought by the so-called Islamic State (ISIL), along with the continued brutality of more than four years of civil war in Syria.While all the key belligerents in the conflict regularly commit cultural property crimes, ISIL stands out as the most brazen and egregious. Its militants expanded the targeting of cultural heritage in 2015 to ratchet up sectarian tensions, fund terrorism and promote their global franchise. ISIL mainly targets Muslim architecture and monuments for destruction, and it sells looted antiquities and other portable cultural property for funding. Only occasionally do fighters destroy pre- Islamic material for the cameras: In the first months of 2015, ISIL militants overran the Mosul Museum, smashing many of the collection's artifacts, and took bulldozers and sledgehammers to Iraq's fabled first millennium B.C. cities of Nineveh, Nimrud and Hatra, a UNESCO World Heritage site. In April, UNESCO Director General Irina Bokova accused ISIL of war crimes for these and other acts of destruction. The extremists continued their campaign in August with the destruction of important sites in the ancient desert oasis city of Palmyra, another World Heritagesite.Some might ask, "Why should we fret about 'old stones and bones' amid the human suffering of this conflict?" We do not face either-or decisions between saving lives or culture: The two are inextricably linked. By protecting heritage, we defend cultural identity. Radical extremists understand the power of heritage -they fear and loathe it, hence their obsession with pulverizing symbols of resistance anddiversity.

At the same time, cultural property protection undercuts terrorist financing beneath its thin ideological veneer, ISIL operates as an organized crime enterprise. As with other transnational criminal groups, antiquities crime provides a reliable and lucrative source of revenue and means of moneylaundering. While ISIL talks of destroying "ancient idols," in truth many of these artifacts are pouring out of the conflict zone for sale on the black market.

ISIL is adept at fusing global jihad, cultural cleansing and cultural property crime. Left unchecked, radical extremists will eradicate the evidence of more than 10,000 years of human achievement in Syria and Iraq, and the problem is spreading. With each looted archaeological site, robbed museum, exploded monument or burned archive, we lose data on the world's earliest-known agriculture, settled communities, organized religions, state-level polities, writing systems and great empires. Extremists are also stealing the future by destroying cultural assets vital to the tourist sector and by degrading educational and cultural infrastructure.

Syrian and Iraqi cultural heritage experts continue to risk their lives daily to document war crimes and to save our shared cultural patrimony. In August, ISIL militants beheaded archaeologist Khaled al-Asaad, who served as Palmyra's chief of antiquities for half a century. Asaad had helped move many artifacts to safety before ISIL seized control of the site in May. According to media reports, he was killed because he refused to divulge their location.From verifying reports of destruction with satellite imagery to monitoring the illegal antiquities market, more than 45 international organizations are involved in the effort to preserve the rich legacy of this region, the Cradle of Civilization. As the poet John Donne observed, "No man is an island, entire of itself; every man is a piece of the continent, a part of the main."

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DEFINING A DINOSAUR IS NOW FAR HARDER

New fossils are making it a challenge to know what links them - and separates dinos from others
"There's a very faint dimple here," Sterling Nesbitt says. He holds a palm-sized fossil up to the light. The fossil is a pelvic bone. It belonged to a creature called *Teleocraterrhadinus.* The slender, 2 meter (6 foot) long reptile ran on all fours and lived 245 million yearsago. That's about 10 million to 15 million years before scientists think dinosaurs first appeared. Nesbitt is a paleontologist at Virginia Tech in Blacksburg. He tilts the bone toward the overhead light. That illuminates a small depression in the fossil. The dent is about the size of a thumbprint. It marks the place where the leg bone fit into the pelvis. In a true dino, there would be a complete hole in this hip socket, not just a depression. The dimple is like a waving red flag: Nope, not a dinosaur.

The hole in the hip socket probably helped dinosaurs position their legs beneath their bodies. Without it, their legs would have splayed to the sides like a crocodile. Until recently, that hole was among a handful of telltale features - physical traits - used to identify a dino. Another no-fail trait was a particular depression at the top of the skull. Until, that is, *Teleocrater* mucked things up. The creature lived before dinos. But it had the "dinosaur" skull depression.

The list of "definitely a dinosaur" features was once quite long. Over the past few decades it has been shrinking. That's thanks to new discoveries of close dino relatives suchas *Teleocrater.* An April 2017 report of *Teleocrater*'s skull depression knocked yet another tell- tale trait off the list.Today, only one feature is still unique to Dinosauria. That's the great and diverse group of animals we know as dinosaurs. They inhabited Earth for about 165 million years. Then, some mix of asteroid impact and volcanic eruptions wiped out all dinos except birds.

"I often get asked 'what defines a dinosaur," notes Randall Irmis. He's a paleontologist at the Natural History Museum of Utah in Salt Lake City. Ten to 15 years ago, scientists would list perhaps half a dozen features, he says. "The only one to still talk about is having a complete hole in the hip socket."

Recently, scientists have dug up lots of new info about dinosauromorphs. That's a group that includes dinosaurs and dino-like creatures that lived right before and along with early dinosaurs. New discoveries are now calling some of those dino-diagnostic features into question. And that has been shaking up long-standing ideas about what the dino family tree should look like.

(14)
DESIGNING A MORAL MACHINE

Artificial intelligence is learning right from wrong by studying human stories and moral principles.Back around the turn of the millennium, Susan Anderson was puzzling over a problem in ethics. Is there a way to rank competing moral obligations? The University of Connecticut philosophy professor posed the problem to her computer scientist spouse, Michael Anderson, figuring his algorithmic expertise might help.

At the time, he was reading about the making of the film *2001: A Space Odyssey*, in which spaceship computer HAL 9000 tries to murder its humancrewmates. "I realized that it *was* 2001," he recalls, "and that capabilities like HAL's were close." If artificial intelligence was to be pursued responsibly, he reckoned that it would also need to solve moral dilemmas.

In the 16 years since, that conviction has become mainstream. Artificial intelligence now permeates everything from health care to warfare, and could soon make life-and-death decisions for self-driving cars. "Intelligent machines are absorbing the responsibilities we used to have, which is a terrible burden," explains ethicist Patrick Lin of California Polytechnic State University. "For usto trust them to act on their own, it's important that these machines are designed with ethical decision-making in mind."

The Andersons have devoted their careers to that challenge, deploying the first ethically programmed robot in 2010. Admittedly, their robot is considerablyless autonomous than HAL 9000. The toddler-size humanoid machine was conceived with just one task in mind: to ensure that homebound elders take their medications. According to Susan, this responsibility is ethically fraught, as the robot must balance conflicting duties, weighing the patient's health against respect for personal autonomy. To teach it, Michael created machine-learning algorithms so ethicists can plug in examples of ethically appropriatebehavior.
The robot's computer can then derive a general principle that guides its activity in real life. Now they've taken another step forward.

"The study of ethics goes back to Plato and Aristotle, and there's a lot of wisdom there," Susan observes. To tap into that reserve, the Andersons built an interface for ethicists to train AIs through a sequence of prompts, like a philosophy professor having a dialogue with her students.The Andersons are no longer alone, nor is their philosophical approach. Recently, Georgia Institute of Technology computer scientist Mark Riedl has taken a radically different philosophical tack, teaching AIs to learn human morals by reading stories. From his perspective, the global corpus of literature has far more to say about ethics than just the philosophical canon alone, and advanced AIs can tap into that wisdom. For the past couple of years, he's been developing such a system, which he calls Quixote - named after the novel by Cervantes.Riedl sees a deep precedent for his approach.

Children learn from stories, which serve as “proxy experiences,” helping to teach them how to behaveappropriately. Given that AIs don’t have the luxury of childhood, he believes stories could be used to “quickly bootstrap a robot to a point where we feelcomfortable about it understanding our social conventions.”

As an initial experiment, Riedl has crowdsourced stories about going to the pharmacy. They’re not page-turners, but they contain useful experiences. Once programmers input a story, the algorithm plots the protagonist’s behavior andlearns to mimic it. His AI derives a general sequence - stand in line, tender the prescription, pay the cashier - which is then practiced in a game-like pharmacy simulation. After multiple rounds of reinforcement learning (where the AI is rewarded for acting appropriately), the AI is tested in simulations. Riedl reports more than 90 percent success. More remarkably, his AI figured out how tocommit “Robin Hood crimes” by stealing the meds when the need was urgent and funds were insufficient - mirroring the human capacity to break the rules for higher moral ends.

Ultimately, Riedl wants to set AIs loose on a much broader body of literature. “When people write about protagonists, they tend to exemplify their owncultural beliefs,” he says. Well-read robots would behave in culturally appropriate ways, and the sheer volume of available literature should filter out individual biases.Cal Poly’s Lin believes that it’s too soon to settle on just one technique, observing that all approaches share at least one positive attribute. “Machine ethics is a way for us to know ourselves,” he says. Teaching our machines tobehave morally requires an unprecedented degree of moral clarity. And that can help refine human morality.

AI just might teach *us* philosophy.

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DNA FROM AFRICAN MUMMIES TIE THESE FOLKTO MIDDLE EASTERNERS

High-tech genetic methods and skilled techniques reveal genetic origin to the east, not the southAncient mummies are yielding a new treasure - DNA. The genetic material unwrapped from 90 of these preserved bodies in Egypt, a part of North Africa, show their family roots extend seemingly to the Middle East. They appear to have far less in common with ancient peoples throughout most of the rest of Africa.What this means, researchers now say, is that the ancient Egyptians had relatives in what is now the Middle East, and possibly Europe.
An Egyptian mummy provided the first sample of ancient human DNA in 1985. But scientists had doubts about how trustworthy the DNA was. The reasons? The chemicals used to mummify bodies can degrade DNA. So can Egypt's steamy climate. And, there were some worries that any tested samples might have been tainted with DNA from the people who worked on them when they were first unearthed.Enter Verena Schuenemann and her team. Schuenemann had been studying the genetics of ancient microbes at the University of Tübingen in Germany. She had become an expert at finding really old DNA. And to do this, she used the latest technology to sequence the DNA - map its building blocks to read its genes. These researchers extracted and analyzed two types of DNA. The mitochondrial type is genetic material that passes directly from a mother to her child. The other type, from cell nuclei, is passed down from both parents.

The researchers focused on sampling teeth and bones. These harder body parts had more preserved DNA than did soft tissues, such as muscle. The scientists screened for the highest quality samples and then checked for any sign of contamination with modern DNA.
Their hard work paid off. The team got usable mitochondrial DNA from 90 mummies. Three also yielded readable samples of the nuclear DNA.The mummies date from 1388 B.C. to A.D. 426. All came from a popular burial site in central Egypt. Called Abusir el-Meleq, this site was a hub for a religious cult that was devoted to Osiris. That's the ancient Egyptian god of the dead. A Jewish-German archaeologist had excavated the site in 1905. At the time, he reported evidence of a Greek influence on the burial site. But he offered few details about individual graves. And most of his research never survived World War II.

The new analysis reveals genetic ties to Greece and the Middle East. This is not a huge surprise since Egypt was a center of travel and trade at that time. But today's Egyptians are more closely related to sub-Saharan Africans to the south. Those genetic links were notably missing in the mummy DNA. Their absence suggests that foreigners from sub-Saharan Africa moved into the region later, the researchers say.

Schuenemann's group described its findings May 30 in *Nature Communications*. The new analysis leaves many open questions. The mummies found at Abusir el- Meleq come from a range of social classes. Even so, the researchers point out that people from just one site can't be counted on to reflect all of ancient Egypt's people. Still, the study shows that mummies can offer a glimpse into that nation's genetic roots.

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DO OLDER BRAINS MAKE NEW NEURONS ORNOT?

One of the most basic things our bodies do is make new cells. It's what allows tissues to grow and heal, and allows our bodies to continually rejuvenate themselves.When it comes to cellular replenishment, one of the places researchers are most interested in is the brain. The formation of new brain cells is of critical interest to researchers studying everything from brain injuries to aging to mental illnesses like depression.

New Neurons Or No?

But researchers might be experiencing a bit of whiplash right now. Two papers, published just under a month apart, stand at odds with each other. One, led by researchers from the University of California, San Francisco, and publishedin *Nature* in early March, suggests that the hippocampus, a brain region important in the formation of memories, learning and emotional regulation, stops making new neurons after childhood, something that contradicts most previous research. The second, from Columbia University researchers out today in *Cell Stem Cell*, and using a very similar method, says that's not true at all - the hippocampus does in fact make new cells throughout our lifespan.

It's enough to tangle your neurons. But, it's really a reminder that science is driven by debate and disagreement. It takes time and effort to arrive at a true consensus, and researchers can't answer questions as definitively as we might wish.

In this case, the confusion seems to come down to methodology. Finding evidence of newly-formed neurons isn't as simple as putting samples of brain tissue under a microscope. In fact, there are few direct ways of searching for neurogenesis.Instead, most researchers use indirect approaches, like searching for marker proteins involved in the maturation of new cells or other molecules somehow involved with cell development.

Though the way both teams of researchers looked for marker proteins differed slightly, both essentially involved highlighting cells expressing various marker proteins. They looked to see whether any cells "lit up", and if so, checked to make sure they were actual new neurons.

What Do You See?

If both teams used the similar methods, how did they come to such different conclusions? Maura Boldrini, the author of the most recent paper who found the hippocampus continues to make new neurons throughout our lives, thinks it came down to the samples each team used.

"It's not that they did something different from what we are doing substantially, I think it's more a matter of what kind of tissue they had available," she says.Boldrini studies how neurogenesis in the brain is related to things like depression and suicide. Over the years, she and others at Columbia University have built a large collection of brain tissue samples. Most importantly, she says, they had samples from people with healthy brains.

"As we started going on, we started having people with no psychiatric or neurological disease, no treatment, no history of drug abuse; spanning a biglifespan," Boldrini says. "So we thought we had the right collection of brains to be able to look at the effects of aging, without having these confounding factors. Not too many brain collections in the world actually have informationabout this."

The California researchers, says Sorrell, didn't know the exact diagnosis of each brain sample, and had no toxicology reports for them. Drug use or psychological conditions like depression could affect the brain's ability to make new neurons, potentially throwing the results off. In addition, some marker proteins begin to disappear soon after death, so if the samples aren't preserved quickly, evidence of neurogenesis could be wiped away.

Another factor, Boldrini says, is the method of preservation. Some fixatives can obscure researchers' ability to see certain types of cells. She encountered this problem during the course of her previous work, and that helped her choose the right fixatives to use. The California researchers used different fixatives thanBoldrini did, and she thinks it's another reason they might have come to different conclusions.

Counterpoint

Though Boldrini's work agrees with the bulk of prior research into the subject, she and her team are still relying on an indirect method of imaging neurons, and it makes it difficult at the moment to close the book on the subject.

And not every researcher is convinced. Arturo Alvarez-Buylla is a neuroscientist at UC, San Francisco and a co-author of the paper that found no evidence of adult neurogenesis in the hippocampus. While he says more work needs to be done, he thinks Boldrini's work may be misinterpreting some evidence, specifically the cells they label as new neurons."I believe what they are calling dividing cells and what they are calling new neurons, they may be those things, but the evidence is not there," Alvarez-Buylla says.He points to a marker protein both his team and Boldrini's use to search for developing cells, called Ki-67. Boldrini's team likely misread figures showing the protein, Alvarez-Buylla thinks, leading them to falsely conclude that new neurons existed.As for his own research, he says the fact they identified new neurons in samples of young tissue proves that his team's methodology was solid, and that his results weren't simply the result of poor sampling or fixing. They watched those cells dwindle and disappear as they looked at samples from progressively older people, which is evidence that

neurogenesis does stop.In fact, their method did turn up similar structures in adults as Boldrini did, Alvarez-Buylla says, but their interpretation differs.“So, we did see the same cells that they do see in our post-mortem material, it’s just that we do not agree that they are young neurons,”he says.

Where Do We Stand?

Jonas Frisen, a stem cell researcher at Sweden’s Karolinska Institutet who was not involved with either study, agrees that the reason both teams got such different answers most likely lies in how they went about collecting and analyzing samples. Furthermore, drawing conclusions from negative data, as Alvarez-Buylla’s team did, is difficult.“The commonly used quote, ‘Absence of evidence is not evidence of absence,’ summarizes that,” Frisen says in an email. “An analogy to the current situation is that you send 10 people into the woods to search for blueberries. Nine come back with blueberries and one not-are there blueberries in that forest?”The method that both teams relied on has its drawbacks as well. There is a poor signal-to-noise ratio when searching for marker proteins in the brain, Frisen says,and much of the evidence that it works is based on animal studies - which may not fully translate to humans.

In the end, he agrees with Boldrini that humans probably continue to make neurons throughout the course of their lives. It would be good news for those of us worried about cracking our heads one too many times, though it obviously doesn’t change how our brains actually behave. The real benefit would be to researchers studying how the formation of new neurons relates to depression and other mental disorders, as well as how we make new memories and regulate emotions.

These past few weeks have been a case study in the machinations of science, and it serves as a solid reminder that there aren’t many hard-and-fast truths in science.And, new neurons or not, it’s another piece of the puzzle of how our brains work. In the end, that’s good for all of us.

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DOG WINS TALLY OF NERVE CELLS IN THE OUTER WRINKLES OF THE BRAIN

Comparing neuron numbers in different species could provide clues to animals' smarts
If more nerve cells mean more smarts, then dogs beat cats, paws down, a new study finds. That harsh reality may shock some friends of felines. However, scientists say the real surprises came from the brains of less popular carnivores. Raccoon brains are packed with nerve cells, for instance. But brown bear brains are sorely lacking.

The researchers tallied the numbers of nerve cells, or neurons, in eight species. The ferret, banded mongoose, raccoon, cat, dog, hyena, lion and brown bear are all carnivores. Comparing how many neurons each hosted in their brains gave the scientists a better understanding of how different-sized brains are built. This neural tally appears in a December 12 *Frontiers in Neuroanatomy* paper. Ultimately, such data may also help reveal how brain features relate to intelligence.

For now, the multispecies nerve-cell count raises more questions than it answers, says Sarah Benson-Amram. She's a zoologist at the University of Wyoming in Laramie. "It shows us that there's a lot more out there that we need to study to really be able to understand the evolution of brain size and how it relates to
cognition," she says.

Suzana Herculano-Houzel is a neuroscientist at Vanderbilt University in Nashville, Tenn. She and her colleagues gathered brains from the different species. For each animal, they then whipped up batches of "brain soup." This was brain tissue dissolved in a detergent. To this they added a molecule in this slurry that attaches only to neurons. This let the researchers count the neurons in each bit of brainy real estate.

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DON'T BLAME THE RATS FOR SPREADING THE BLACK DEATH

People - not rodents - may have spread the most famous plague in history. The Black Death was one of the worst disease outbreaks in human history. This bacterial disease swept across Europe from 1346 to 1353, killing millions. For hundreds of years afterward, this plague returned. Each time, it risked wiping out families and towns. Many people thought rats were to blame. After all, theirfleas can harbor the plague microbes. But a new study suggests researchers havegiventhose rats too much blame. Human fleas, not rat fleas, may be most to blame for the Black Death.Black Death was an especially extreme outbreak of *bubonic plague*.Bacteria known as Yersinia pestiscause this disease. When these bacteria are not infecting people, they hang out in rodents, such as rats, prairie dogs and ground squirrels. Many rodents can become infected, explains Katharine Dean. She studies ecology - or how organisms relate to one another - at the University of Oslo in Norway.he plague's species "persists mostly because the rodents don't get sick," she explains. These animals can then form a *reservoir* for the plague. They serve as hosts in which these germs can survive.Later, when fleas bite those rodents, they slurp up the germs. These fleas then spread those bacteria when they bite the next critter on their menu. Often, that next entrée is another rodent. But sometimes, it's a person. "Plague is not picky," notes Dean. "It's amazing that it can live with so many hosts and in different places."People can become infected with the plague in three different ways. They can be bitten by a rat flea that's carrying plague. They can be bitten by a human flea carrying the plague. Or they can catch it from another person. Plague can spread from person to person through an infected individual's cough or vomit. Scientists have been trying to figure out, though, which route was most responsible for the Black Death.

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E-CIGARETTES DON'T NEED NICOTINE TO BE TOXIC

Vaped liquids produce gases that can damage and kill human cells and the people thinkthat electronic cigarettes without nicotine are harmless. Think again. A new study shows that the flavorings in e-cigs can harm human infection-fighting cells.

E-cigarettes work by heating a flavored liquid to make a mist that users inhale,or "vape." These flavored liquids, called e-liquids, usually contain nicotine. But not always. Manufacturers add nicotine for vapers who want a buzz from theire-cigarettes. It's the same stimulant that true cigarettes deliver. That nicotine - made from tobacco - qualifies most e-cigs as "tobacco products."

The nicotine may be useful for adults who are addicted to cigarettes and want to wean themselves off. But nicotine can harm children and teens. That's why some young people may choose to vape instead of smoke, and use nicotine-free products. But the new data suggest that e-cigs can still be toxic, even without nicotine.

"We know these flavors are really attractive to teens," says Irfan Rahman. He works at the University of Rochester in New York. He says studies have shownthat one reason many teens try e-cigarettes is an interest in fruity and candy-flavored products.

As a toxicologist, Rahman studies whether various materials can poison the body's cells or tissues. His team decided to test whether certain flavored e-liquids are toxic (meaning poisonous). They tested several common e-liquid flavorings. These included cinnamon roll, cotton candy, melon, pineapple, coconut and cherry.Such flavorings are considered safe in foods. That's because after a personswallows them, they're broken down in the gut. But that doesn't mean these same chemicals are safe to breathe in. They could harm parts of the respiratory tract, such as the lungs.

Rahman's team didn't expose people to these flavorings, in case they *were* harmful. Instead, they tested e-liquid chemicals on human cells in a dish. This helped them judge whether the chemicals might also harm cells inside the body. The answer: Some of the vaped flavorings did prove toxic to those cells. The researchers published their findings in the January *Frontiers in Physiology.*

Cells vs. cinnamon

After a person vapes, e-liquid chemicals could pass through the walls of small vessels in the lungs to enter the blood, says Thivanka Muthumalage. He's a researcher in Rahman's lab.Rahman's team wanted to know what would happen when these chemicals encountered blood cells. In one set of tests, the researchers exposed blood cells directly to the flavorings. They chose a type of white blood cell called a macrophage. These cells are part of the immune system, which fights disease. Macrophages hunt down and "eat" particles that shouldn't be in the blood stream. Those foreign particles could be germs or other things that might make people sick.The team used doses of flavoring chemicals similar to what are in the e-liquids that you can buy at a store, says Muthumalage. The doses in the experiment might even have been lower than what people would vape.To measure how toxic each chemical was, the researchers looked for signs ofstress in the cells, or even cell death. A number of e-liquid flavoring chemicals caused high levels of cell stress or death. Those included flavorings that taste buttery (these contain the chemicals pentanedione and acetoin). They also included flavorings that taste like vanilla (O-vanillin), cotton candy, caramel (maltol) and cinnamon (cinnamaldehyde).That last one, cinnamaldehyde, killed the most cells. And that's bad. Dead immune cells can't fight infection, explains Muthumalage.His team's findings are backed up by a study in the March 27 *PLOS Biology*. Researchers at the University of North Carolina School of Medicine in Chapel Hill tested the effects of 148 e-liquids on human cells. When exposed to vapors of some e-liquid flavors, it showed, fewer of these cells grew. The worst culprits?Cinnamaldehyde and vanillin.

A vaping machine

In a second set of tests, the researchers used a "vaping machine" to suck e-liquids through an e-cigarette. Afterward, they measured what vapors had entered the air.These mists are what an e-cig user would ordinarily inhale. The researchers then exposed human cells to these vapors.They showed that heating each flavoring in an e-cigarette created harmful levels of molecules that can damage cells. What's more, mixing two or more flavors together caused even higher levels of these damaging molecules than did heating each on its own. This suggests that breathing in multiple e-liquid flavors could be more dangerous than exposure to just one at a time.That's concerning, says Melanie Prinz. She's a college student who worked on the study in Rahman's lab. "Teens at parties often pass their [e-cig] devices around," she notes. That means they could be "sharing and inhaling a lot of different flavors."The findings from Rahman's lab agree with the findings from another study. It looked at vapors from nicotine-free e-cigs. Here, researchers at the University of California San Francisco studied the urine of teens who had vaped e-liquids without nicotine. The researchers looked for toxic chemicals that form when e- liquids are heated. The teens had up to three times the levels of five potentially cancer-causing chemicals in their bodies as did those who didn't vape. These findings appear in the April *Pediatrics*.That was the first study to measure the toxic chemicals that can get into the bodies of teens vaping nicotine-free e-liquids.

Cause for concern

Maciej Goniewicz works at the Roswell Park Comprehensive Cancer Center in Buffalo, N.Y. There he, too, studies the health effects of e-cig vapors. Testing the toxicity of e-liquid flavoring on cells is extremely important, he says. It helps identify which chemicals may be "bad actors," he explains.If these tests show strong toxicity, they could help government agencies decide which products to regulate - or even ban. Such data, he adds, could also help manufacturers create safer vape products.One benefit of studying cells in a dish, rather than studying actual people, is that you can limit variables, Goniewicz says. For instance, the Rochester team could omit nicotine, a known bad actor. But in real life, people might vape a liquid with nicotine one day and another without nicotine the next day. This could make it harder for scientists to tease apart the effects of flavorings and nicotine.But cell studies are just one piece of the puzzle. They're good for identifying potentially toxic chemicals. They don't, however, tell us about the long-term effects of exposure to them. Human studies will -but they take far longer. A disease may not show up for years or decades after a toxic exposure.

In fact, a large review found that the long-term health effects of vaping are not yet clear. A review is a research paper that gathers the results of other studies. This paper included more than 800 scientific studies - and found cause for concern.For instance, it found "moderate evidence" that vaping led to more coughing and wheezing in teens, and worse asthma. There is also moderate evidence linking vaping to a short-term rise in blood pressure, and to harmful stiffening of bloodvessels. And the review authors found "substantial evidence" that e-cig vapors can damage DNA and cells.This massive report, released January 23, was issued by the U.S. National Academies of Sciences, Engineering and Medicine.

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EBOLA AFTERMATH: THREE PERSONAL STORIES

Experts weigh in on the ongoing battle against Ebola's legacy.

The Ebola outbreak gripped the world in 2014, infecting more than 24,000 people and claiming over 11,000 lives. In 2015, the epidemic was ongoing in parts of Sierra Leone, Liberia and Guinea. *Discover* talked with three scientists involved in the worst Ebola outbreak in history, about their roles and the promising vaccines that may ultimately vanquish the disease.

Alexandre Delamou

Chief of research, National Centre for Training and Research, Maferinyah, Guinea.

Ebola's lasting legacy may be in maternal and child health: Public health officials worry that deaths during childbirth and from preventable childhood diseases like measles could escalate into the tens of thousands. Delamou talks about why the collateral damage triggered by the epidemic could turn out to be even more lethal than the outbreak itself.

*Delamou:*There have been a lot of efforts to improve access to maternal health in Guinea, Liberia and Sierra Leone. But one of the impacts of Ebola is a decrease in hospital attendance because there were a lot of infections among health professionals. And the outbreak is not over - we had 10 to 12 new cases a week [until recently]. So people still don't feel safe, and they continue thinking that hospitals are a place where you can get Ebola. MultipleEbolacasesoccurred in rural communities, and health care providers left those areas tocome to the cities, and most did not return. So now, when women in rural areaschoose to deliver at home, if they have complications, there's no one whocan take care of them, and they're more likely to die.

Children's health is connected to their mothers' health. Because pregnant women won't come to the hospital to have their babies delivered, it is unlikely she will bring her newborn in later for immunizations. There is now a measles outbreak in this country, which is a direct consequence of the lack of usual immunization services, and there have already been some deaths.

Joanne Liu

President, MSF International, Geneva, Switzerland

The medical aid group Doctors Without Borders (Médecins Sans Frontières, or MSF) dispatched more than 700 doctors, health care professionals and relief workers to ground zero, treating about 35 percent of all Ebola patients, starting in March 2014. Within MSF, 28 of its colleagues became infected, 14 of whom died, and the aid group cared for more than 2,600 patients who later died. MSF was among the first to sound the alarms about the Ebola outbreak.

*Liu:*Ebola spun out of control because of a lack of political leadership - the world stood aside while Ebola tore through western Africa. Everyone missed Ebola, but when we said it was out of control, we were [accused of] being alarmist. It was only when an American got sick in August of 2014 that the world woke up and took action to stop Ebola from coming to their countries.

But it was too little, too late, and thousands were already dead or dying. When I visited western Africa [that] August, I saw how local people were completely overwhelmed by the situation. We didn't have enough room for all the patients, there was no place for them to lie down, and we were completely limited in the care we were providing. This is the first time in all of our history that MSF built crematoriums - we had too many dead bodies.

This was the first outbreak that spread from rural to urban areas. Normally, outbreaks last between eight and 12 weeks, but this has lasted 17 months and is still ongoing. There is a triumphant narrative that it's over when it is absolutely not. We are kidding ourselves. This outbreak started with one case, and it could flare up again.

Initially, we told people it's a deadly disease and we have no cure, so essentially we're telling them, "Come and die in an Ebola center." We need to change that because if these people come in earlier, they have a better chance to pull through and not infect their loved ones. We know what to do because it's like HIV and AIDS two decades ago - it was a death sentence, and people hid from it. But today it is not a death sentence, and we need to apply what we learned from fighting that epidemic..

Thomas Geisbert

Virologist, University of Texas Medical Branch, Galveston

Human safety tests of two vaccines began in the summer of 2014, after the prototypes languished in labs for nearly a decade because Ebola wasn't enough of a threat to attract Big Pharma. But one of them -VSV-ZEBOV, in which the Ebola protein is spliced inside of a live vesicular stomatitis virus normally found in cattle - proved 100 percent effective in a preliminary test of morethan 4,000 people in Guinea this past summer. Geisbert helped devise theVSV ZEBOV vaccine and also worked on an inhaled version of the vaccine that immunized monkeys earlier in 2015.

*Geisbert:*After 9/11, there was a lot of concern that Ebola could be used as a bioterror agent, and the National Institutes of Health put a lot of money into biodefense. But there wasn't any money for product development or the financial incentive for Big Pharma to get involved because who were you going to sell your drug to? Still, we made tremendous progress as a field, but everything just sat there until this outbreak. I felt a real sense of frustration watching this outbreak because we had something sitting on the shelf that might have saved lives. But the silver lining is that we now have the public's attention.

The VSV vaccine is extremely robust and has tremendous potential to be used to control an outbreak and contain its spread rather than to vaccinate large populations. To contain, manage and control an outbreak in Africa, you need a vaccine that requires just one injection and that works quickly. The VSV vaccine works fast, within seven to 10 days. It was shown to protect up to 50 percent of primates after exposure but before they showsymptoms.

Consequently, this vaccine has a great chance of combatting an outbreak in the context of ring vaccinations, where you give the vaccine only to people in close contact with infected patients. That strategy can be used to break the chains of transmission and reduce the number of cases. It can also be used with first responders and health care workers who need to be protected really quickly.

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EXPLAINER: WHAT IS A CONCUSSION?

This severe type of head injury can damage a brain for weeks to years - perhaps a lifetime

It may start with a car accident. Or a collision with another athlete on the basketball court or soccer field. Perhaps a cheerleader did a header off a human pyramid. In each case, the end result is the same - a whopping knock to the noggin. If the hit was particularly hard, doctors may diagnose the individual with a concussion.Its symptoms can include forgetfulness, headache, dizziness, fuzzy vision and sensitivity to noise. Some people may vomit. Others undergo behavioral changes. They might become irritable or have trouble concentrating. Severe concussions can even knock someone unconscious. People in this sleeplike state are not aware of their surroundings and experiences.

Concussion occurs when the brain slams against the inside of the skull. The brain's parts are not uniform in size and density. So when this organ collides with bone, some parts of the brain will move faster than others. That can cause parts of the tissue to twist and get squashed. These movements can damage delicate nerve cells.Those nerve cells, or neurons, are what relay signals inside our brains. They connect with each other through long, slender structures called *axons*. It's these axons that a head injury can damage.

Just like a wire carries electricity, an axon carries electrical signals. Those signals tell other parts of the brain, or specific parts of your body, what to do. Without neurons to communicate information from your eyes to your brain, you wouldn't be able to understand - or even see - the words in this sentence.All those neurons in the brain form the control center for the body. That's why the body has a skull: to protect the brain.

The skull forms a solid barrier between that control center and anything that might harm it. A cushion of fluid inside the skull surrounds the brain, further protectingit. This fluid keeps the brain from banging into the skull during normal activity. But extreme head movements can be too much for that cushion to handle. When the head snaps forward, back or to the side, the skull stops moving. The brain, however, may keep going - and smack hard against thebone.

When an axon is stretched or twisted, the cells to which it is a part may die. That's why symptoms of concussion may last for weeks to months. More worrisome: Some changes may persist for years, emerging data show. These may escape the notice of patients and their doctors. For instance, the brain may seem to perform just fine, yet have to work unduly hard just to manage simple tasks. Such subtle changes may never go away.

Especially troubling is that repeated concussions in professional athletes - especially in boxers and football players - have been linked with permanent memory problems, even dementia. Many of those changes have been associated with a type of progressive brain disease known as CTE. That's short for chronic traumatic encephalopathy.

A 2017 study of the brains of 202 former U.S. football players, all now deceased, showed 177 of them had developed CTE. The same condition also showed up in the brains of some younger athletes, including three of 14 high school football players and 48 of 53 college players.Clearly, concussion is nothing to be ignored. Most experts now recommend weeks or months of recovery before a concussed athlete resumes activities that may pose a risk of being reinjured.

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EYEBROWS: A HIDDEN FORCE INHUMANEVOLUTION?

From Spock to "The Rock," arched eyebrows can speak volumes. Now researchers suggest that communicative eyebrows may have proven key to the evolution of modern humans, a marked advance over the prominent brow ridges of early humans.Modern humans possess smooth foreheads with expressive eyebrows. In contrast, early humans had sloping foreheads with thick brow ridges."There have been many explanations over the years for why early humans had these huge bony ridges," said study co-author Paul O'Higgins, a physicalanthropologist at the University of York in England. "One is that they served kind of like a big girder across the head, protecting the skull when one bites hard.Another suggestion was that their faces were so enormous, they didn't fit under the brain, so these brow ridges sat forward simply to fit the gap between the forehead and the eye sockets."

Bow to the Brow

To see what role these protruding brow ridges might have played in early humans and learn more about why modern humans no longer have them, scientists first created a 3-D computer model based on X-rays of a fossil skull known as Kabwe1 from Zambia. This cranium belonged to an archaic human lineage knownas *Homo heidelbergensis*, which lived between 600,000 and 200,000 years ago.

The researchers next experimentally reduced the size of Kabwe 1's brow ridges to see what the effects would be. When they simulated the forces of biting ondifferent teeth in the skull, they found the brow ridge experienced very little force, and taking it away had no effect on the rest of the face when biting. They also found that Kabwe 1's heavy brow was much larger than was needed to fill the space between the forehead and eyesockets.

Oversized brow ridges may not play a role physically, but the scientists now suggest they may have had a social function. They noted that baboon-like mandrills have bony, colorful muzzles that males use to signal dominance, and they mayhave played a similar role in early humans, like the antlers on a stag. Indeed, O'Higgins noted that when anthropologist Grover Krantz wore artificial brow ridgesformonths, "the way in which people crossed the street to get away from him suggested they might prove intimidating."The communicative eyebrows and foreheads of modern humans might have emerged as a side effect of the way in which our faces have shrunk over the past 100,000 years. This shrinking process "has proved especially rapid over the past 10,000 years, with our faces now often not big enough to allow wisdom teeth to come out," O'Higgins said.

Ridge No More

It remains uncertain why the modern human face shrunk - it may be due to the advent of cooking and other forms of food preparation, or a change in levels of exercise, among other possibilities, O'Higgins said. However, these changes did coincide with increasing sociality among modern humans.

"One thing people are very good at is mind-reading - you may not be talking, but if I can see you, I can often tell a lot about what you're thinking," O'Higgins said. "Trading large brow ridges for mobile eyebrows and a high forehead might have given us a big canvas to signal more subtle emotions than before to help us form groups."

This change may have helped play a key role in modern human evolution. "If you look at archaic lineages like Neanderthals, their genetics suggest there was inbreeding, while if you look at modern humans, there were larger groups and a lot more mobility between groups," study co-author Penny Spikins, an evolutionary
anthropologist at the University of York. "The ability to express quite subtle emotional changes may have opened up the possibility to communicate with people we didn't know particularly well, allowing collaboration between different groups of people."

The researchers do expect that their new theories on brow ridges might raise a few eyebrows. "But even the phrase 'raised a few eyebrows' just goes to show that eyebrows are capable of quite complex ideas," Spikins said.O'Higgins, Spikins and study lead author Ricardo Miguel Godinho detailed their findings online April 9 in the journal Nature Ecology & Evolution.

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FINDING AND HELPING TEENS FOR WHOM SADNESS IS A DISEASE

Life can be challenging for teens. They must juggle schoolwork, family life and friends. Feelings of sadness, frustration and irritability are common. But for some teens, those emotions take a more extreme turn. Their negative feelings don't come and go, punctuated by periods of satisfaction or happiness. Instead, those intense feelings can point to a disease called depression - one that may require treatment. The American Academy of Pediatrics, or AAP, has now asked its member doctors to start screening for signs of this in all preteens and teens.

It's easy to think that depressed people simply feel sad or hopeless. For many teens that may be true. But depression in teens can be hard to spot. Some kids withdraw from friends and family. Others respond with angry outbursts.Some teens may skip school or stop eating or sleeping. Some may startabusingalcohol or drugs. Teachers, parents or even a teen's close friends may find it hard to tell whether these behaviors are just part of being a teen or signs of something truly serious.

How serious?

Each year, an estimated 5,000 Americans between the ages of 15 and 24 take their own lives. "The rate of suicide for this age group has nearly tripled since 1960," according to Mental Health America, or MHA. Indeed, it says, suicide has become "the third leading cause of death in adolescents and the second leading cause of death among college-age youth." Founded in 1909 and based inAlexandria, Va., MHA describes itself as "the nation's leading community-based nonprofit dedicated to addressing the needs of those living with mental illness."

There is a link between mental illness and suicide in teens. That's according to the American Academy of Child and Adolescent Psychiatry, based inWashington, D.C. "The majority of children and adolescents who attempt suicide have a significant mental health disorder," it says - "usually depression." And as a disease, depression can last for a decade or longer.

Explainer: What is anxiety?

Even depressed teens may not realize they have this problem. And the share of those affected is high. More than three million Americans between the ages of 12 and 17 experienced depression in 2016. However, most likely went untreated. A 2001 study by researchers at Harvard and Yale universities found that halfofall teens with depression don't get help until they become adults. And only one in three will have been diagnosed by their primary care doctor, another study reported.

The new guidelines aim to improve those numbers. AAP is asking pediatricians to undertake mental-health training. It wants them to become more aware of the signs of depression. It's also asking these doctors to screen for mental-health problems at regular annual check-ups of every teen. Where depression is suspected, doctors can then work with mental-health professionals to find out how to treat any disorders so that their patients can feel good again.

The AAP's new guidelines were published in AAP News on February 26.

Peers can help

"It's a great start," says Teri Langan Dee. This mental-health professional in Lincoln, Neb., sees many adolescents with depression. "I have had very few pediatricians reach out to me to coordinate treatment," she says. The new guidelines should change that by making it easier for doctors and mental-health professionals to work together. That means more cases of depression likely will be caught and treated, Dee notes.Teens concerned about giving embarrassing answers in front of their parents need not worry. The AAP guidelines ask doctors to interview their patients alone.Teens should be honest with their answers. "I can only work with what you give me," Dee says. "If you're not honest, you won't benefit." Dee says peers should also scout for signs of depression. Keep an eye on your friends, she recommends. Watch for symptoms of isolation or hopelessness. Or irritability, anger and excessive drama. That last issue can be hard, because drama affects most teens. But here, the symptom to worry about is drama that emerges when interacting with almost everyone. Even skipping classes can be a sign that something serious is going on. Any of these behaviors could be a symptom of depression.

Explainer: Tips for overcoming loneliness

So how can people tell what behavior reflects mental growing pains and what's a sign of disease? One key is a sharp change in behavior, Dee says. Another warning sign: a persistence in that new behavior - meaning that it sticks around for two weeks ormore.

Researchers at the University of Michigan in Ann Arbor support the idea of friends helping friends. They trained teens from 10 high schools in a peer-to- peer program on depression awareness. These teens then took what they had learned into their schools to educate the rest of the student body. At the end of the study, students in all 10 schools were more understanding of mental-health problems. And - more importantly - they were better able to identify people who might be suffering from depression.

Are certain people at higher risk of depression? Yes.

Some individuals seem to have a family history of depression. It can show up in parents and their children. If these people have an imbalance in certain brain- signaling compounds, they may need medicines to correct the problem.

Other people may find themselves as social outcasts owing to physical ormental traits that make them appear different from most of their classmates. Such people often experience bullying. They can develop low self-esteem. This can include girls who may enter puberty at a young age. Because their bodies don't match their emotional development, people who mature early often experience depression that can last intoadulthood.

Overall, knowing who - and how - to help is essential for successfully treating depression in teens, therapists say."Mental health is often overlooked by parents and other adults in the teen's world," Dee says. The new guidelines should make it easier for teens to get the help they need.

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FINDING THE UNIVERSE'S MISSING MATTER

After decades of coming up short, scientists have finally discovered what was hiding in plain sight.When Colin Hill found himself bored on winter break from Princeton University in late 2013, he decided to search through old cosmology papers. (Grad students are fun like that.) He saw one that sparked an idea: Now that telescopes are so sensitive, could we learn anything new about missing matter by comparing the latest maps of galaxies with traditional records of the universe's oldest light?

Over the next few days, Hill worked through a quick analysis. It looked like he might be on to something. He returned to campus in January and sat down with his thesis adviser, David Spergel, and others to dig deeper on this map comparison. After finishing up - and triple-checking every step - they could do something no one had done before: reliably account for all of the normal matter in the universe.

A Normal Problem

It's a surprisingly big deal. This normal matter, the types of particles that make up you and me and everything astronomers can see in the universe, seemed to be evading detection. The mystery of this missing stuff officially began in the early 1990s when scientists first tallied up all the stars, hot gas, cold dust and everything else they knew about. The total amounted to only a fraction of all the normal matter that the universe should have created during its first few minutes, based on other, super-solid observations using both the oldest cosmic light and nuclear physics equations. (Dark matter is its own mystery, and it involves totally different stuff.)

Over the next two decades, as telescopes became more sensitive, astronomers would make some progress hunting that unseen normal matter they knew had to be there. But the numbers still weren't adding up.

"There's a huge disconnect," says Argonne National Laboratory cosmologist Lindsey Bleem. "We're missing about 30 percent of the [normal matter] we know should be there when we do this accounting."

And the fact that astronomers couldn't find it was disconcerting. After all, telescopes can see every form of light, from radio waves all the way up to high- energy gamma rays. Regular matter shouldn't be able to hide.

In the Beginning

It all goes back to the oldest light in the cosmos. It's been traveling through our expanding universe since 380,000 years after the Big Bang. Today, it saturates the modern sky in microwave light. Embedded in this cosmic microwave background (CMB) radiation are hints aplenty about the universe in its infancy.

But the all-sky maps that chart the CMB also contain details of everything the light passed on its way to our telescopes. The gravitational pull from massive clumps of matter can yank on the light's path, and the hot gas floating between galaxies in clusters can donate a bit of energy to the light. Moving gas can also impart some of its own momentum to the light particles passing through as microwaves, literally shoving around the CMB.

Rashid Sunyaev and Yakov Zel'dovich hypothesized this action in the 1970s, but it hid from astronomers' detectors until 2012. Because it's synonymous with movement, the momentum transfer is called the kinematic Sunyaev Zel'dovich, or kSZ, effect - and that's what Hill's team used to unveil the universe's normal matter.

Push Comes to Shove

It's not easy to find, but researchers are just barely able to detect the kSZ effect today by correlating two separate datasets: their CMB maps of choice and the newly precise maps of galaxy structures. When combined, these allow astronomers to see the exact locations of the moving gases that give the CMB light particles a kick. Hill's team looked for the strength of that kick, because from that they can figure out how much matter is out there. However, determining that strength depends on two things: the velocity and amount of gas doing the kicking within the galaxy.

Once cosmologists have the KSZ signal, they can finally determine how much matter is out there - as long as they also know its velocity. Normally that's no problem, as astronomers can study a galaxy's light to learn how far away itis
and how fast it's moving. But that type of measurement is time-intensiveand
expensive, and Hill's team wanted to look at a lot more - ultimately 46 million galaxies.

So they created a computer model based on scientists' standard understanding of the universe - things like how old it is, how much dark matter it holds and how powerful gravity is. And from that model, they could estimate, statistically, the velocities of the galaxies across the entire sky. All the pieces fell into place."By comparing the measurements with the theoretical model," says Hill, "we get the measurement of the amount of gas associated with the galaxies."Their technique worked, and they published last year in *Physical Review Letters*. "According to the measurement we made, all of the [normal matter] is accounted for in the present-day universe," Hill says. The kSZ signals, while faint, revealed the long-missing matter had been there all along, too diffuse to make out. Now researchers could finally seeit.

Complementary Conviction

But tallying that normal matter was just the beginning. "I was both relieved and excited with the results," says Hill, now at Columbia University. "But what's more exciting is to think about what we're going to be doing in the next couple years."

The next decade will include more advanced CMB telescopes and galaxy sky surveys. The Large Synoptic Survey Telescope (LSST), for example, will photograph all of the southern skies from its Chilean ridge in a matter of days, compiling information on 20 billion galaxies over 10 years.

Those observations will lead to refined maps of the universe's normal material. "We'll be applying [this technique] to these much bigger samples and measure how the gas distribution is changing as the universe evolves," says Hill's adviser and co-author Spergel.

That information can start to reveal details of cosmic structure. How exactly is matter distributed throughout a given galaxy? How much material do high- energy objects, like exploding stars or ravenous black holes, toss out of their galaxy's gravitational grip?

"We're hoping that by using these types of measurements over the next few years, we'll probe precisely how this gas is getting moved around by these very dramatic processes," says Hill. "That's the next frontier."

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HEALTH IS MORE IMPORTANT THAN WEALTH, CHILD DEVELOPMENT STUDY FINDS

Report in the Lancet shows that children across the globe will hit the same milestones, as long as basic needs are met

Healthy children develop in remarkably similar ways, no matter where they live, according to a study that confounds prevailing beliefs on childhood development.

A report published in the Lancet found that early developmental milestones in a large number of children aged from 0-3 years, in four diverse countries -Argentina, India, South Africa and Turkey- were similar.

The study's authors said that by using a universal tool for measuring child development for the first time, they managed to overcome a key barrier to addressing analytical difficulties in low -and middle-income countries- that of obtaining reliable data.

Previous research, which has shown that children attain different milestones across sex and cultures, did not pay enough attention to children's health and its impact on development, researchers said.

Dr Roopa Srinivasan, a developmental paediatrician based in Mumbai, India, said researchers there "have often felt pressured to use what scarce resources we have to develop, customise and re-standardise existing 'gold standard' tools for use in our own settings, without which we are not taken seriously by bureaucrats or
politicians".

The report, which studied thousands of healthy children, said: "Our studyadvances the understanding of early childhood development by showing that many milestones in numerous domains are similarly attained across sexes and countries. We found that the attainment of almost all milestones is similar in the first year when environmental and cultural influences might have the smallesteffect."

The lack of standardised instruments that are culturally appropriate, affordable and simple enough to be used by community health workers has meant that data on child development is scarce, the authors said. Furthermore, low- and middle- income countries have sometimes been reluctant to invest in earlychildhoodinitiatives whose logic may be questioned and whose effectiveness they may not be able to measure.

The universal tool used by the study, the guide for monitoring childhood development, uses seven indicators: expressive language, receptive language, fine motor skills, gross motor skills, relating, play and self-help.

The research is part of a growing trend in low- and middle-income countries to focus on child development.

“With irrefutable evidence that children in low- and middle-income countries can be expected to develop optimally as long as basic needs for nutrition, safety and stimulation are met, policy makers and political leaders can now turn their attention to making it happen.”

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HERE'S WHY VENUS IS SO UNWELCOMING

There's a planet next door that could explain the origins of life in the universe. It was probably once covered in oceans. It may have been able to support life for billions of years. No surprise, astronomers are desperate to land spacecraft there.

The planet is not Mars. It's Earth's twin, Venus.

Despite its appeal, the second planet from the sun is one of the hardest places in the solar system to get to know. That's partly because modern Venus is famously hellish. Temperatures are hot enough to melt lead. Choking clouds of sulfuric acid swirl through its atmosphere.

Today, researchers who want to explore Venus say they have the technology to master such challenging conditions. "There's a perception that Venus is a very difficult place to have a mission," says Darby Dyar. She is a planetary scientist at Mount Holyoke College in South Hadley, Mass. "Everybody knows about the high pressures and temperatures on Venus, so people think we don't have technology to survive that. The answer is that we do."

Indeed, researchers are actively developing Venus-defying technology.

In 2017, there were five proposed Venus projects. One was a mapping orbiter. It would probe the atmosphere as it fell through it. Others were landers that would zap rocks with lasers. From a technology point of view, all were considered ready to go. And the laser team actually got money to develop some parts for the system. But the other programs failed to find funding.

"Earth's so-called 'twin' planet Venus is a fascinating body," notes Thomas Zurbuchen. He is the associate administrator for NASA's science mission programs in Washington, D.C. The problem, he explains, is that "NASA's mission selection process is highly competitive. By that he means that right now there are more good ideas than money available to build them all.

Story continues below image.

Visiting Venus

In the search for alien life, Venus and Earth would look equally promising from afar. Both are roughly the same size and mass. Venus lies just outside the sun's habitable zone. That zone has temperatures that could keep liquid water stable on a planet's surface.

No spacecraft have landed on the surface of Venus since 1985. A few orbiters have visited Earth's neighbor in the past decade. The European Space Agency's Venus Express was one. It visited Venus from 2006 to 2014. The other is the Japanese space agency's Akatsuki. It has been orbiting Venus since December 2015. Still, no NASA craft has visited Earth's twin since 1994. That's when the Magellan craft plunged into the atmosphere of Venus and burned up.

One obvious barrier is the planet's thick atmosphere. It is 96.5 percent carbon dioxide. That blocks scientists' view of the surface in almost all wavelengths of light. But it turns out that the atmosphere is transparent to at least five wavelengths of light. That transparency could help identify different minerals. And Venus Express proved it would work.

Looking at the planet in one infrared wavelength allowed astronomers to see hot spots. These might be signs of active volcanoes. An orbiter that used the other four wavelengths might learn even more, Dyar says.

Ground truth

To really understand the surface, scientists want to land a craft there. It would have to contend with the opaque atmosphere while looking for a safe place to touch down. The best map of the planet's surface is based on radar data from Magellan a quarter century ago. Its resolution is too low to show rocks or slopes that might topple a lander, notes James Garvin. He works at NASA's Goddard Space Flight Center in Greenbelt, Md.

Garvin is part of a team that's testing a computer-vision technique. Called Structure from Motion, it could help a lander map its own touch-down site. It would do this during its descent. The system quickly analyzes many images of stationary objects taken from different angles. This allows it to create a 3-D rendering of the surface.

Garvin's group tried it out with a helicopter over a quarry in Maryland. It was able to plot boulders less than half a meter (19.5 inches) across. That's about the size of a basketball hoop. He is scheduled to describe the experiment in May at the Lunar and Planetary Science Conference in The Woodlands, Texas.

Any lander that survives to reach the surface of Venus faces another challenge: surviving.

The first landers there were Soviet spacecraft. They landed in the 1970s and 1980s. Each lasted only an hour or two. That's not surprising. The planet's surface is about 460° Celsius (860° Fahrenheit). The pressure is some 90 times that of Earth's at sea level. So in short order some crucial component will melt, become crushed or corrode in the acidic atmosphere.Modern missions are not expected to fare much better. It could be one hour - or maybe 24 hours "in your wildest dreams," Dyar says.

But a team at NASA's Glenn Research Center in Cleveland, Ohio is hoping to do far better. It aims to design a lander that would last months. "We're going to try to live on the surface of Venus," explains Tibor Kremic. He is an engineer at the Glenn center.

Past landers have used their bulk to temporarily absorb heat. Or they have countered scorching temps with refrigeration. Kremic's team proposes something new. They plan to use simple electronics. Made of silicon carbide, these should withstand the heat and do a reasonable amount of work, says Gary Hunter. He is a NASA Glenn electronics engineer.

His group has tested the circuits in a Venus simulation chamber. Called GEER, it's short for Glenn Extreme Environment Rig. Kremic compares it to "a giant soup can." This one has walls 6 centimeters (2.4 inches) thick. The new type of circuits still worked after 21.7 days in an atmosphere that simulated Venus.

The circuits could have lasted longer, Hunter suspects, but didn't get a chance. Scheduling issues put an end to the test.

The team now hopes to build a prototype lander that would last for 60 days. On Venus, that would be long enough to act as a weather station. "That has never been done before," Kremic notes.

Reading rocks

And that presents the next challenge. Planetary scientists have to figure out how to interpret such data.

Rocks interact with the Venusian atmosphere differently than they would with the surface atmosphere on Earth or Mars. Mineral specialists identify rocks based on the light they reflect and emit. But the light that a rock reflects or emits can change in high temperatures and pressures. So even when scientists get data from the rocks on Venus, understanding what they show could prove tricky.

Why? "We don't even know what to look for," Dyar admits.

Ongoing experiments at GEER will help here. Scientists can leave rocks and other materials in the chamber for months, then see what happens to them. Dyar and her colleagues are doing similar experiments in a high-temperature chamber at the Institute of Planetary Research in Berlin.

Story continues below image.

"We try to understand the physics of how things happen on the Venus surface so we can be better prepared when we explore," Kremic says.

There are other ways to explore rocks, too. Two approaches NASA didn't yet fund would use different techniques. One would maintain Earthlike conditions inside, then bring crushed rocks into a chamber for study. Another shoots rocks with a laser, then analyzes the resulting puff of dust. The Mars Curiosity rover uses this technique.

But their high costs are putting some planned tests on indefinite hold. Last year, NASA issued a research challenge. It is looking for candidate missions to Venus that could get there for $200 million or less.

"The Venus community is torn on this idea," Dyar says. It would be hard to make meaningful headway on science questions at such a low cost, she notes. Still, she concedes, it may take multiple piecemeal missions to understand Venus anyway. "We'll get the frosting on one trip and the cake on a different trip."

Lori Glaze works on a Venus project at NASA Goddard. "My new favorite saying for the Venus community," she says, is "Never give up, never surrender." So, she notes, "We keep trying."

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HISTORY'S NEW OLDEST TOOLS

A fossil find rewinds the timeline for the creation of stone tools.

The road almost not taken led to the discovery of a lifetime. In 2011 archaeologists Sonia Harmand and Jason Lewis of Stony Brook University and colleagues took a wrong turn as they followed a creek bed, surveying sites around Lomekwi, near Kenya's Lake Turkana. A team member spotted stone tools eroding from sediment laid down 3.3 million years ago, making them the oldest ever found.

Up to 8 inches long, these tools are larger, heavier and less refined than those of the 2.6-million-year-old Oldowan type, the previous record-holder of the oldest tool title. Like Oldowan tools, the Lomekwian tools were clearly modified with intention, Harmand says. The maker mainly used a two-handed technique, holding a core on another large rock, or anvil, and hitting it with a hammer stone to release sharp flakes.

Until now, stone tool knapping and the abstract thought it requires have been credited to the genus *Homo*, beginning with *Homo habilis*, the presumed originator of the Oldowan style. But the Lomekwian toolkit, reported in *Nature* in May, predates *H. habilis* by half a million years. So far, all the candidates for making the Lomekwian tools are pre-*Homo* species, including *Australopithecus afarensis* of Lucy fame, and *Kenyanthropus platyops*, discovered in 1998 near the Lomekwi site. Says Lewis, "If it's a non-Homo species, that's a big game changer."

Getting a grip

To learn more about the evolution of the "power squeeze" - the grip we use to hold a hammer - University of Kent anthropologist Matt Skinner compared hand and wrist bones from living and extinct hominids using 3-D X-ray technology. Human hand bones showed increased density in certain key spots associated with toolmaking. In research reported in *Science* in January, Skinner found the same modifications in corresponding bones from *Australopithecus africanus*, possibly a direct ancestor of the *Homo*genus, which suggests that toolmaking was an earlier adaptation than previously thought. Could this help us identify the Lomekwian toolmakers? "The main point," says Skinner, "is that there was no *Homo* around (3.3 million years ago), so it would either need to be *Australopithecus or Kenyanthropus*who made those tools

Homo naledi and the Chamber of Secrets

An underground cave reveals a collection of fossils that could bring a new human species into the fold.

Deep underground, beyond a 39-foot vertical shaft narrowing to 8 inches in some spots, tantalizing clues of humanity's earliest origins are whispering up from the darkness. Here, in the Dinaledi Chamber of South Africa's Rising Star cave system, researchers have found a spectacular assemblage of fossils they say belongs to a new human species: *Homo naledi*.

In September, University of the Witwatersrand paleoanthropologist Lee Berger and his team described the fossils - discovered by spelunkers in 2013 - in the journal *eLife*. Media hoopla surrounding speculation about *H. naledi*'s behavior distracted attention from what made the discovery so scientifically important: the unprecedented quantity of bones. Ancient hominin fossils are rare, and those from early members of our own genus, *Homo*, are rarer still. So it is all the more astonishing that Berger's team recovered more than 1,500 fossils, from 15 individuals, including a fully articulated hand - the first ever found for early *Homo*.

H. naledi has a mix of primitive and modern anatomy, with an upper body suited for climbing trees and a lower body, particularly its feet, capable of walking long distances. The stunner is *H. naledi*'s cranium: It's shaped like the later, more advanced *Homo erectus*, but - with less than half the volume of our own- is tiny for its 5-foot-tall body.

Berger's team suggests that these primitive humans may have been put in the cave by their kin in an act of "deliberate body disposal." Such behavior would be incredible because only modern humans and Neanderthals, our closest relatives, are believed to have buried their dead. Compounding the controversy around the team's claim is not knowing how old *H. naledi* is. The age of a hominin fossil is typically determined by using a proxy - more easily dateable matter, such as bones of now-extinct animals with known timespans - deposited around the same time as the bones. In the case of *H. naledi*, this material doesn't seem to exist. The team will attempt to establish the fossils' age through alternative methods in the coming months. The information is crucial for understanding whether *H. naledi* is a primitive human displaying a behavior otherwise unknown until much later in hominin evolution, or a relatively modern human with a primitive anatomy that challenges conventional ideas about how our genus developed.

Regardless of the age, Berger said earlier this year, before publishing the *H. naledi*discovery, the fossils will force paleoanthropology to rethink long-held theories about human evolution. Not everyone agrees. Tim White, a paleoanthropologist not connected to the project, says the findings were published too early, with too much left unknown - including the age of the fossils and whether concrete evidence for the intentional placement of the dead exists. He says this rushed approach, which came amid a media frenzy, risked putting entertainment and excitement ahead of the less glamorous slog of more deliberate science.

Others, like William Jungers, a paleoanthropologist at Stony Brook University, say there isn't enough evidence to confirm that *H. naledi* is necessarily a new species. "It could even be an early, regional representative of *Homo erectus*," says Jungers. Yet even Berger's harshest critics agree on the magnitude of the discovery. Just a fraction of the Dinaledi Chamber - a plot about the size of a large manhole cover - has been excavated. The whispers have only started to surface. "It's a big deal," says White.

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HOUSEHOLD PRODUCTS CAN REALLY POLLUTE THE AIR

Cleansers, paints, glues and more spew gases that pose a risk to health and the environment

AUSTIN, Texas - Families wanting to reduce their impact on air pollutionmight need to do more than trade in a gas-guzzling car, a new study reports. It found that simple household items also are dirtying urban air. One example: those nicely scented air fresheners.

Paints, cleaning supplies and personal care products (think deodorants and hair sprays) are among common products that send a host of chemicals into the air. These air pollutants - some of them sweet smelling - now contribute as much to lung-irritating ozone and to tiny airborne particulates as does the burning of gasoline or dieselfuel.

It might not seem that way, but the finding is a mark of success, says Brian McDonald. He is a chemist at the Cooperative Institute for Research in Environmental Sciences in Boulder, Colo. He also was an author of the new study. And he shared some of his team's findings February 15 during a news conference. It took place here, at the annual meeting of the American Association for the Advancement of Science. His group's data also were published February 16in *Science.*

Steps to clean up car exhaust over the past few decades have had a huge effect, says McDonald. As a result, he notes, in cities "the sources of air pollution are now becoming more diverse."

Spyros Pandis works at Carnegie Mellon University in Pittsburgh, Pa. He's a chemical engineer who did not take part in the study. "When you have a big mountain in front of you," he explains, "it's difficult to know what lies behind it." Now that big sources (such as traffic emissions) are falling, other sources become more visible.

The new study focused on a class of pollutants known as volatile organic compounds. Most are derived from petroleum or other fossil fuels. These VOCs are hundreds of diverse chemicals that easily evaporate. These gases then may linger in the air.Some VOCs can be harmful when directly inhaled. Bleach and paint fumes make people lightheaded, for example. But beyond their immediate effects, VOCs also can react in the air with other chemicals. (These include oxygen and nitrogen oxides, largely from vehicle exhaust.) Those reactions can create ozone as wellas *fine particulates*. High levels of fine particulate, tiny dustlike motes, can make it hard to breathe. They also can help foster chronic lung problems, diabetes and heart disease. (And while ozone high in the atmosphere helps shield earth from the sun's harmful ultraviolet rays, at ground level it mixes with fine particulates to brew up breath-choking smog.

For six weeks, the researchers collected air samples in Pasadena, Calif. This was at a site in the well-known smoggy Los Angeles valley. They also studied indoor air measurements made by other scientists. The team traced the VOCs in these air samples to their original sources. To do this, they used databases showing the particular VOCs released by different household products.

Those household products had an outsized effect on air pollution, the team now reports. By weight, people use about 15 times more gasoline and diesel compared with VOC-emitting goods, such as soaps, shampoos, deodorants, air fresheners, glues and cleaning sprays. Yet those household products were responsible for
38 percent of the VOC emissions, the researchers found. That amount is 6 percentage points higher than the share due to gasoline and diesel use. The VOCs from household products also contributed as much as the fuels did to the production of ozone and fine particulates.

VOC-emitting consumer products:

- *Shampoo*
- *Hairspray*
- *Deodorant*
- *Perfume*
- *Airfresheners*
- *Cleaning sprays*
- *Laundrydetergent*
- *Disinfectantwipes*
- *Handsanitizer*
- *Glue*
- *Paint*

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HOW MANY SCIENTISTS DO YOU KNOW IN REAL LIFE?

The death of physicist Stephen Hawking on March 14 at age 76 sparked a globaloutpouring of admiration. In our appreciation, *Science News* physics writer Emily Conover calls him “a black hole whisperer who divined the secrets of theuniverse’s most inscrutable objects." He was also among the very fewcosmologists (hello, Carl Sagan) to have written an international best seller; Hawkingwasalso the subject of an Academy Award–winning biopic .

Hawking’s status as superstar scientist led us to ponder what other contemporary scientists people would immediately recall. Primatologist Jane Goodall came to mind, as did astrophysicist Neil deGrasse Tyson. Also Bill Nye (who worked as a mechanical engineer for Boeing before heading off to TV-land) and string theorist Brian Greene.

After that, our water cooler discussion of scientists who excel both at science and at explaining it branched off in many directions. We named Lisa Randall (yet another articulate physicist); Dava Newman, a former deputy administrator of NASA; Anthony Fauci, an AIDS researcher and director of the National Institute of Allergy and Infectious Diseases; neuroscientist Christof Koch; economist Raj Chetty; geneticist George Church; physician and *New Yorker* contributor Atul Gawande; “inner fish” paleontologist Neil Shubin; and climate science defender James Hansen. We could have gone on for hours; we talk with more than a thousand scientists each year in the course of researching stories, each one fascinating in her or his own way.

But most people don’t have the chance to talk with scientists as we do, and their vision of “who’s a scientist” remains tragically underpopulated. A survey last year by Research!America found that 81 percent of Americans couldn’t name a single living scientist. The most well-known then living?Hawking.

But the news isn’t all bad. A new analysis of schoolchildren’s drawings of scientists that reaches back decades shows that children today are less likely todraw the stereotypically nerdy guy with glasses. The number of women pictured has grown from close to zero in the 1960s to about one-third in 2016. One particularly charming drawing shows a casually attired scientist happily collecting data amidst a field of flowers, her red braids peeping out from a safari hat. That looks like science, and it looks delightful.

But clearly scientists and we science journalists have more work to do in making it easier for people to connect with scientists and their work. We rise to that challenge in this issue, in the next - a double issue that you’ll receive on or around May 12 -and in every issue we offer up. In the months to come, look for more profiles and Q&As with scientists, so you can look behind the scenes and see them at work. We love science and the people who do it, and we know you do, too.

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HOW THE BODY PROTECTS US FROM POTENTIALLY TOXIC AMOUNTS OF SUGAR

A study in mice challenges assumptions about how the body processes the sugar

Too much sugar can cause liver damage and raise the risk for other medical problems. Now, researchers studying mice have learned that the small intestine protects the liver from exposure to one type of sugar, called *fructose*. But the small intestine has its limits, the study finds. High doses of fructose overwhelm the intestine's ability to process the sugar. Researchers reported those results February 6 in *Cell Metabolism*.

Fructose is a type of simple sugar. It's found in honey and fruits, as well as in table sugar and in many sweetened foods and drinks. To use fructose for energy, the body needs to convert it into another type of simple sugar, called glucose, or into other smaller molecules. But too much fructose puts a strain on the body. For example, in people it puts the liver at risk for conditions such as fatty liver disease. It also raises the risk of obesity and type 2 diabetes (DIE-uh-BEAT-eez).

Scientists knew fructose could be broken down and absorbed in both the liver and the small intestine. But they believed the liver was mainly responsible for the process. The new study suggests otherwise. It finds that moderate doses of fructose are transformed in the small intestine. The liver steps in only when the dose of fructose is too high for the small intestine to handle.

In that way, the small intestine shields the liver from dangerously high doses of fructose, says Joshua Rabinowitz. One of the study authors, he works at Princeton University in New Jersey. He studies how the body breaks down chemicals.But how much fructose is too much is still up in the air. Rabinowitz and colleagues fed mice a sugar mix that contained equal parts glucose and fructose. (That's the ratio in basic table sugar.) Some mice got a lower dose of sugar, and some got a higher dose.

The researchers used a special technique to chemically "label" the sugar molecules they gave to the mice. The method involved swapping certain carbon atoms out fora slightly heavier form of carbon. That allowed the researchers to track which sugars were being transformed and where their by-products were ending up.Later, the researchers collected samples from different mouse organs. Then they separated out the sugar by-products by weight and identified the molecules with heavier carbon.

At lower sugar doses, researchers found lots of by-products from labeled fructose molecules in the small intestine. But they found only small amounts in the liver. The same was true in the vein that connects the small intestine to the liver. Lots of glucose molecules were found in this vein, though. The chemical labels showed some had been transformed from fructose molecules in the small intestine.

At high sugar doses, the small intestine couldn't keep up. The vein connecting the intestine and liver had a much higher ratio of fructose to glucose than at lower sugar doses. That suggests the small intestine was passing some fructose along to the liver.

Translating these findings into dietary recommendations for people could be challenging because mice burn more energy relative to their body weight than people do, cautions Luc Tappy. He's a physiologist at the University of Lausanne in Switzerland. He wasn't part of the study. He notes that it's hard to compare sugar doses between humans and mice.Plus, Rabinowitz adds, scientists don't know whether the small intestine is a safer place than the liver to process fructose. His lab plans to research that next.

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HOW TO COPE WİTH THE COLLEAGUE WHO DİSLİKES YOU

Some of you may have experienced the following situation: a colleague at workhas a great dislike for you no matter how nice you are toward him. The following article will give you some ideas on how to resolve such a personalityconflict.

Self-esteem & ego

There are two concepts that are of importance when it comes to personal relationships, namely self-esteem and ego. These are not synonyms, but are rather negatively correlated. The higher self-esteem you have, the smaller is your ego.Self-esteem is in essence how good and confident you feel about yourself. This is dependent on how much you feel that you are in control. Ego is the part of usthat seeks self-respect from otherpeople.

Let us illustrate this with an example. If you are a Professor and somebody calls you stupid, chances are that you will get less offended than say a school drop-out would. The reason is that you know that you are not stupid (because you are a Professor), so you have pretty high self-esteem and do not need to seek self-respect from others on this field.

However, if someone criticized your smell or clothing, even you as a Professor can become offended, because fashion sense and good smell are not necessarily required for becoming a Professor. In this field you might not have such good self- esteem, which brings your ego into play (the need for constant confirmation from others). If we are embarrassed by others in a field with which we lack confidence, we loose control and thus our ego is hurt.

Why does not my colleague likeme?

Let us move back to the problem with your critical colleague. There may be afew specific reasons that he dislikes you, even though you have never done anything wrong toward him. More than likely your colleague is suffering from low self- esteem (and thus having a greatego).

- He could feel threatened by you. Maybe he perceives you as more successful than him, which causes jealousy. He will then notice unfavorable (in his eyes) aspectsof you and recognizes them as arrogance orimpatience.
- He may see aspects or traits in you that remind him of things he dislikesabout himself.
- It could be that he believes that you dislike him. The reason might seemtrivial, like for example, that you have overlooked him or made a face which he misinterpreted.

It could also be a combination of the above mentioned factors. In essence, the main reason that your colleague dislikes you may be because of his inflated ego (unless you have really done something wrong against him).

What you can do to better the relationship

You may be dealing with a person with low self-esteem, so a good idea could be to feed his ego. There are basically three ways of doing this:

- You can tell a mutual friend or colleague that you really like, admire, and respect the critical person. The reason you should do this through a third person is that when the message reaches your troublesome colleague, it will be more strong and believable than if it came directly from you. The reason this might work is that itis psychologically difficult to dislike someone who likesyou.
- Ask the person to do you a favor. It seems counterintuitive, but people tendto form more favorable impressions of people they help, than of people who help them.
- Tell this person something embarrassing about yourself. This way youwill become less threatening to thisperson.

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HOW TO FIGHT WASPS – THE REAL KIND

We have all experienced them during the summer: Hordes of wasps attacking you when trying to enjoy a glass of fresh lemonade in your backyard. And we are not talking about the sociological phenomenon of White Anglo-Saxon Protestants, but the black and yellow flying insects. This annoying creature is a nuisance to social scientists all around the world, wracking havoc from their nests along riverbanks, underneath floors, or attached to the side of walls and trees.

We in *Popular Social Science* want our readers to be well prepared before this summer, and provide you with some tips on how to defeat those little devils.
They are not to be confused with the WASPs of sociology. WASP is short for White Anglo-Saxon Protestant, and is used to describe the group of high-status Americans of Protestant ancestry. WASPs differ from Yankees, in that they also include high-status white Southerners. These people attended the Ivy League Universities and presented their daughters of College-age at a debutante Ball.The term was popularized in 1964 by the sociologist and University of Pennsylvania professor E. Digby Baltzell.Of course, this piece is not about how to fight White Anglo-Saxon Protestants, as they already have entered a period of fading dominance following the end of World War II. In the 21st century there are roughly equal proportions of Protestants, Jews, and Catholics represented at the elite levels of the federalcivil service.The Rockefeller family is perhaps the most well-known stereotypes of this type of WASPs. They had so much influence that their Standard Oil Company eventually was hit with a US Supreme Court verdict of having an "unreasonable monopoly," and had to break up into 34 independent companies.

The real wasps, and how to fight them

The most known wasp to most our readers is the *Aculeate*, belonging the order Hymenoptera in the class Insecta. It is denoted as parasitic as it benefits at the expense of other, which is called a host.A preventive action you could do is to fill in cracks and holes in your home so that the queen cannot enter and start building a nest. If you should be so unfortunate to discover a nest, you should destroy it while it still is relatively small. One easy way of doing it is to hang a bucket filled with white spirit belowit. As the wasps enter and exit the nest, they will become dizzy and fall into the bucket.

If you decide to get rid of the wasp nest yourself it is advisable to do this in the evening hours. The reason is twofold; they are both sleepy and they have poor night vision. You can also use wasp spray on the nest, and then check the next day for any wasps hanging around the nest. If there aren't any, knock it down.If the nest has grown large you need to call a pest control company, as it could be dangerous for you to try to deal with them alone.

A good way to deal with those wasps you encounter outside is to mix water with dish washing soap, and fill your super soaker or your regular squirt gun with this mixture. This will paralyze and even kill the wasps. It can be employed on individual wasps outside or even on a wasps' nest.

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HOW TO GROW A CACAO TREE IN A HURRY

To study the genetics of cacao, the main ingredient in chocolate, scientists clone flowers

Growing a cacao tree - the plant whose pods are made into chocolate - takes patience. It takes three to five years for a cacao seed to become a fruiting tree. Each tree makes a limited number of seeds. And those seeds are not identical to the parent plant. The genes inside the seeds are a mix. Some come from the plant that grows the fruit. Others come from the tree that provided the pollen. That's a challenge for researchers who study the genetics of cacao plants. As they try to improve features of these trees from one generation to the next, they don't want to wait years to learn whether a tree contains good genes for specific traits.

And now they don't have to. Mark Guiltinan and Siela Maximova are plant biologists at Pennsylvania State University in University Park. Theirsecret: cloning.They start with a tree that has the genes they're interested in. These genes might help the tree resist diseases, for example. Or the genes might help the tree grow faster, or make better-tasting chocolate. (The researchers do not insert genes into the tree - it is not *genetically modified*. Rather, they look for genes that developed in them naturally.)

The scientists snip off tiny pieces of a tree's flowers. They put the pieces in a germ- free solution. Then they add hormones that make each flower piece start growing into a young plant, as if it were a seed.In this way, the researchers can create thousands of plants from the pieces of a single flower. These new plants are *clones*. That means they have the exact same genes as their parent tree - and each other.

Identical genes are a blessing and a curse. Those genes may make a cacao tree grow lots of pods or keep it from getting a certain disease. But there are many different cacao diseases. Resistance to one disease may not protect the plantagainst another of them. Because all of these young plants share the same genes, they are all vulnerable to the same pests and diseases. If someone planted an entire farm or plantation with identical cacao trees, a single infection might later on wipe them all out.

Guiltinan and Maximova are very much aware of the problem. "We would never recommend a single variety," Guiltinan says. Instead, he suggests that cacao farmers plant many genetically different types of trees. Each variety wouldproduce many pods and be resistant to at least one disease. This should help ensure a healthy field - and a crop of deliciouscacao.

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HOW TO TELL IF A DRONE IS STALKING YOU

Researchers can now detect when a flying robot is streaming video of you or your home
Now there's a way to tell if you're being spied on by eyes from the sky.Researchers have developed a method to find out what a drone - a flying robot - is recording. And they can tell without having to translate the video information that the device is streaming to its pilot. This technique, described January 9 on the site arXiv.org, could help military bases detect unwanted robotic snoops. It also could help civilians protect their privacy as more drones take to the air.

"People have already worked on detecting (the presence of) drones," says Ahmad Javaid. He studies cybersecurity -or how to keep computers secure from spies - at the University of Toledo in Ohio. "But no one had solved the problem of, 'Is the drone actually recording something in my direction?'"

Ben Nassi is a software engineer. That's someone who develops computer programs. He works in Israel at Ben-Gurion University of the Negev. The images streaming from a drone are made up of tiny lighted areas, called *pixels.* Nassi's group realized it could change how objects look to a drone. When something it's recording changes (say, switches to a different color), the stream of encrypted data that the drone broadcasts to a computer (that controls it) also will change. (Encrypted data are those that have been put into a secret code.)

The drone sends those data via *Wi-Fi*. When the pixels change color, the data need to change, too. The more pixels that change from one video frame to the next, the more data the drone sends per second. So if a scientist could rapidly switch the
appearance of a person or house, the drone's pixel information would switch as well. That would require more data. And the scientists could then track whether the appearance changes corresponded to higher drone-to-phone Wi-Fi traffic. If they do, that suggests the drone might be recording you.

Spotting drone signals

Nassi's team decided to test this idea. They covered a house window with a special film. It could switch between clear and nearly solid white. To do that, they merely had to point a remote control at it. The researchers either flickered this "smart" film back and forth every two seconds or left it clear. Then the scientists aimed a dronewith a video camera at the window from 40 meters (130 feet) away and hit "record."

The flickers should show up on the drone's video as pixel changes. To find out if it did, the scientists pointed a scanner at the drone that could detect radio waves.

Those were the Wi-Fi signals being broadcast by the drone. And sure enough, the drone's Wi-Fi traffic spiked whenever the smart film flickered. That confirms that a simple radio scanner can tell when a drone is videotaping a window.Using radio equipment may not be strictly required. It's possible to intercept Wi-Fi signals with a laptop or other computer with a wireless card, says Simon Birnbach. He's a computer scientist not involved in the work. He works in England at the University of Oxford.

In a second test, a drone recorded someone from about 20 meters (66 feet) away. This person was wearing a strand of LED lights. (These are also known as *light- emitting diodes*.) Every five seconds, the lights flickered on and off, or just stayed off. Data streaming from the drone's camera spiked whenever the lights flickered. These data show that scanning data from the drone could detect surveillance of even an individual.This technique to identify a drone camera's target is "a very cool idea," says Thomas Ristenpart. He's a computer scientist not involved in the new study. He works at Cornell University in Ithaca, N.Y. Still, he says, the researchers need to test whether this technique will work for more than a house window or flashing lights. "I don't think anyone is going to want to wear a [light-up] shirt on the off chance a drone may fly by," he quips.Javaid agrees. This prototype system must be more user-friendly, he says. For home security, he imagines a small device with a flashing light stuck to a window. It could intercept a passing drone's Wi-Fi signals. That could alert the homeowner when a snooping drone flew by.

Drew Davidson works as a computer scientist at Tala Security, Inc. in Dallas, Texas. He was not involved in the new work. He points out that even if you knew a drone was nosing around, you may not know who was controlling it. "It's sort of the equivalent of knowing that an unmarked van pulled up and waited outside of your house," he says. "[It's] better to know than not," he says. Still, he adds, it may not be enough for the police to track down the snoop.

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LITERACY

I’ve written this article and you’re reading it. So we are members of the same club. We’re both literate – we can read and write. And we both probably feel that literacy is essential to our lives. But millions of people all over the world are illiterate. Even in industrialised western countries, such as the UK and the USA, approximately 20% of the population have 'low literacy levels'. But what exactly does that mean?

My parents both left school at 14. They could read and write, but except for a quick look at the daily newspaper, reading and writing didn't play a big part in their lives. There were very few books in the house. My mother was amazed because the woman who lived next door always wrote a list of what she needed before she went to the supermarket. Why couldn't she remember? We laughed about that for weeks. Our family didn't write lists! And when I was only 14 years old my father gave me an important letter that he'd written to the bank and asked me to check it for grammar and spelling mistakes. And there were quite a lot. He never usually wrote letters or postcards or even Christmas cards. So when he had to write he wasn't comfortable or confident. Does that mean that my father had a low level of literacy? I don't think so.

What is illiteracy?

There are lots of different definitions of literacy. Some experts define it as having the reading and writing skills that you need to be independent in your everyday life. So, for example, if you can read instructions, write a cheque, fill in a form, – anything that you need to do in everyday life – then you are functionally literate.Other people say that you are illiterate if you think that you are illiterate. In other words, if you feel that you can't read or write as well as you would like to.

If you live in a society where most people are literate then you will feel ashamedor embarrassed and avoid situations in which you have to read or write. The father of a friend of mine finally admitted to his family that he couldn't read when he was 45 years old. He bought the newspaper every day and pretended to read it - and believe it or not, his family had noidea.

Literacy in the past

We often forget that writing is a recent invention. Many years ago, the word 'literate' meant being able to communicate well in speaking, in other words whatwe now call 'articulate'. Story telling was an important activity in the past and still is today in some societies. Reading was often a co-operative activity – someone would read aloud to a group, often from a religious text such as the Koran or the Bible.

Only a hundred years ago, in the United States, you were considered to be literate if you could sign your name to a piece of paper. It was an important skill. You were not allowed to vote if you couldn't sign the voting register, so literacy was connected with political rights, and many people were excluded from the democratic process.

Nowadays we see reading and writing as being connected, but that wasn't so in the past. Many people could read, but not write. Writing was a skilled profession. If you needed something written then you paid an expert to write it for you. And of course, rich and important people have always employed people to write things for them. Important company bosses dictated letters to their secretaries or personal assistants. And now with new computer software you can dictate directly to your computer.

Is literacy important?

Being illiterate can have a big effect on people's lives. For example, a study in the UK showed that people who write and spell badly are seen as careless, immature and unreliable, and often unintelligent. So it is more difficult for them to find jobs, even when reading and writing are not necessary for the work.

World-wide statistics show that literacy problems are associated with poverty and a lack of political power. More women than men are illiterate. Illiterate people have worse health, bigger families and are more likely to go to prison. So literacy campaigns must be a good thing. But don't forget that an illiterate person, or someone with a low level of literacy, isn't necessarily stupid or ignorant – and may not be unhappy at all. Knowledge and wisdom isn't only found in writing.

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ISLAM AND DEMOCRACY

Islam is at present the second largest religion in the world. It has more than one billion followers, mostly in the Arab world, Asia, and Sub-Saharan Africa and its numbers are increasing also in Europe and other parts of the World. Recent events such as the Arab spring have given rise to a hope that democracy can spread to the Islamic world. However, there are several reasons to be skeptical.

Unlike the Bible's position in Christianity, the Quran is reckoned to be of direct divine origin. Believers in Islam have to obey not only God, but also Muhammad, his messenger. The law of Sharia intervenes in both religious and secular life, including penal punishments and judicial matters, as well as the acts of worship and family life. Muslims are expected to accept the Quran as the word of God, and the Sharia as the regulator of society and daily life.

One could argue that with a base of this kind, there is little room for the rights of citizens and freedom of expression, which are key features in the Western pluralistic model of democracy. Both civil liberties and political rights tend to be neglected in the vast majority of Muslim countries today.

However, there are differences within the Islamic world. More secular countries like Bangladesh, Indonesia, and Turkey are better at fulfilling democratic rights than states that practice Sharia, like Saudi Arabia and Iran. Even though there can be different interpretations of Sharia, there is a tendency that the implementation, or even just the acceptance, of Islamic law could mean less emphasis on civil liberties. Sharia can be viewed as an obstacle for democracy in the Muslim world.

The late Harvard professor Samuel P. Huntington argued that there is a culture barrier which prevents the spread of democracy. He is partly supported by Michigan professor Ronald Inglehart who emphasizes what he names the *post-modern shift*, which has its origin in the economic miracles that occurred first in Western Europe and North America, and later in East Asia and Southeast Asia. According to Inglehart, the post-modern shift takes focus away from both religion and the state, and over to the individual.

The argument concerning democracy is that certain basic values must be in place for a society to successfully become democratic. In other words, a society, which has not experienced the post- modern shift, will experience difficulties implementing democracy. Even though Western and Islamic societies agree on several indicators of political values, they do differ when it comes to the question of tolerance.

However, there are voices within the discipline of social science that are more optimistic with regard to the future of democracy within Islam. The Binghampton professor Ali Mazrui statesthat mores and values have changed rapidly in the West in the last several decades as revolutions in technology and society progressed. He assumes that Islamic countries will follow the rest of the world, as they now are experiencing many of the same changes.

Clash with religion

One could argue that the teachings of the Quran and the laws of Sharia stand in opposition to what most Westerners consider to be democratic ideals. Many Islamic political groups claimthat the nature of the state is of secondary importance to the implementation of Sharia. These laws are not compatible with many of the principles of democracy: examples are the limitations on free speech, women's rights, and minority rights. In contemporary practice of Sharia these conditions are not respected. So even though the Quran does not prescribe any particular system of government, the importance of Sharia is still an obstacle for introducing Western democracy in the Islamicworld.

Samuel Huntington pointed out that the Muslim world has not gone through the same historical events as the West, which led to the development of liberal democracy. Ronald Inglehart emphasizes the post-modern shift: that the Muslim world has more basic values and beliefs than the West, and that religious authority therefore plays a greater role.Yet, the problem is maybe not what the Quran or the Sharia says. By all means, Christianity has similarities. The problem is rather that all Muslims do, at base, accept the sanctity of the Quran as the word of God, and the Sharia as the regulator of society and daily life.

Another form of democracy?

One possible road to democracy would be to westernize/modernize. It has happened in the past, one example being Turkey. However, most governments in the Muslim world are relatively authoritarian while also committed to programs of modernization. Thus, the authoritarian political establishments have become identified with secularist approaches to politics and modernization. In many Muslim states we are then faced with an opposition to authoritarian regimes expressed through a reaffirmation of the Islamic identity and heritage. One then has a different type of democratic movement, one lacking many of the ideals of the Western liberal model.

Several Muslim states can be denoted as having at least to some extent political freedom, such as Bangladesh, Indonesia, Senegal, and Turkey. These countries are not considered best in class when it comes to civil liberties and political freedom. However, there are other factors than religion that influence this picture. Poverty, history, colonialism, and religion should all be taken into account.

Turkey chose the way of modernization. The Turkish nationalism under Kemal Atatürk was also a reaction against Islamic culture and a demand for westernization of society. The new republic dismantled the Turkish Kalifat in 1924, and in 1928 they introduced religious freedom. Turkey thus took a step from the Islamic toward the European culture.

Local adjustment instead of Westernization?

As already mentioned, one road to democracy would be to westernize/modernize. Yet, most governments in the Muslim world are relatively authoritarian. One question that could be raised is: Can there be a non-western path to democracy in the Muslim world? Another one is: Are there other ways of achieving democracy than to import the Western version of it?

Due to the strong sense of democracy being a Western concept, the debate in Muslim states can easily shift from whether or not one wants democracy, to whether or not one wishes to adopt a "foreign model". Most societies have some local traditions that have democratic elements in them. Western democracy not only has its roots in Classical Greek democracy and Roman law, but also in the old Germanic traditions of gatherings at the *thing*.

The Quran does not prescribe any particular system of government. However, there are elements within Islam that could work in favor of democracy. In the Quran one can find the *Shura* in which men are asked to settle their differences in patience by mutual consultation. There is also a second democratic principle, the *ijma* (concencus), meaning that important policies should have the support of a significant segment of society.

However, these two local traditions do not amount to the centuries of history and traditions that lies in the foundation of Western democracy. One important factor that likely would be neglected in an Islamic-based majority founded on local customs and traditions would be the protection of the rights of minorities. One could argue that if people want to give away their Lockian "natural rights", then why should they not? Yet, you would then still have the problem of the minorities who does not agree with the policies of the majority.

Unlike the West, Islam lacks a historical tradition of democracy. During the Islamic empires and the Ottoman Empire, which covered much of the Muslim world, a tendency developed tosupport authoritarian rule. Scholars like Ali Muzrai might find room for an Islamic version of democracy, with consensus and majority rule. But with base in the liberal democratic tradition of the West, one would see several flaws with this type ofdemocracy.

Another road toward democracy would be to westernize society, as Turkey to some degree has already done. Yet, this is hardly conceivable in the foreseeable future, due to the reaffirmation of the Islamic identity, and the ongoing conflicts and sentiments in the Muslim world.

Two roads to democracy

Compared to Western standards most Muslim countries of the World tend to have a poor record of democracy. But one should take into account that most of these states are developing countries and have a history of colonialism and violent conflicts. There are Christian countries in many parts of the world who are no better off than the Muslimones.

Still, one should not downplay the role of religion. There are different perceptions of the meaning of democracy. Some aspects of Western democracy could be transferred to an Islamic country, like the principles of majority rule and equality. But other aspects, like liberty, women's rights, freedom of speech, and the protection of minorities could prove more difficult to include in an Islamic version of democracy. The Quran can be interpreted to support a variety of positions, and the Sharia is troublesome, particularly in the areas of rights for women and non- Muslims.

However, countries with Sharia, like Sudan and Iran, had abusive governments before Islamic-oriented regimes rose to power. Secular based regimes like that of Syria and Saddam Hussein's Iraq have been among the worst violators of human rights. The point here being that even though religion is an important factor when it comes to the success of democracy in the Islamic world, other variables must be taken into account.

We have looked at two routes for achieving a democratic Muslim world. One path is to make Islam compatible with democracy. This implies a modernization or westernization of society, as Kemal Atatürk's Turkey is an example of. Even though Turkey, Indonesia, and Bangladesh are not prime examples of liberal democracies, one could still argue that this is a step in the right direction. But again, achieving democracy could prove difficult. Westernization might not be a very popular thing to introduce due to the ongoing conflicts in the contemporary Muslim world.

The second route is to make democracy compatible with Islam. As already mentioned one has the Islamic traditions of consultation and *ijma*. These are local fundaments from which onecould build an Islamic version of democracy. Other components such as equality and participation are also inherent in Islam, as all Muslims are partners in the community of believers and are equal before God. Unfortunately Islam seems to be lacking other elements of what most Westerners conceive as being important elements ofdemocracy.

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LONG-LASTING FLU VACCINE COULD REPLACE YEARLY SHOTS

Researchers have developed a single vaccine that protects against many types of flu virus November marked the start of flu season in the Northern Hemisphere. So if you haven't gotten your flu shot yet, now's the time. Unlike other vaccines that people may only need once in their lives, flu shots must be given yearly (to account for the ever-morphing virus it targets). But that soon may change. Researchers have just developed a vaccine that protects against many more types, or *strains*, of the flu virus. Its benefit? These shots might be able to confer lifelong protection from flu.

A flu shot can help you avoid fever, aches and fatigue that are no fun. But influenza poses far bigger risks for people who are very young or very old, or who have a weak immune system. For them this viral infection can be deadly.

U.S. statistics show how variable the risk of flu mortality can be from year to year. In some flu seasons, as few as 3,000 flu victims may die. Other years are far worse. Roughly 56,000 U.S. residents died from flu during the winter of 2012 to 2013.

Explainer: What is a vaccine?

Flu shots are the best defense against these infections. These vaccines teach the immune system how to identify a flu virus. That lets the body respond quickly to quash an infection before it can take hold.But the flu virus evolves rapidly. The strains most likely to infect people this year will be different from last year's major strains. If your immune system doesn't recognize the latest version, you could get sick.So scientists create new vaccines each year to target the latest variants. That's why people need a new shot each year. But researchers at the University of Nebraska–Lincoln have developed a new vaccine that could last longer. To create it, they probed the genes of flu viruses and then "rewound" their evolutionary clock.

Hunting viral ancestors

Eric Weaver led the team. As a virologist, he studies viruses and how they affect the body. His group started by figuring out what the ancestral flu virus might have looked like. From what they learned, these researchers hoped to partially recreate some shared ancestor of today's flu strains.If two people trace their family trees back far enough, they will find a sharedancestor. That's what Weaver and his team did with genes in the flu viruses. They traced them back to find genes from an ancestor that modern flu strains share in common.

There are 18 subtypes of flu, Weaver notes. The researchers worked with just four. These are the strains most likely to cause disease outbreaks in people. The scientists analyzed the viruses' genes. From these, they created an average set of flu genes and put them into an artificial virus. This new virus might resemble the ancestor to the four modern strains.

Next, they created a vaccine to their artificial virus. To do this, they altered the genes so that they couldn't cause illness. Then they inserted these into yet another virus. That recipient virus is called a *vector*. It can insert genes into cells. For their vector, the scientists chose a virus that causes the common cold.That vector had been changed so it couldn't make people or animals sick. Yet itcould still insert its DNA into a host's cells. That trait was important. (Viruses can't reproduce on their own. Instead, they inject their genes into a host animal's cells, which forces those cells to copy the virus.)The researchers used their vector to deliver their new vaccine into cells. That triggered an immune response to the ancestral virus.

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MEET STEVE, THE NORTHERN LIGHTS IN MAUVE

Citizen scientists captured images of a new type of AuroraHave you seen STEVE? An aurora is a brilliant light display that can show up at night in Earth's upper northern and southern latitudes. STEVE is a new and nontraditional type. This aurora can drape the sky with a reddish-purple ribbon and bedazzling green bling.Auroras form when charged particles interact with Earth's atmosphere.*Citizen scientists* in Canada recently discovered and photographed STEVE. Now the phenomenon has been explained - sort of. To do this, researchers made measurements from ground-based cameras. They also enlisted help from a satellite that passed STEVE when it was in full swing. The streak of color showed up to the south of the main aurora.

Scientists now suspect that STEVE may be a visible version of a typically invisible process that involves drifting charged particles, or ions. These ions move at high speeds through Earth's upper atmosphere. They form a stream of particles with a strong flow. Researchers described what they observed in *Science Advances* on March 14. It's still not clear how STEVE's glow arises from this flow, note Elizabeth MacDonald and her colleagues. MacDonald is a physicist at NASA's Goddard Space Flight Center in Greenbelt, Md. She was a coauthor of the new study. Its air of mystery hasn't kept people from giving the phenomenon a scientific name. Citizen scientists had been studying this aurora as part of a project called Aurorasaurus. They named it "Steve" before its association with ion drift was known. MacDonald and colleagues decided to keep the name. They just turned it into an acronym for Strong Thermal Emission Velocity Enhancement. The rest of us, though, can just call it STEVE.

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MORE THAN HALF THE WORLD'S OCEAN AREA IS ACTIVELY FISHED

New mapping highlights location - and intensity - of those fishing efforts People's taste for seafood affects a surprisingly large share of Earth's oceans. That's according to a new study that mapped where marine fish are harvested.Oceans cover more than two-thirds of the planet's surface. In 2016, fishing fleets used more than 55 percent of the ocean's area, the new study shows. In contrast, only about one-third of Earth's land area supports agriculture or livestock grazing. That means that catching fish uses four times as much of the Earth's surface as all the food plants and animals grown on land!Fishing vessels have plied the oceans for hundreds of years to catch fish. Data about where they fished and how much time they spent at sea have been scarce and inconsistent. Now, though, most large ships have a tracking system. It's meant to help them avoid collisions. Called an automatic identification system, or AIS, it sends out data on where vessels are and how fast they are moving.

Fourteen researchers from universities, Google and other groups used these data to map fishing throughout the seas. For their new study, they examined 22 billion AIS data points between 2012 and 2016. The team trained computers to sort through all of those data. They turned up more than 70,000 fishing vessels. Then, the
researchers tracked the ships' activity - their time at sea. The researchers reported the results February 23 in *Science*.Much fishing takes place close to coastlines. This isn't surprising, because countries can claim exclusive rights to fish in waters closest to their own shores.A few fishing hot spots were farther out in the open ocean, the team found. One such spot was the northeastern Atlantic Ocean, around Europe. Others were off the coasts of South America and West Africa. In those areas, cold, nutrient-rich water rises toward the surface from the deep ocean. The nutrients in that upwelling water helps nourish large populations of fish.Surprisingly, just five nations dominated those fishing spots in the open ocean. China, Spain, Taiwan, Japan and South Korea accounted for nearly 85 percent ofthis fishing on the high seas. The affected areas do not belong to any one country. This means that they can be especially vulnerable to overfishing.

Understanding the extent of ocean fishing is important, the researchers note. So is knowing how fishing varies over space and time. This information might help identify spots that need protection. And it could guide international efforts to safeguard fish populations. That may be particularly important in a time of rapid ocean change.

For example, ocean water temperatures are rising. This has caused some fish populations to migrate to new sites. Meanwhile, fishing activity on the seas has also been increasing.In 2016, just five nations were responsible for nearly 85 percent of observed fishing activity in international waters. These areas, which are not controlled by any single country, can be particularly vulnerable to overfishing. Tap each circle for more details.

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NASA'S LATEST PLANET HUNTER

It's ready to forge a new path through space.

NASA will be making history again, soon.

Sometime this spring, if all goes as planned, a SpaceX Falcon 9 rocket will carry the Transiting Exoplanet Survey Satellite (TESS) into space. Once in “high-Earth” orbit, the satellite’s instruments will scan the entire sky, hoping to find small planets outside our solar system. The main targets are potentially habitable worlds that are relatively nearby, within a few hundred light-years.

But the mission’s scientific objectives aren’t the only historic part: TESS also stands out because of the orbital path it will follow around Earth, blazing acourse through space that no craft has ever flown. Thanks to the orbit’s elongated elliptical shape, says TESS principal investigator George Ricker of MIT, “we can stay away from Earth during observations and get close to Earth to transmit our data, once every 13 or so days.”

These and other orbital attributes will get TESS exactly where it needs to be - with relatively little expenditure of energy and money. That has caught theattention of scientists planning future space missions. It’s a unique orbit that, if not groundbreaking, is certainly “spacebreaking.”

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NEW AWARDS AIM TO CELEBRATE WOMEN IN SCIENCE

Prizes will reward outstanding scientific discovery and exceptional efforts to engage girls and young women in science.Female scientists are under-represented in global research. Nature has long argued the need for initiatives to increase their opportunities and participation -so we are delighted to announce an awards programme that aims to do both.The two annual awards will recognize inspirational early-career female researchers and those who have worked to champion young women's and girls' participation in science. By rewarding and celebrating these achievements, we hope the programmes will contribute to a positive shift towards the equity sorely needed in the research community.

The first is called the Inspiring Science Award and will honour female scientists who have completed their Phd within the past ten years and have made an exceptional contribution to scientific discovery, as reflected in publications, poster and conference presentations, leadership, tutoring and mentoring. Candidates can be nominated by anyone in their research institute, and we encourage nominations from around the globe and across all subject areas. Our independent judging process will ensure that those working under adverse circumstances or in regions where there is limited access to scientific literature will not be unfairly disadvantaged.

The second prize, the Innovating Science Award, recognizes individuals or organizations that have led a grass-roots initiative to support increased access to, or interest in, science, technology, engineering and mathematics (STEM) for girls and young women around the globe. This backs our belief that supporting early interest in STEM worldwide is a crucial step towards sustainably increasing the representation of women in these subjects. Candidates for this award can nominate themselves.

Nominations opened on 9 April and will close on 11 June 2018. A longlist of ten nominees for each award will be announced on 24 July, and a shortlist of five will be announced on 4 September. Both awards are run by Nature Research in partnership with The Estee Lauder Companies.

The winners of the awards will be announced in October. They will receive grants of US$10,000 to build on their efforts, and an invitation to an award ceremony.The Inspiring Science Award winner will also receive a grant of up to $5,200 to support open-access publication of their research, and the Innovating Science Award winner will receive up to $5,200 to support an event that showcases their initiative. These awards complement the existing Nature Awards for MentoringinScience and the John Maddox Prize for promoting sound science and evidence on a matter of public interest.

Nature strives to champion and showcase the achievements of researchers, and we have a responsibility to drive positive change in the research community. Our journals are committed to supporting gender equity. We recognize that a huge amount must be done to overcome the many barriers that women face to entry and progression in research; these awards are just one small contribution. We look forward to identifying outstanding individuals who are deserving of these awards, celebrating their achievements and sharing their stories.

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NEW TREATMENT COULD CALM TEMPERATURE- SENSITIVE TEETH

Sand-like grains and a green tea extract help plug holes that leave tooth nerves vulnerable.

On a chilly winter day, there's nothing better than a steaming hot chocolate - unless you have sensitive teeth. Then that yummy treat could give you a jolt of pain. Brushing your teeth or eating ice cream might feel just as horrible. Dentists can't cure sensitive teeth, although treatments are available. However, they don't last very long. But a new and possibly longer-lasting treatment is under development in China. Researchers there say it could repair the holes behind temperature-sensitive teeth. And a bonus: It might help prevent cavities, too.

Teeth have a cement-like outer layer called enamel. But this protective coat isn't perfect. Acidic foods such as soft drinks can wear it down. Brushing too often with a stiff toothbrush also can damage it. As the enamel wears away, it can expose a sensitive inner layer called dentin. This layer contains many hollow channels called tubules that lead to nerves. Those nerves sense how things feel and relay their assessments to the brain.

A tooth's enamel acts like a jacket on a cold day. While you're wearing the jacket, standing outside doesn't feel too bad. But unzip it and any cold wind can really sting. The same thing happens when nerves become exposed. Cold, heat, the pressure from stiff toothbrush bristles and other everyday sensations may now become really painful.

Dentists treat such teeth by clogging the open tubules. Often they use a mineral with a long name: nanohydroxyapatite. It mimics the natural structure of a tooth's enamel. However, regular wear and tear can strip this mineral off of the teeth quickly. With the tubules again open, their temperature sensitivity returns. Open tubules also may leave a tooth more vulnerable to decay.

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PHEW! RESEARCHERS AREN'TTORTURINGOCTOPUSES

Some cephalopod researchers have another job title: Octopus anesthesiologist.

It sounds far-fetched, but it's an important task. Octopuses, and cephalopods in general, are the smartest invertebrates, and their complex, unique central nervous systems are studied by researchers interested in everything from motor control to visual processing to cognition itself. But that kind of research often involves invasive techniques that could cause the creatures significant pain.

Can You Feel It?

As researchers began to grasp just how developed the brains of cephalopods were, they began to worry that they could actually feel something like what we would call pain. While most animals will flinch away from potentially harmful stimuli, experiencing what researchers call a "noxious stimuli," and what we simply call "ouch!", is another thing. Most invertebrates aren't thought actually feel pain, but cephalopods stand apart.

Octopuses have as many neurons as a dog and are intelligent enough to open jars and escape from tanks. Their brains don't look like ours, but they're complex and powerful. In all, it was enough to convince researchers that cephalopods were deserving of extra care during research.

Canada, Australia, the United Kingdom and the European Union all require researchers to get ethical approval for experiments with cephalopods, which includes the use of anesthesia during procedures that could be painful. The EU even gave them the same protections as vertebrates - the only invertebrates it's done so for.

To knock cephalopods out, most researchers use either magnesium chloride or ethanol. But here's where researchers from San Francisco State University noticed something troubling: Up until now, scientists assumed that because both substances render the cephalopods immobile, they must be unconscious. But, no one had ever checked to see that they were actually out cold. The supposed anesthetic could just be acting as an immobilizing agent. It's the equivalent of being operated on while still conscious, but unable to move-pain and all.

Good Thing to Know

So, the researchers set out to test specifically what was happening to cuttlefish and octopuses under the influence of these chemicals. They attached electrodes to the pallial nerve, which runs just beneath the skin and is easy to access.

Then, they exposed cephalopod subjects to one of the two substances and, once they had stopped moving, gave them a series of pinches. Changes in how active the nerve was would let researchers know that the anesthetic was doing its job. They published their findings in February in *Frontiers in Physiology*.

Luckily, it turned out that all of the cephalopods were truly knocked outfollowing a dose of either magnesium chloride or ethanol. In both cuttlefish and octopus, the neural signals indicated that pain sensations weren't reaching the brain, andthecephalopods were unaware of the stimuli. It's cause for researchers to breathe a sigh of relief - they were treating the invertebrates ethically after all.

One thing the researchers did notice that they hadn't seen before was a delay of about 15 minutes between the cephalopods becoming immobile and becoming unconscious when using magnesium chloride, something the researchers say they will incorporate into future studies. Ethanol, too, appeared to have its own downside - the animals displayed a behavior associated with discomfort or irritation.They also tested magnesium chloride and lidocaine as topical anesthetics, which could be administered along with the general anesthesia to help treat any lingering pain associated with surgical procedures.In all, the researchers say they're confident that experiments on cephalopods haven't been causing them unnecessary harm. And for octopus anesthesiologists everywhere it's good news - they get to keep their jobs.

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PHYSICAL EDUCATION

By Richard Sidaway

School days are supposed to be the best days of your life and part of that experience usually involves some strenuous physical activity. I asked some colleagues to give me their recollections of what happened to them on the sports field and beyond, and this is what they told me…

Cup winners

When I was about ten, the football team from our year inexplicably made it to the cup final of the local schools' league. I say inexplicably because I only remember us losing nearly every match we played. Anyway, in the final I set up the winning goal, a brilliant cross to my mate David who headed the ball in just before the final whistle. I still have a photograph of the team holding the cup.

Forest hike

I remember having to lead a group of eight boys on a school expedition for the best part of two days when I was a teenager. Even though we got lost at one point, I managed to keep them all together and got them from one end of a large forest to the other and back by sheer force of will. I was chosen to be the leader, I think, because I was the only one who knew how to read a map! When we arrived back at the campsite we found out that all the other groups had cheated and hitched most of the way instead... I felt a bit of a mug, but also rather proud of myself at the same time for having done it properly.

Learning to swim, learning to drown

I learned to swim comparatively late, I suppose, I was maybe nine years old, but my brother had a traumatic experience which nearly put him off for life. We lived in the USA for a while and had access to a university pool where the coaches had trained the American Olympic team. In those days, though, their idea of teaching kids how to swim was to tie a tin can to their ankles with a bit of string, throw them in the deep end and shout 'Swim!'. I'm surprised my brother survived at all. He could only have been about six at thetime.

Sponsored walk

One of my earliest physical feats was probably going on a ten-mile walk for charity when I was about seven. I went with my older brother and my Dad, but they didn't make much allowance for the fact that my legs were shorter - I had to go at the same pace as them!

Even so, I made it and raised quite a lot of money from school friends and teachers who had agreed to pay me for every mile I walked.

Cross-country ordeal

I remember one dark, wet afternoon in February being herded out onto the school field and having to run three miles across country while the rain came bucketing down. Soon we were all drenched to the skin, shivering with cold and the only way to stay warm was to keep running. One of the gym teachers, who had been sitting inside having a cup of tea, came out to meet us halfway around the course and told us to jump over a stream before we could start on the home stretch. This teacher
actually stood on the hands of the boys he didn't like as they were trying to climb up the muddy bank on the other side, so that they slid back down into the freezing water. I was disgusted by this, but of course I didn't say anything, I was only twelve. I think it changed my view of human nature a bit after that, the fact that someone who I had previously respected could be so cynical and cruel.

Dwarfed in Germany

We went on a tour of Germany one year from secondary school to play football against three different teams there. Everyone was violently sick on the ferry going across to Holland, and the whole thing was a bit of a farce as the teacher who had
arranged it didn't speak German very well so we ended up playing teams who were three or four years older than us! Naturally we got beaten every time.

Climb every mountain

One of my best memories of early physical endeavour was climbing Ben Nevis, which is the tallest mountain in the British Isles. It was a glorious day, which is pretty rare for that part of Scotland, and we walked up in about five hours. The last bit is pretty hard going as it's a zigzag path of big stones. We took the family dog and she had a really difficult time of it. The strangest thing was that we didn't see too many people on the way up, and then when we reached the top it was suddenly covered with Japanese tourists. I can only presume they had been airlifted there by helicopter.

Down to earth

My cousins were always the outdoor, adventurous types, learning how to canoe and windsurf and abseil and so on. One day, one of them climbed onto the top of the house to fix some tiles with my uncle. The next minute he appeared at the kitchen door a little bit dazed and his mother, who was cooking lunch, looked at him in surprise and said:

‘What are you doing here? I thought you were helping your Dad.’ ‘I’ve just fallen off the roof, Mum’, he said. Apparently he had overbalanced and toppled over backwards. Because he had recently been doing parachute training - his latest hobby- he had rolled over automatically when he hit the ground, without thinking. This was a big, old two-storey house and he must have been at least 10 metres from the ground, but he didn’t have a scratch on him!

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POLLUTION FROM NEW TECHNOLOGIES THREATENS ASTRONOMY

Satellites, LEDs and Wi-Fi may make it harder to ‘see’ the starsOXON HILL, Md. - Astronomers can peer more deeply into the cosmos than ever before. The key is new technology. But new technology can have a dark side. It can create pollution that interferes with astronomers’ work.

Space debris, light pollution and radio waves are the most worrisome. And the situation is getting worse. These types of pollution could prevent astronomers from getting a clear look at the night sky. This warning came from speakers at the annual meeting of the American Astronomical Society on January 9.

Just six decades have passed since the former Soviet Union launched Sputnik, the first artificial satellite. Back then, there was no terrestrial debris around Earth. But conditions have changed. Today, U.S. government scientists track nearly 18,000 objects orbiting Earth. Most are considered space “junk.” These objects range in size from centimeter-long chunks of metal or other spacecraft debris to bus-sized satellites.

And here’s the problem. All of this junk can damage existing space telescopes. What’s more, many also can reflect light, which could potentially confuse observers using ground-based telescopes. From Earth, a glint of light could be a distant star - or just a hunk of metallic junk.

“The worst is yet to come,” warns Patrick Seitzer. He is an astronomer at the University of Michigan in Ann Arbor. “We're going to double our catalog [of debris] over the next 20 years.” There’s an aerospace company called Boeing, for example, that wants to launch a global network of nearly 3,000 satellites. And collisions between any two of them could cause problems. Any smashup can release thousands of new pieces of debris.

Polluting with light

Down on Earth, light pollution is a well-known problem. Artificial lights can outshine the light of stars. And a shift by many nations to illuminating the environment with light-emitting diodes, or LEDs, isn’t helping.In 2010, LEDs constituted less than 1 percent of the American lighting market. Today, they account for about half. And their share is expected to grow.

LEDs do have environmental and economic benefits. They are long-lived and energy efficient. But they emit a broad spectrum of light, meaning wavelengths that include many colors. These include blue-rich light, which is especially bad for astronomy. Blue light scatters more easily than longer wavelengths, such as yellow light. That scattering worsens *sky glow*, a sort of haze of light created as the light reflects off of particles in the air above big cities. Sky glow makes it hard to see the stars.

Radio waves, another source of energy, also pose a problem for star gazers. Astronomers search space for radio waves generated by stars and galaxies. But Earth-based sources of this energy can be confused for those signals. Those terrestrial radio sources can include Wi-Fi and even driverless cars. For instance, the radar on driverless cars could affect radio astronomy operations up to 100 kilometers (62 miles) away, said Harvey Liszt. He is a radio astronomer at the National Radio Astronomy Observatory, based in Charlottesville, Va.

Saving the stars

There is no doubt that technology is affecting the visibility of skies for astronomers across the planet. That's why the late astronomer Jean Heidmann proposed aradical idea. He suggested putting a telescope on the moon. He'd site it on the far side, away from Earth. There, it would be safe from space debris, light and radio pollution, he noted.

Another, less extreme idea: Impose strict government regulation on radio frequencies. Astronomers may need to expand and secure what are known as "radio quiet" zones. A notable one covers half of West Virginia. It was developed to surround the extremely sensitive Green Bank Observatory. It's home to the world's biggest fully steerable radio telescope. In this almost 34,000 square-kilometer (13,000 square-mile) region of radio silence, there is no cell-phone service and almost no radio stations. People here communicate with land-line phones or call from the road at phone booths.Without a similar effort to safeguard the radio airways, "radio astronomers would lose the ability to observe," says Liszt. Such action might be the only way, he argues, to preserve a future for Earth-based radio astronomy.

As for artificial light, having none would be best - at least to many astronomers. But most realize that's almost a futile fight. Still, there are ways to cope. Flagstaff, Ariz., is adopting LED lights. But this city is using what are known as narrow-band amber LEDs. They resemble the yellow, low-pressure sodium lights that many cities have used in the past, and that astronomers prefer. One reason: They limit sky glow."Dark skies have become part of the culture here," said Jeff Hall. He is an astronomer and director of the Lowell Observatory in Flagstaff. He describes itas "a community value. We even have a company called Dark SkyBrewing."

Such down-to-Earth solutions to pollution may be astronomers' onlyhope.

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PREPARING FOR THAT TRIP TO MARS

Here are some of the obstacles that scientists are hurdling to get humans to the Red Planet. This is the first of a two-part series on preparations for upcoming human space missions to the Red Planet.

Mark Watney has found himself stranded on Mars. It's 2035 and his crewmates, thinking him dead, have left him behind in their evacuation of the Red Planet. He faces years, all alone, trying to survive in the face of radiation, storms and little food.That last problem turns out to be a solvable one. Watney is a botanist. And he figures out how to grow potatoes. The potato seedlings come from his Thanksgiving dinner. Water is derived from leftover rocket fuel. And his own poop becomes fertilizer.This scenario, from the book and movie *The Martian*, is science fiction. It is, however, based on fact. NASA studied potatoes in the 1980s and 1990s as a potential crop for human space missions. And though no one is yet growing potatoes on Mars, scientists are already developing tools to grow food in space.Why? People will likely travel to Mars sometime in your lifetime. NASA has said it plans to send people to Mars in the 2030s. And the private space company SpaceX may send its first crewed mission to Mars as early as 2024.

But ferrying humans to Mars would be a much bigger challenge than getting them to the moon. To pull it off, we first need to solve a lot of problems.
Getting to Mars is just one of them. Then we have to figure out where our food and water will come from. Planners also must figure out how space travelers will get any tools they may suddenly need when they're millions of miles from the nearest hardware store. It's a huge undertaking, but researchers around the world are already on the job.

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PSYCHOLOGY'S INNER DEMONS

Results from the field's biggest replication study yet make it clear psychology has room for improvement.It was a group project of staggering proportions. University of Virginia psychology professor Brian Nosek and his colleagues at the nonprofit Center for Open Science got help from over 350 scientists to repeat 100 high-profile psychology experiments published in 2008 - the largest replication study to date. In August, they announcedthe results in *Science,* forcing psychologists to face some hard truths about the reliability of their field's studies.

The project is a response to the so-called "reproducibility crisis," a growing concern that many published studies may not hold up to repeat testing. The problem affects other sciences, but several high-profile failures to reproduce important psychology findings have made it a particular concern.

Researchers not involved in the initial studies contacted the original authors to get feedback on their protocols; in most cases, the original researchers helped with study designs and strategies. Despite this thoroughness, while 97 of the original studies reported significant results, only 35 of the replications reported the same. And even then, the effect size (a measurement of how strong afinding is) was smaller - on average, less than half the original size. So even when Nosek's team ended up with significant results, those results weren't as strong as the initial reports claimed theywere.

The replications are not definitive, Nosek says: "No study provides perfect evidence for or against any finding, and that also applies to the original studies." The replication simply adds information about the phenomenon under study, he says.

But it does mean that psychologists are starting to learn more about how to make their experiments more rigorous. "What this paper can help us do is accept that this is a problem so we can go about finding ways to fix it," says Dorothy Bishop, a psychologist at the University of Oxford and a leading voice onpsychology's reproducibility issues. The problem won't be solved overnight, but this study is a step in the right direction.

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RESEARCH ON ELECTORAL BEHAVIOR – AHISTORY

In 1960 the book *The American Voter* was published. It was authored by Angus Campbell, Phillip Converse, Warren Miller, and Donald Stokes who worked at the University of Michigan Survey Research Center. The book deals with the structure of causes that influence the individual when making political choices. It was based on American surveys from 1952-1958.Their findings are held together by what the authors name the "funnel of causality," where the axis of the funnel represents a time dimension. The funnel gives a picture of what influences a person's vote. At its narrow end are located those factors that the authors reckon to be immediate determinants of the vote.

At the other end we find more remote and underlying factors, like economic structure, social divisions, and historical patterns. This book is reckoned as the most important publication of what was to become known as the Michigan model of electoral research.The next influential work originating in this research tradition was Philip E.Converse's (1964) article "The Nature of Belief Systems in Mass Publics." Here he argued that the majority of the voting public had no clear ideology and lacked the ability or desire to understand issues that are not directly related to them as individuals.

One must also mention Vladimer O. Key's (1966) *The Responsible Electorate*. Here, the author argues that in large the electorate behaves relatively rationally and responsible. Some more recent contributions are the works of Stimson and Zaller, which came in 1991 and 1992 respectively.Stimson argued that mass public opinion can be described as policy "moods," that pendulum between conservatism and liberalism. Zaller's argument is that people's responses to survey questions comes from knowledge of public affairs, and also that people will resist holding opinions that are inconsistent with their political predispositions.

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ROSETTA REVEALS THE HEART OF A COMET

The spacecraft continues to sate our curiosity.

Rosettabecame the first spacecraft to orbit a space iceball when it reached Comet 67P/Churyumov- Gerasimenko in 2014. This year we learned even more about the ancient object and, in turn, the solar system.“Comets have been stored far from the sun in a deep freeze,” says Rosetta principal investigator Alan Stern of the Southwest Research Institute. “They represent samples of the original material out of which planets were formed.”Rosetta’s been telling the comet’s secrets ever since its May 2014 arrival, starting with its rubber duckshaped body, 4.1 miles long with a head 1.6 miles wide. Fluffy dust up to 16 feet thick coats the comet’s surface and acts like sunscreen, protecting the vulnerable ice from the sun’s heat. This has kept 67P together despite its millions of close encounters with the sun, around which it orbits every 6.6 years.But as it approaches the sun, the comet does release into space some dust and gas, which form its tails. Astronomers were surprised to see molecular oxygen, the kind humans breathe, blasting from the comet. The comet also released about 24 times as much water as oxygen, as well as a great deal of carbon monoxide and carbon dioxide. The liberated dust contains many organic molecules, showing that comets may have seeded our planet with the chemistry that life needs to thrive. The probe further revealed the comet is less than half as dense as water and three-quarters empty space.

Scientists had also long suspected that comets’ crashing into Earth had given our planet its water stores, but Rosetta found otherwise. The water on Comet 67P has more neutrons than earthly water, suggesting differentorigins.To get a closer look, in November 2014 Rosetta deployed its lander, Philae. Instead of landing smoothly on the surface, the solar-fueled lander bounced and rolled away, coming to rest in the shade where it soon lost power. While scientists did revive Philae in June 2015 and confirmed that all its instruments had a pulse, they couldn’t get those instruments to actually do anything. It went silent a week later.During its brief but productive life, Philae detected 16 organic molecules,confirming the orbiter’s findings and showing that the chemicals of life can form and survive in space. The lander also found the comet has no magnetic field,meaning magnetism doesn’t affect how the early solar system’s building blocks came together, contrary to several models.

Just after Philae’s momentary resurrection, 67P roared to life. On July 29, the comet released a huge jet of gas and dust moving at 22 mph. On Aug. 13, the comet reached perihelion - its closest approach to the sun - and released two bathtubs’ worth of water every second. Engineers moved Rosetta farther away from the comet to protect it from the deluge and dust.Since its close encounter, 67P has been spewing less and cooling off, getting ready to return to its cosmic freezer, with Rosetta in tow. The probe will continue to watch the show until its mission ends in September 2016, when scientists will likely send it to rest onon the comet’s surface.

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SCANDINAVIANS, WHY DO THEY ALL HAVETHE SAME NAME?

Have you ever wondered why Scandinavian names are so similar and easy to recognize? It seems like they are all named Olsen/Olson, Andersen/Andersen, and a few other names.Well, this stereotype is not far from the truth. If one looks at the 10 most common surnames, these make up 26 percent of the population in Denmark, 19.5 percentin Sweden, and 9 percent in Norway. The Scandinavian countries are only rivaled by Spain (19.5percent).The reason that it is so little variation in the family names of Scandinavians is the common practice of taking your father's name and making it your own last name, by adding the ending *sen* (in Denmark and Norway) or *son* (Sweden). This means that if your father's name was Peter, then your last name would become Petersen.Even so, present day Scandinavians are not named after their father, but rather some distant great great grandfather. This is because the practice stopped in the 19th century, freezing the name. Thus, if a Scandinavian's great great grandfather was named Karl, his son would become Karlsen, and his son would also become Karlsen (regardless of his father's given name), and so on. The exception to this rule is Iceland, where the people are still named after their father. Whereas Scandinavians are named after the given names of their forefathers, their British and German counterparts are often named after the occupation of their forefathers. This is seen in names like Smith/Schmidt, Taylor/Schneider, and Baker/Becker. As we can see from this list, all the top 10 names of Denmark, Norway, and Sweden ends with either *sen* or *son*.

Denmark: Jensen, Nielsen, Hansen, Pedersen, Andersen, Christensen, Larsen, Sørensen, Rasmussen, Jørgensen

Norway: Hansen, Johansen, Olsen, Larsen, Andersen, Nilsen, Pedersen, Kristiansen, Jensen, Karlsen

Sweden: Johansson, Andersson, Karlsson, Nilsson, Eriksson, Larsson, Olsson, Persson, Svensson, Gustafsson

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SLEEP HELPS WOUNDS HEAL FASTER

Snoozing may be more important than good nutrition for cutting down healing time A good night's sleep can improve your mood, help you stay alert and boost your memory. Now data show that getting enough Z's might also get your cuts to heal more promptly. In fact, sleep was more important than good nutrition in speeding wound healing.This wasn't what scientists had expected to see.They had hoped to show that giving people a nutritional boost would make their skin wounds heal faster - even in people who were sleep-deprived. That would have been useful for soldiers in combat, or for doctors working long shifts in a hospital. The scientists thought it should work because good nutrition keeps the body's immune system strong. That immune system helps repair injuries and guards against infection.

Tracey Smith is a nutrition scientist at the U.S. Army Research Institute of Environmental Medicine, in Natick, Mass. She and her team studied three groups of healthy people who came to their laboratory to take part in tests. They gave each recruit small skin wounds. Applying gentle suction on their forearms, they created blisters. Then they removed the tops of these blisters. (The procedure doesn't hurt, although it can be itchy, Smith says.)One group of 16 volunteers got a normal amount of sleep - seven to nine hours a night. The other two groups of 20 people each were kept sleep deprived. They got only two hours of sleep a night, for three nights in a row. To stay awake, the volunteers were asked to do things such as walk, play video games, watch TV, sit on an exercise ball or play ping-pong. Throughout the experiment, one of the sleep- deprived groups got a nutritional drink with extra protein and vitamins. The other group got a *placebo* drink: It looked and tasted the same but had no extra nutrition.Sleep clearly helped. People who slept normally healed in about 4.2 days. The sleep-deprived volunteers took about 5 days to heal.And getting better nutrition offered no clear benefit. Scientists sampled fluid from the wounds. The group that drank the nutritional supplement did show a strongerimmune response at the wound. But that didn't speed the healing, Smith reports in the January *Journal of Applied Physiology*.

What to make of the data

Sleep expert Clete Kushida didn't find the results all that surprising. He is a neurologist at Stanford University Medical Center in California. The idea that lost sleep harms the immune system - and healing - "makes total sense," he says.Yet studies that have tried to test this in people and animals showed mixed results.Why didn't nutrition help healing time? Smith can think of a few possibilities. The healthy drinks may have helped a little - just not enough to show up clearly in the relatively small numbers of men and women tested here.

There was also a big difference in healing time between individual participants, which could have made it harder to see a small effect due to nutrition.For people who can't avoid lost sleep, scientists still don't have a nutritional way to help them heal, Smith says. If you want to heal faster, your best bet for now is toget more "vitamin Z."

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SOLAR ECLIPSES

There are four types of solar eclipses: total, partial, penumbral, and hybrid. They occur when the moon passes between the sun and the earth. In order for an eclipse to occur, the three bodies roughly must form a straight line. The moon's shadow is cast back toward earth, causing the sun to be totally or partially blocked from an observer's view. In order to witness a solar eclipse, an observer must be within the area upon which the shadow falls. The observer's location in relation to the moon's shadow over the earth and the moon's location within its orbit of the earth determine the type of eclipse it will be.

The August 21, 2017, solar eclipse visible across the entire North American continent is a total solar eclipse. This occurs when there is a new moon and when the moon's orbit around the earth is at its perigree, or closest. The moon seems to appear at its largest from earth at this time. When the three bodies come into alignment, the moon completely blocks out the sun, causing a total solar eclipse. In order to observe a total solar eclipse, you must be within the area that the innermost and darkest part of the moon's shadow covers when it is cast back on the earth. That portion of shadow is called the "umbra." The next total solar eclipse visible from the U.S. will be April 8, 2024.

A partial solar eclipse can occur at any time during the moon's orbit. The moon only partially blocks the sun, allowing a crescent-shaped piece of it to appear behind the moon's edge. In order to see a partial solar eclipse, you must be within the area traversed by the lighter, outermost part of the moon's shadow called the "penumbra." The next partial solar eclipse visible from the U.S. will be January 14, 2029. An annular solar eclipse is a type of partial eclipse. It occurs when the moon is further from the earth in its orbit, which means the moon appears smaller than it does during a total solar eclipse. Because of this perceived size difference, the moon does not appear to be the same size as the face of the sun, leaving a ring of sun visible around the edge of the moon. During this time, the moon's shadow visible on earth is called "antumbra," meaning "before the umbra." The next annular solar eclipse visible from the U.S. will be June 10, 2021.

A hybrid solar eclipse, sometimes called an annular/total eclipse, occurs rarely and only when the coverage of the sun shifts during the eclipse from annular to total back to annular over the course of the eclipse. (Even more rarely, the eclipse may shift from annular to total or vice versa and not back again.) This change is caused by the curvature of the earth, which raises certain areas of the surface of the planet slightly, bringing it into the umbral shadow of the moon. As the curvature shifts away, the surface of the earth shifts out of the umbral shadow and back into the antumbral shadow. The next hybrid solar eclipse visible from the U.S. will be December 6, 2067. It is only safe to look directly at a total solar eclipse when the sun's face is completely obscured by the moon, but as the moon is coming into alignment and during all other types of solar eclipses, looking directly at the sun can damage your eyes. Using special equipment is the only safe way to observe most eclipses.

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STRICT GUN LAWS ENDED MASS SHOOTINGS IN AUSTRALIA

Reduction in semiautomatic weapons likely a key factor, study concludes

Twenty years ago, Australia passed strict laws to control what types of guns people could own. The country also required people to sell to the government any guns that were made illegal. Since then, Australia has seen zero mass shootings, a new study finds. Researchers reported those findings June 22 in the *Journal of the American Medical Association*.
Daniel Webster is a health policy researcher at Johns Hopkins University in Baltimore, Md. He wrote an editorial that was published along with the new study. Key to the laws' success, he suspects, was a sharp reduction in public exposure to semiautomatic weapons. (These are weapons that fire each time their triggers are pulled, and then automatically reload). "Here's a society that recognized a public safety threat, found it unacceptable and took measures to address the problem," Webster says. The data from Australia are potentially valuable for understanding what effects gun-control laws might have elsewhere. In the United States, for instance, there have been a number of high-profile mass casualties. Among the most recent: the June 12 shooting that killed dozens of people in Orlando, Fla.

In fact, gun violence in the United States has become fairly common, according to the Gun Violence Archive, a nonprofit group that tracks such incidents. As of July 1, it had logged 163 mass shootings in 2016. Mass shooting trackerpegged the number at 208 for the same period. Its numbers for June alone included 97 deaths and 213 injuries. Such events have made people question which gun-control laws, if any, have cut gun violence. To date, there hasn't been enough evidence to make strong conclusions aboutmost U.S. laws. David Hemenway is a health policy researcher at Harvard Universityin Cambridge, Mass. He says one reason the effectiveness of U.S. gun laws is hard to pin down is that the laws typically aren't very strong.

In April 1996, a man with two semiautomatic rifles shot and killed 35 people in Tasmania. (That's an island state that is part of Australia.) Known as the Port Arthur massacre, this attack also wounded at least 18 others. Two months after the event, Australia began putting in place a far-reaching set of gun laws. They are known as its National Firearms Agreement. The laws banned semiautomatic long guns. These include the guns used by the Port Arthur shooter. The new agreement made buying other guns a lot harder too. People have to show a "genuine need" for a weapon that they want to buy. They must pass a safety test, show good moral character and wait at least 28 days. They also cannot have any *restraining orders* for violence, among other restrictions, Webster notes. "In Australia, they look at someone's full record and ask, 'Is this a good idea to let this person have a firearm?'" Webster says.

In the United States, he notes, “we do pretty much the opposite. The burden is on the government to show that you are too dangerous to have a firearm.” Australia also started a mandatory gun-buyback program in 1996. Through that program, the government bought and destroyed more than 650,000 firearms.

Simon Chapman at Australia's University of Sydney led the new study. He and his colleagues counted mass shootings before and after the National Firearms Agreement. They also analyzed 35 years of data about deaths in the country. Those data came from the Australian Bureau of Statistics. From 1979 to 1996, Australia had 13 fatal mass shootings, Chapman’s team reports. The researchers counted an event as a mass shooting if it involved five or more victims (not including the shooter). From 1997 to May 2016, the country has had none. (Three shootings, though, have killed three or four victims.) Chapman’s team also found that the rate of gun deaths dropped rapidly after 1996. But the researchers can’t confirm that this reduction is due to the gun laws.

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STUDENT POWER

When most people think of strikes, they think of factory workers asking for better pay and conditions, or perhaps refusing to work to support a colleague who has been unfairly sacked. It is not often that people associate strikes with school students. But in Italy, it is different. While in many countries it is absolutely unthinkable, in Italy it happens almost every year. Some people may remember the "Paris spring" of 1968, when in the French capital university students and factory workers all went on strike in a crisis which almost made the French republic collapse, but for many this is a long time ago now. But in Italy, however, the tradition has remained. It seems that almost every autumn there is a reason to protest. Most of the protests are national, like the current opposition to thegovernment's planned educational reforms, but there are also protests against things like local issues such as heating in the classes or treatment of individual students.And what do students do to protest? All over the country they go on strike, they have demonstrations in the streets, they occupy their schools, they have lots of meetings and sometimes they try to run the schools themselves for a period, setting up their own lessons and courses.Are all the students behind this? Well, it's difficult to say exactly. But what is certain, is that very few students object."I think it's important to show what we feel" says one high school student, "The new school reform will be very bad for state schools."Other students are more sceptical. "I think it's great!" says one student, "It means we get a few days off school." Another student is openly cynical: "All the people who are doing this... well, some of them are just troublemakers, others are people who are already planning to become politicians. They want to start their career now." Others say that the strike leaders are being manipulated or used by groups from outside the schools.

Problems occurred recently when students from one school which was being occupied marched to another school which wasn't protesting. The strikers stood outside the school and shouted and threw things at the windows. The non-striking students sat in their classrooms and did nothing, but their teachers went out and began to shout at the students from the striking school.

In Britain, and a lot of other countries, such action is unthinkable. Students are not allowed to go on strike, and if they did they would probably face severe disciplinary measures.The strange thing about this, however, is that despite the number of school hours lost to strikes, Italian students are certainly no less intelligent or knowledgeable than their European counterparts. Their national averages are the same as others, despite the fact that on average they spend up to 20% less time in the classroom – with strikes being only one of the many interruptions of the Italian school year.Troublemakers or not, perhaps there is something to be learned from the Italian way of studying!

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SUPERBUGS: A SILENT HEALTH EMERGENCY

Bacteria are outsmarting antibiotics to an alarming degree The first of a two-part series.Bacteria and other microbes can make us sick. But there's a lurking danger with some germs that's far more frightening than a bout of food poisoning or aninfected wound. Today, drugs exist to fight most of these germs. They're called antibiotics. Before these medicines came along, common infections frequently killed people. And that's where the danger lies: What will happen if antibiotics no longer kill germs?Already some antibiotics have lost their superpowers. Many others are beginning to lose theirs. Biologists describe this problem as resistance. Across the globe, germs are becoming resistant to antibiotic medicines. In a sense,these "superbugs" have begun to laugh at those former wonderdrugs.But resistance is no laughing matter. As germs toughen up against drugs that are supposed to slay them, treatable conditions such as TB - tuberculosis - can spread. And surgeries that rely on antibiotics could turn from life-saving to life- threatening.

The threat is huge

"Alarming levels" of drug-resistant bacteria already exist in many parts of the world. That's the conclusion of a 257-page report published in April. It was issued by the World Health Organization (WHO).This United Nations agency, based in Geneva, Switzerland, recently reviewed how well these germ slayers perform in 114 countries. In some places, it found, antibiotics no longer work for half of all people being treated against common diseases. Those diseases include pneumonia and gonorrhea.

The Centers for Disease Control and Prevention (CDC), based in Atlanta, Ga., also has been investigating the problem. It estimates that in the United States alone, antibiotic-resistant infections now sicken some two million people each year. At least 23,000 of them die.But even antibiotic-resistant germs that don't kill can be a problem. Their infections become harder to treat - and more expensive. Consider one estimate $233 million - published May 20 in the journal Antimicrobial Resistance and Infection Control. That's how much researchers calculated that it coststheUnited States each year to deal with just one resistant superbug. That germ causes a lung disease known as pneumonia.

Drug-immune bugs that flourish in the human gut can enter the environment with every flush of the toilet. Researchers discovered how big this problem is when they analyzed wastewater from 11 sites in one French city. Antibiotic- resistant bacteria tainted 96 percent of their samples. A May 1 paper in Clinical Infectious Diseases describes the disturbing details.

Some scientists have scouted for such germs in the environment. They collected superbugs at hospitals. Then they probed the germs, identifying parts of their genes that appear to make them resistant to antibiotics.

Next, the researchers looked in the outdoor environment for that same genetic fingerprint of superbugs. And they turned up that superbug DNA in 71 places - from the soil

and sea water to human wastes. The researchers reported their findings May 8 in Current Biology.

Why it's happening

Drug designers have created antibiotics to kill bacteria, as well as some fungi and other germs. But sometimes, a few treated germs survive. They survive because they're stronger. Or they may have certain genetic mutations that allow them to break down the drug. They might even have evolved a way to keep the drugs from harming their operational machinery. Over time, all germs susceptible to a drug will die off. That will leave behind only superbugs - those microbes that medicines can't kill.This is not surprising. In fact, it's quite natural. Part of evolution, it's known as survival of the fittest.Scientists stumbled onto the first antibiotic, penicillin, around 1930. Since then, research has produced a medicine cabinet full of additional ones. It appeared that these would make many of the worst bacterial infections ever more manageable. So, during the 1970s, drug developers began focusing on noninfectious health problems, such as cancer and heart disease. As a result, in the past 30 years, no new types of antibiotics have been developed.Right now, bacteria are outsmarting antibiotics faster than developers can make new ones. And there are no signs things will change, says Stewart Cole. He directs the Global Health Institute at the Ecole Polytechnique Federale de Lausanne in Switzerland.

Writing in the May 12 Philosophical Transactions of the Royal Society B, heargues that the "golden age" of antibiotic development "is a distant memory, and the likelihood of there being another seems slim." This lack of new types of germ killers, he says, has been allowing superbugs to morph and thrive.One of the most famous of them is known as MRSA (pronounced MER-sah). The letters stand for methicillin-resistant Staphylococcus aureus. Methicillin is a widely used antibiotic. And Staph aureus is a germ that can cause boils, food poisoning, toxic-shock syndrome and more. These bacteria sicken (and sometimes kill) by releasing potent natural poisons - called toxins - into the body.Despite its name, MRSA is resistant to far more antibiotics than just methicillin. That makes this superbug particularly nasty in hospitals and prisons. These are places where people often have open wounds or weak immune systems. Both increase a person's chance of picking up an infection.

Too much of a good thing

Drug resistance can develop at any time. But its likelihood climbs as the use of an antibiotic increases. And this is especially true when an antibiotic isoverused. That's when a doctor prescribes it for infections it has no hope of curing.For instance, doctors sometimes prescribe antibiotics to treat an infection before they learn if the disease is caused by bacteria. If viruses are responsible, then antibiotics will be useless.

The reason: Antibiotic medicines do not kill viruses. Yet by giving an antibiotic to someone with a viral infection, that drug will reach good bacteria living in our bodies. And over time, some of these bacteria will become resistant to the drug.

Last year, the CDC reported that up to half of the antibiotics that U.S. doctors

prescribed went to people who didn’t actually need them.Take, for example, someone who visits a doctor for a lingering cough. Viral infections cause most coughs. So a viral cough won’t be helped by drugs and will tend to go away on its own. Yet 71 percent of the time, doctors will still prescribe antibiotics for patients coming in with a common cough, a May 21 study finds.“I think there’s this perception among both doctors and patients that coughs don’t go away without antibiotic treatment,” Jeffrey Linder told Science News for Students. Linder, who coauthored the new report, is a doctor at Brigham & Women’s Hospital in Boston, Mass. He and Michael Barnett, also from thehospital, tracked the drugs that doctors prescribed during more than 3,000 U.S. clinic visits between 1996 and 2010. They reported their findings in the Journal of the American Medical Association.A small number of people who visit a doctor with a cough turn out to have bacterial pneumonia. These cases do require antibiotic treatment. But Linder says doctors should easily be able to recognize these few from the hordes of people coming in with a routine, viral cough.

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PERILOUS PROFIT

Antibiotic overuse also has become a problem on farms. In the United States, animals - not people - receive about 80 percent of all antibiotics. Sometimes the drugs are used to save an infected animal or prevent disease from spreading through a herd. More often, though, feed suppliers put small amounts of these drugs into the food that will be given to healthy animals. These antibiotics help speed the animals' growth. And this has boosted farmers' profits.But using antibiotics just to beef up livestock is "a direct threat to human health," argues Kellogg Schwab. He's an environmental microbiologist at Johns Hopkins University in Baltimore, Md. Earlier, he and his coworkers detected bacteria that are resistant to antibiotics in the exhaust air blowing out of farm buildings. That suggests these superbugs can spread through the air from animals to people.

Farmers often feed livestock, like these beef cattle, trace amounts of antibiotics to promote their growth. Many disease experts now think this contributes to antibiotic resistance and risks these drugs no longer working to fight human disease.

Germs that are immune to antibiotics also can hitch a ride into your body through ground beef or the chicken breast on your cutting board. Biologists have found that much of the fresh beef, pork and poultry sold in grocery stores contains bacteria resistant to antibiotics. Even if those germs don't sicken us or cause other immediate harm, they can offload their resistance genes into other bacteria that normally live inside ourbodies. Sometimes, like with the MRSA superbug, resistance is carried on circular pieces of DNA called plasmids. These plasmids can slip easily from one bacterial cell into another.

In this way, our gut microbes can become "a reservoir of resistance," says Sharon Peacock. She's a microbiologist at the University of Cambridge in England. Later, "when we actually get sick and need an antibiotic, we mayalready carry a resistance gene" that may keep that drug from working, she says.

In the United States, farmers have fought against banning antibiotics as growth promoters. They say it will reduce their profits because more animals will get sick, slowing their growth. But that's not been the experience in other countries.The U.S. Food and Drug Administration, or FDA, has proposed banning antibiotic use in healthy animals. But for more than 30 years, the livestock industry and Congress have fought such action. Recently, the FDA stepped up its efforts to end this practice.

In December 2013, FDA laid out a plan to phase out within three years the use of antibiotics on farms to boost livestock growth. Its stated reason: concern that farm use of these drugs has made more germs immune to the antibiotics needed to fight life-threatening infections in people. And that's a worry because the same germs that sicken animals often sicken people.

Antibiotic resistance is a complex and growing problem. Many microbiologists worry that the time when antibacterial medicines no longer work could be coming. Thankfully, doctors and many patients are becoming more aware of the problem. Researchers also are hard at work creating new tools to keep superbugs from taking over.

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THE CATS THAT FOUGHT IN WORLD WAR II-THE ALLIES

It is maybe not the most well-known fact among the general public. Even so, truth is that cats are the unsung heroes of the Second World War. We in *Popular Social Science* are happy to tell the untold stories of the kittens that helped liberate Europe, and the Nazi tabbies who almost took Europe back to the Dark Ages.In this first part we will tell the story of the allied cats, before moving on to the swasticats and the communist cats in the following week.

Blackie

The black cat with the suiting name served as the ship cat of HMS Prince of Wales in the British Royal Navy. He participated in naval battles both in the Denmark Strait and in the Mediterranean. The former was fought between British and German ships in May 1941. Blackies ship traded blows with the *Bismarck* of the German *Kriegsmarine*.Blackie received worldwide fame after he had his picture taken together with Winston Churchill, who was on his way to meet with US President Franklin D. Roosevelt to sign the Atlantic Charter. This charter defined the allied goals for the post-war world.

Faith

In 1936 the cat Faith was accepted at the church in the congregation of St. Augustine on Watling Street. During the early stages of the war she was roaming the streets of Britain's capital. In 1940 she gave birth to a kitten, which was called Panda. The birth was celebrated by the clergy.However, for unknown reasons Faith moved Panda into the cold basement. The following day London was bombed by the German *Luftwaffe*. The church was severely damaged, as was much of the neighborhood. Yet, both Faith and the kitten survived, and her bravery became well known throughout London.

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Oscar – Die Bordkatze der Bismarck (Unsinkable Sam)

Why have we in *Popular Social Science* categorized a swasticat together with the allied cats? Well, the story of Oscar is perhaps the most intriguing of all.

Oscar (later Sam) was originally the nemesis of Blackie the cat, fighting against him aboard the *Bismarck* in the battle of the Denmark Strait.However, *Bismarck* was sunk in that

battle, and Oskar was subsequently rescued from the water by the British destroyer HMS Cossack. He thus became an allied cat.

In October 1941 HMS Cossack was torpedoed by a German U-boat, and Sam (Oscar had gotten an allied name now) was once again rescued, and transferred to the aircraft carrier HMS Ark Royal. He had now gotten his nickname “Unsinkable Sam.”Then the HMS Ark Royal was torpedoed as well, and Sam was once again transferred, first to HMS Lightning and later HMS Legion. He survived the war, and went on to enjoy his retirement days in Belfast.

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THE CAUSES OF CİVİL WAR

Civil wars are the most frequent form of armed conflict since the end of World War II. These conflicts constitute an enormous burden on ordinary people who are not involved in power politics. But what are the causes of civil wars?

Man's history has been stained by countless armed conflicts. As the English philosopher Thomas Hobbes so eloquently described the nature of man'sexistence: "*Bellum omnium contra omnes*" or "the war of all against all". The Prussian military theorist Carl von Clausewitz stated that war is interwoven with politics, more precisely the prolonged arm of, or continuation of, politics.

Professor Paul Collier defines civil war as taking place when "an identifiable rebel organization challenges the government militarily and the resulting violence results in more than 1,000 combat related deaths, with at least 5 percent of the casualties on each side." In other words, a civil war takes place when a group of citizens forms a rebel organization and carries out large-scale enduring attacks on government forces and civilians. Regarding civil conflict, two main theoretical schools have competed in explaining collective violence.

Explanation 1: The Deprived Actor Argument

This line of thinking highlights grievances as an important cause of civil war. It tries to explain the link between deprivation and violent behavior. The argument is that discontent is turned into dissent through psychological processes, both cognitive and emotional. According to Dr. Ted Robert Gurr, it is through these processes that the deprivations generate grievances, and grievances, together with identification with other deprived actors, bay result in violence. This is called the *frustration-aggression mechanism* which is held to be an important part of man's psychobiological makeup, and is, according to Gurr, the source of a person's proneness to collective violence.

Explanation 2: The Rational Actor Argument

On the other side of the table stands the rational actor school of thought. This line of thinking downplays the role of grievances, and instead emphasizes both resource mobilization and opportunity structures as factors motivating rebellious activity. Paul Collier and Anke Hoeffler assume that higher income for a personleads to a higher opportunity cost of rebellion. In other words, if you have a good income, you are not likely to risk this to participate in rebellious activities.

If one follows this logic, each individual then makes a cost-benefit calculus, and the higher their income from non-violent activity, the higher the potential reward for rebellious activity must be for them to quit their daytime job.

Whether or not the expected utility (EU) of rebellion is greater than the expected utility of keeping their daytime job is a function of both the *income level* , *potential reward* for the insurgency, and the *perceived probability of success*.

The ongoing debate

The debate between the deprived actor and rational actor schools is continued through the ongoing grievance versus opportunity discussion. In 2004, PaulCollier and Anke Hoeffler published their article "Greed and Grievance in Civil War." Here they contend that opportunity factors provide a better explanation of the occurrence of civil war than grievance factors. In sum, the opportunity (rational actor) argument has received more support in the research community in the latest decade than the grievance (deprived actor).

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THE ETHICS OF EDITING HUMAN EMBRYOS

Researchers alter human DNA and spark a heated ethical debate.

Imagine if genetic diseases could be removed from the very biological code of our species - a future in which the likes of hemophilia, cystic fibrosis or dozens of other afflictions are simply edited out of human embryos.In April online in the journal *Protein and Cell*, a team of Chinese scientists reportedthe first documented experiment to do just that.

The researchers attempted to quash an inherited, potentially fatal blood disorder by injecting 86 non-viable human embryos with the gene-editing system CRISPR/ Cas9. In recent years, CRISPR has emerged as a game-changing tool in biology, allowing researchers to tweak an organism's DNA with unprecedented ease. Based on a defense mechanism in the immune system of bacteria that hunts and destroys invading viruses, CRISPR can locate and replace specific genes.

In the human embryo experiment, the researchers used it to delete a faulty gene and replace it with one that produces normal blood cells. But the editing worked for only four of the embryos and created numerous unintentional mutations. Those accidental mutations illustrate the concerns some scientists have about using the tool in humans. Earlier in the year, when the Chinese team's experiment was still a rumor, 18 researchers co-authored a letterin Science that called for the community to address the ethical questions and potential hazards of using CRISPR in humans. Until we can wield CRISPR more precisely and understandtheimplicationsofitsusemorefully,saidthescientists,itshouldnot be used onhumans.Despite the concerns, in September researchers at the Francis Crick Institute in London applied to the United Kingdom's governing authority on fertility research for permission to use CRISPR on human embryos. The need for clear guidelines has spurred the organization of an international summit on human gene editing. As of this writing, it was scheduled for early December in Washington, D.C.

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THE EXTRAORDINARY ENCLAVE: DAHALA KHAGRABARI

Most students of Political Science have heard about enclaves. Its definition is when a territory (of e.g. a country or municipality) is completely surrounded by another unit's territory. It is thus an enclave of the surrounding unit, and an exclave of the unit with whom it has legal and political ties. Famous examples include the Baarle- Hertog which consists of 22 Belgian exclaves surrounded by Dutch territory, as well as Llivia which is a Spanish exclave within France.

The presence of enclaves may complicate relations in international politics. Most history students are familiar with the German pre-WW2 demands for its exclave of Eastern Prussia, and this was part of the conflict that eventually led to the German invasion of Poland.To complicate things further, there are also examples of enclaves within enclaves. The previous mentioned municipality of Baarle-Hertog (which was Belgian, surrounded by Dutch land) also contains Dutch exclaves, namely those of the Dutch municipality of Baarle-Nassau (as seen in the illustration).However, there exists one even more extreme example. In the Cooch Behar district of West Bengal (the border between India and Bangladesh) there are 24 so-called second-order enclaves (similar to the Belgian-Dutch example), and even one third- order enclave. This is a piece of India within Bangladesh, within India, within Bangladesh.Naturally, the situation in Cooch Behar can be frustrating, with visa requirements and border violations. Many of the people living there are poor and have no passport, and can thus not leave their enclaves. The islands of land in this region are the result of ownership arrangements made by local princes centuries ago.The third-order enclave in question is called Dahala Khagrabari #51. The size of this Indian parcel of land is a mere 7000 m^2, and is actually owned by a Bangladeshi farmer who lives nearby in the surrounding Bangladeshi second-order enclave (called Debidoda), which is surrounded by an Indian enclave surrounded by Bangladeshi territory.

The Indian and Bangladeshi governments are aware of the difficulties facing the residents of the two countries enclaves in the Cooch Behar district, and they have announced their intention to resolve the problem by exchanging 162 enclaves.

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THE GREAT ARCHITECT SINAN

Sinan is considered the greatest Ottoman architect of the Ottoman Empire's Architectural heritage. It is generally assumed that Sinan was born in the year 1490. It is also assumed that he spent his youth in the village of Agirnas near Kayseri until conscription (devsirme) to the "masters of carpenters". At age 22, Sinan is then recruited into the Corps of Ottoman Standing Troops (Janissary). During this military tour he travels widely throughout the empire, as far as Baghdad, Damascus, Persia and Egypt. In his own words he informs us about his observations:
"I saw the monuments, the great ancient remains. From every ruin I learned, from every building I absorbed something."

By mid-life Sinan acquires a reputation as a valued military engineer and is brought to the attention of Sultan Suleyman (1520-66) who in 1537 appoints Sinan (aged fifty) as head of the office of royal architects. The sultan, upon the death of his favorite son Prince Mehmet, orders Sinan to design and construct a royal mosque. Challenged by the works of his predecessors and the majesty of Hagia Sophia, Sinan creates the Sehzade Mosque, one of his first masterpieces and is considered one of the most remarkable of buildings to this day.

Due to Sinan's rising reputation, a flood of royal as well as individual clients produces an unprecedented building boom that changes the Istanbul landscape to what today the Turks and people from all over the world consider the hallmark of this great city's image. Under Sultan Suleyman, Sinan is elevated to the position of State Architect, which he holds for a decade.

The legendary stature of Suleyman is realized in what is commonly called the "crown on the hill". Dominating the Bosporus and the Golden Horn, the silhouette of the Suleymaniye, with its slender minarets and lofty dome, is one of the defining features of Istanbul. Almost 10 years in the making, Sinan master plans, designs and builds the "Suleymaniye Kulliye" (a complex of charitable buildings) commissioned by the Sultan on a site overlooking the Golden Horn and Pera. The Kulliye covers almost 25 acres and includes in addition to the large mosque (basilica plan), four schools (medreses), a hospice, public baths (hamam), a hospital & dispensary, bookshops, a library, the Sultans' tomb (turbe) and the worlds first teaching asylum (bimarhane).

One of the truly unique urban Mosque and charitable building project is commissioned by the Grand Vizier and called after his name, the Sokollu Mehmet Pasha Mosque Complex (1571-72) in the Kadirga Liman quarter, location of the former gate (Kumkapi), which protected the harbor. The approach to this neighborhood complex is through descending narrow crooked lanes. The irregular site drops over 56 feet and presents a serious urban planning challenge. Sinan's indigenous talent for taking advantage of the lay of the land is evident from the respect for scale and the ingenuity and delightful changes in views one experiences accessing any one of the

number of entries to this complex. During the construction of the Sokollu Sinan receives a great deal of pressure from Sultan Selim II, son and successor to Sultan Suleyman, to progress what is to be Sinan's monumental masterpiece, The Selimiye Complex in Edirne (1568-74). As described …"tall minarets announce the city of Edirne from its endless landscape and from as far as the eye can see. The mosque dominates and crowns the highest elevation, looking down on a city articulated by domes and minarets of other massive buildings."

It is said that in Istanbul monuments grow from the city but the Selimiye grows from the land. The dome is of the same diameter as Hagia Sophia but is higher. The pencil- shaped minarets, grooved to express verticality, are some of the tallest ever built (230 feet from ground to finial). Sinan used these minarets as buttressing piers. The mosque plan, like the Sehzade Mosque, comprises two equal parts, one open (the spacious court) and one covered (the mosque). "The superb quality of the exterior does not adequately prepare one for the breathtaking spaciousness and sheer poetry of space and light within". Edirne has suffered through many earthquakes but none have harmed this monument. Sinan's crowning glory is summed up in this project through its graceful synthesis of the exterior with and ideal spatial interior.

The few prominent projects presented here represent only a small part of this great architect's voluminous design and construction accomplishments throughout the Empire. It is believed that Sinan's total works encompass over 360 structures which included 84 major mosques, 51 small mosques (mescit), 57 religious schools (medreses), 7 seminaries, 22 mausoleums (turbe) 17 care facility, 3 asylums, 7 aqueducts, 46 inns, 35 palaces and mansions and 42 public baths.

Sinan died in 1588 and was buried in a modest tomb, which he designed for himself at the rear of his garden near the Suleymaniye Mosque in Istanbul

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THE HISTORY DISCIPLINE - AMUTT?

History as a scientific discipline is concerned with the past. Man is in the center, not as individuals, but rather as parts of a greater whole, or as parts of big events. History can be described as a "mutt" as it has incorporated elements of other scientific disciplines. However, historians argue that the subject can be helpful to other disciplines as well.

Other social sciences are more oriented toward the present time, and seek to uncover regularities that can be explained. History is focused on the past, is concerned with specific events, and has a more pragmatic relationship to the general regularities of the other social sciences. The discipline is so wide-ranging that one sees a tendency to specialization within the subject. As a Historian one thus wish to concentrate on a specific event, time, time period etc. One seeks to draw conclusion from single events.

History makes use of sources, that is, remains or traces from the past, in order to recreate events, how things used to be, or to give descriptions of important persons. The historian tries to build puzzles where most of the pieces are missing.

History is a discipline where diversity is regarded as something positive. A historian does not work to uncover given truths, he or she rather wish to illuminate several versions of the same story. The sources are the objective part of History, whilst the Historian is the subjective. Through scientific research methods the historian seeks to come as close to pure objectivity as possible.

History is about knowing man's history, and to learn lessons from it. The discipline can be regarded as a mutt, which lies between the historical-philosophical disciplines and the other social sciences.

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THE J-CURVE-JAMES C. DAVIES' THEORYOF REVOLUTIONS

By Tor G.Jakobsen

In 1962, Davies presented his *J-curve theory*. He stated that revolutions are most likely to occur when periods of prolonged improvements concerning economic and social development are supplanted by a period of sharp reversal. He used evidence from the Dorr's rebellion, the Russian revolution, and the Egyptian revolution to support his argument. According to Davies, the sharp reversal of development creates an intolerable gap between what people want and what they get.

After a reversal of fortunes, people will subjectively fear that what they have earned will be lost, and thus their mood becomes revolutionary. Davies claims that political stability and instability are dependent on the mood of the society. In other words, poor people who are satisfied will not revolt, and rich people who are dissatisfied may revolt. What is important is their state of mind rather than how much goods they possess.

Need satisfaction and revolution

Revolutions do not usually occur in impoverished societies. The reason is that when people are preoccupied with their physical survival, the community-sense and consensus on joint political actions goes down and thus also the likelihood for revolutions to occur. Even though physical deprivation is to some extent present at the onset of revolutions, it is seldom the primary cause.

The main factor is rather the fear that ground gained over a time period will be quickly lost. Davies found evidence for this when studying three revolutions using John Stuart Mill's *method of difference*. When employing this method the researcher collects cases of a particular phenomenon in an attempt to find common factors in these cases that are otherwise quite different.

He thus chose three different cases, where revolts had occurred, and found the common explanatory variable to be the presence of a sharp reversal of fortunes after a period of prolonged growth.

The Dorr Rebellion (1841–1842)

The rapid industrial growth of the 19th century meant that the people of Rhode Island in the northeastern United States moved in large numbers from farms tocities. From 1807–15 the textile industry saw a period of great prosperity, followed by a period of decline from 1835–40.

This, in combination with the state's resistance to suffrage demands saw Thomas W. Dorr lead a band of militia men mostly composed of Catholics into a rebellion. Dorr was firmly defeated by the establishment in 1842.

The Russian Revolution (1917)

In 1861 Russia saw the emancipation of serfs and a process of urbanization began. Many became factory workers, thus earning larger salaries than they had as peasants. The period from 1861–1905 can be viewed as a period of rising expectations. Around 1905 began the general downturn; Russia lost the war with Japan, and censorship and confiscations soon followed. The country now saw a period of severe repression, followed by a short period of economic recovery.
But then World War I broke out, inflation rose, and dis content spread throughout the country like a wildfire.

The Egyptian Revolution (1952)

The rising expectations of Egyptians began in 1922 when the British granted them limited independence. The country saw some industrialization, improving the opportunities for many. But with the economic growth came also the rising costs of living. In 1948 exports went down, and many manual laborers became unemployed. This was followed by the Arab (including Egypt) invasion of Israel, where Egypt suffered a humiliating defeat against this newly independent state. In addition, Egyptians suffered a shortage of wheat and oil. A series of peasant uprisings and strikes began, which culminated in the riots in Cairo in 1952.

Prosperity raises expectations, and depression frustrates people

The evidence from the Dorr Rebellion, the Russian Revolution, and the Egyptian Revolution, together with other civil disturbances provided the cases from which James C. Davies created his famous J-curve theory. What he claimed to be important was the gap between what people expect to get and what they actually get. As such, revolutions are likely to occur after a period of good times, followed by a sudden decline of fortunes.

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THE LOOKING GLASS SELF: HOW OURSELF-IMAGE IS SHAPED BY SOCIETY

By Joachim Vogt Isaksen

Do you sometimes experience that the mere presence of other people leads to feelings of discomfort and tension? When not knowing exactly what other people think of you it may lead to self-doubt and feelings of insecurity.
According to the American sociologist Charles Horton Cooley (1864-1929), the degree of personal insecurity you display in social situations is determined by what you believe other people think of you.

Cooley´s concept of the looking glass self, states that a person's self grows out of a person´s social interactions with others. The view of ourselves comes from the contemplation of personal qualities and impressions of how others perceive us. Actually, how we see ourselves does not come from who we really are, but rather from how we believe others see us.

The main point is that people shape their self-concepts based on their understanding of how others perceive them. We form our self-image as the reflections of the response and evaluations of others in our environment. As children we were treated in a variety of ways. If parents, relatives and other important people look at a child as smart, they will tend to raise him with certain types of expectations. As a consequence the child will eventually believe that he is a smart person. This is a process that continues when we grow up. For instanse, if you believe that your closest friends look at you as some kind of superhero, you are likely to project that self-image, regardless of whether this has anything to do with reality.

The concept of the looking glass-self theory constitutes the cornerstone of the sociological theory of socialization. The idea is that people in our close environment serve as the "mirrors" that reflect images of ourselves. According to Cooley, this process has three steps. First, we imagine how we appear to another person. Sometimes this imagination is correct, but may also be wrong since it is merely based on our assumptions. Second, we imagine what judgments people make of us based on our appearance. Lastly, we imagine how the person feels about us, based on the judgments made of us. The ultimate result is that we often change our behavior based on how we feel people perceive us.

Building a strong self-image

"I imagine your mind, and especially what your mind thinks about my mind, and what your mind thinks about what my mind thinks about your mind." Charles Horton Cooley.

So how can we, or anyone else, know who we really are? Can you be sure of the "real you", separated from all the stuff in the outside social world?

You have probably experienced that you have had a strong sense of another person´s dislike for you, only to later find out that this was not the case, and that this person really liked you. Actually, the "real social world" as we perceive it, is often not only wrong, but may even serve as an illusion.

All people want to be liked and be appreciated for talents or personality. But if we have a weak self-image, if we believe that the opinion of others are more important than our own, we can end up living our lives in accordance to other peoples´ expectations. Sometimes, others evaluations mean more to us than our own. This is quite a distressing thought, since it implies that others´ opinion of you can run your life.

A person's construction of an "imagined self-image" is done unintentionally. We are not consciously aware that we often try to conform to the image that we imagine other people expect from us. If a person develops a negative self-image the self-esteem will tend to be low. Low self esteem and poor self-image has long been associated with a whole range of psychological problems, and it is necessary to counter the passive individual that depends heavily on the social world for building self-image. Hence, we should develop a self-image that is more based on our own evaluations rather than how we believe others look atus.

The concept of the looking glass self offers insight not only into our own thinking, but also to how we form our identity based on how others see us. As long as we are interacting with others we are vulnerable for changing our own self-image, a process that will continue throughout our lives.

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THE LUCIFER INSIDE US

In the Bible the character Lucifer is known as a fallen angel and the mainantagonist of God. Originally God's favorite angel, he attempted to usurp his master. Lucifer lost the battle, and was sent out of heaven to rule his own kingdom, the lake of fire.

Throughout time Lucifer has been used as a scapegoat for people's misdoings. The reason is that it is often easier for humans to believe that somebody else is responsible for our mistakes. But truth is, we all do stupid things. And we are perfectly able to do them without being lured by the devil.

Everyone can make bad choices. It may be that we made a decision in hasteand did not know all the facts. A confident person has the ability to break this trend, that is, to make new decisions independent of his or her previousmistakes.

However, from cognitive psychology we know that a person with a negative self-image is not able to break such a trend. That person will try to make things right by justifying previous mistakes when continuing in the same track, rather than admitting that he was wrong. In order to justify past behavior he will compromise present judgment.

You are responsible for your own mistakes

Going back to Lucifer, it is easier for humans to believe that someone else is responsible rather than living up to our own faults. Was Lucifer to blame for Eve eating the apple in the Garden of Eden? Is Lucifer to blame for people cheating on the tax-return or doing drugs?

The answer is no. People choose to do these things; it is a result of human greed or weakness. What the weak person needs to do is to learn from his mistakes and cut his losses. If you have made a faulty decision, like going to a football game that turns out to be a cold and boring affair, just leave. You don't need to sit two hours in boredom catching a cold just because you made a previous mistake of buying a ticket.

Or, if a person started studying at a certain school or university because it felt like the right thing to do. Then things go rather poorly, and it becomes obvious that this was not the right career path for her. What she needs to do is to change directions. That is, choose another field of study or a work-career. What she should not do is to continue on the wrong path as an attempt to justify her previous wrong decision.

Everyone can make mistakes; the wise choose not to repeat them.

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THE ORIGIN OF THE AFRIKANERS

Afrikaners were once the dominant ethnic group in South Africa, and are still considered one of the corner stones of the new South Africa. In sum, they number about three million worldwide, the lion's share residing in southern Africa including Namibia and Zambia.These Dutch-sounding people with European appearance have made their mark on the world scene as well. Most readers know of the actress Charlize Theron who has won both the Academy Awardand the Golden Globe for best actress. She is originally from the Transvaal province of South Africa, and her great-great-uncle Danie Theron was a major figure in the Boer War.

When it comes to science the name Christiaan Barnard springs to mind. Afterseveral years of testing animal heart transplants he finally performed the world's first human heart transplant in 1967. Barnard became an international superstar, though he never received the Nobel Prize for his contribution to medicine. This he later blamed on the international reputation of the South African Regime.

Who are the Afrikaners?

The first Europeans came to settle in South Africa in 1652. They arrived in what is today the city of Cape Town.This colony was founded By Johan Anthonisz van Riebeeck. In ten years the European population at the Cape counted 243 heads. In the start all male immigrants were single Dutch males, most of these are described as being of a peasant background, or being laborers employed by the Dutch East India Company as sailors or soldiers. Few free men of the Netherland would choose to emigrate unless it was of the uttermost necessity due to poverty or hunger. From the Dutch settlers came surnames like Vorster, Botha, Coetzee, Merwe, and Jacobs.

In 1688 a group of French Huguenot families arrived, their numbers totaled at 180 persons. These were people fleeing religious persecution following the 30-years war in Europe. This influence is why many South Africans today have French sounding names, like Blignaut, Cronje, de Klerk, de Villiers, and du Plessis.Apart from these, the female share of the settlers was of Dutch origin. In the 18^{th} century most new arrivals were German males, who had entered a ship inAmsterdam, Rotterdam, or any other Dutch harbor. From the German contingent came names like Kruger, Pretorius, Smit, and Schoeman.Even so, it was Holland rather than Germany that influenced the Cape settlement. There was also an element of racial mixing, mainly due to the gender imbalance within the white population. One could often see marriages between white men and colored women of a fair complexion.So, in sum, todays Afrikaners can be said to mainly a Dutch-German mixture, with a solid presence of French Huguenots, and also drops of other European groups as well as around five percent of none-white ancestry.

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THE PSYCHOLOGY BEHIND DEFENSE MECHANISMS

When a person experiences psychological tension and discomfort, there are several strategies to reduce emotional pain. One of Sigmund Freud's most innovative ideas was his demonstration of how the human mind is designed to deal with psychological difficulties.

Very often in life people find themselves in a state of psychological distress that they need to properly deal with. In Freudian psychoanalytic theory defense mechanisms are psychological strategies used by the unconscious mind to manipulate, deny, or distort reality, in order to protect itself from anxiety and psychological pain. In the following section I will give a short description of the most common defense mechanisms people use when they are confronted with emotional difficulties:

1) *Repression*protects your conscious mind against instinctual wishes or traumatic experiences. Typically this takes place in two different ways; sometimes you may find yourself having forbidden thoughts that go against accepted norms or values of the society. Since these instinctual drives or fantasies can never be fulfilled, they need to be repressed. Repression may also take place when a person has experienced something traumatic that is impossible to handle in everyday life. The mind is designed to repress the unbearable thoughts, in order to functionnormally.

2) *Projection* happens when a person refuses to realize his own negative personality traits, and rather push those feelings onto others. Typically thismay happen in a loving relationship, where a person uses his spouse as an outlet for his own negativeemotions.

3) *Identification*is the opposite of projection. When a person is psychologically or physically abused, he may start to identify with the perpetrator. The most famous example of this is to be found in hostage situations, where the prisoner identifies with the people who keep him captured. This is famously known as the Stockholmsyndrome.

4) *Denial*happens when a person interprets a traumatic experience or a conflict as it suits him. Typically this may happen when a person refuses that he has been captured by a serious illness orinjury.

5) *Rationalization*takes place when a person refuses to get in touch withan unpleasant feeling by analyzing it in a rationalway.

To sum up, defense mechanisms are used both by human beings, groups, and even nations, as a way of coping with reality, and maintain a proper image and self-esteem. Even if defense mechanisms often are considered negative, they actually protect us psychologically toward social anxiety and social pressure from the surroundings. Actually they may help distance ourselves from emotionally difficult situations, and more easily deal with life's stressful experiences.

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THE RISE OF CHRIST

By Tor G. Jakobsen

Christianity is at present the world's largest religion with more than 2.1 billion followers. It is divided into several traditions, with Catholicism, Protestantism, and Orthodox Christianity being its major branches. But this has not always been the case. We in *Popular Social Science*have taken a closer look at the humble origins of Christianity.Christianity as a religion saw its birth on the first Pentecost 49 days after Jesus rose from the dead. The original followers of Christ were Jews; however they differed from the views of traditional Judaism in that they believed Jesus was the Son of God and the savior of humanity.Jerusalem was the center of Christianity. It was here one found the holy sites and the first congregation of Christians. However, the first Jewish-Roman War was to change things dramatically.

The persecution

First, the Temple was destroyed and many Christians were killed suspected of treason against the Romans. Second, the remaining Christians distanced themselves further from Judaism, due to the animosity between Romans and Jews. Christianity was now free to develop and spread by its own force, and it began its journey through the Roman Empire.In the year 64 a fire hit Rome, and Emperor Nero blamed it on the Christian community. The Christians were persecuted and executed in large numbers; their religion described as a new and malefic superstition. Some Christians were even set on fire in Nero's gardens, in order to illuminate them.Even though the persecution took place throughout the Roman Empire; it rather increased than diminished the religion, and provided the martyrdom of St. Paul and St. Peter.

The Baptism of Constantine

Christianity did not disappear, and in the 3rd century many in the intellectual elite in Rome and other cities belonged to this new domination. Several emperors hadgood friends that were Christians, and Emperor Philippus Arabs (204–249) was nicknamed the "Christian Emperor" due to his sympathy with the Christian faith. Still, the 3rd century saw many more persecutions, the last ones put into action by Emperor Valerian in 257.With the death of Valerian Christianity was again free. Thousands of new believers joined the cause and several new churches were built. The faith proved victorious when Emperor Constantine the Great was baptized in 337.

By the end of the 4th century it became the official state church of the Roman Empire, and was adopted by the new Germanic states following the fall of the Western Roman Empire. With the age of discovery Christianity conquered the rest of the World through its message of Jesus being the son of God.

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THE ROOTS OF MARXISM

For almost 50 years the world was divided into the Free World and the MarxistWorld. Then the Berlin Wall fell, and the countries of Eastern Europe got democracy. Popular Social Science has taken a look at the roots of Marxistideology.The founder of Marxism was Karl Marx (1818–1883). He was born in Trier in Prussia, to a wealthy Jewish family. The original plan was that Karl was to become a rabbi. However, these plans changed, and he moved to England where he got into touch with Friedrich Engels.

Marxism is mainly rooted in three traditions, one philosophical, one political, and one economic:

1) The philosophy of Georg Friedrich Hegel: Marx was characterized as a leftist Hegel- follower. He used an economic dialectic inherited fromHegel.

2) Frenchsocialism.

3) Scottish economists: like, for example, Adam Smith. Marxism is also aneconomic theory, and Marx drew on Smith in the way he analyzed capitalism. However, their solutions to the problems of capitalism were completelydifferent.

The economy and the society

According to Marxism the economy is interwoven with both sociology and history. However, the economy is by far the most important feature of society. It provides the basis for everything else in society, like culture, politics etc. Marx felt that work was of great value for ones self-esteem, and of great psychological benefit for the ordinary man.

Societal development occurs every time a way of organizing an economic system reaches its level of saturation. When this occurs, one sees a qualitative jump in history, that is, one reaches a better way of organizing the economy. According to the Marxist, this is best achieved through violent revolution.This way one reaches higher states of organizing the society, and communism is reckoned as the highest level.

A communist society is a classless society, where all citizens own the means of production. The working population would through the state own companies involvedwith agriculture, industry, and trade. The reason Marx gave for this was that a systematic unequal distribution of goods, as seen in a capitalist economy, led to a unfair and exploiting society.

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THE SCIENCE OF CANCER

Cancers are a group of diseases in which abnormal cells uncontrollably develop and spread in the body. More than 100 different types of cancer affect humans. Internationally, it is the second leading cause of death, accounting for one in every seven deaths worldwide.Cancers develop as a result of outside forces-exposure to radiation or toxins in the environment (including tobacco and alcohol), poor diet, insufficient exercise, and infections-or internal factors-genetic makeup, immune deficiencies, and hormonal changes-or a combination of more than one factor. A third of all cancer deaths worldwide stem from modifiable or preventable risk factors, such as smoking, obesity, and infections.

Not that long ago, a cancer diagnosis was a death sentence. Over the last two centuries, though, scientists have worked hard to understand how cancer forms, how it can be prevented, and how to treat it. Today, with many types of cancer, the prognosis for those who receive early treatment is positive, with 14 million cancer survivors living in the United States alone.Research continues into all aspects of cancer and includes a broad swath of sciences, including mathematics, immunology, nanotechnology, epigenetics, engineering, and biotechnology.Most students will recognize the term cancer from outside the classroom. Science NetLinks hopes these resources relating to the science of cancer will help answer questions they might have, offer them insights into how a cancer diagnosis has changed in recent years, and interest them in an area of scientific study that will continue to expand into the future.

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THE SELF-FULFILLING PROPHECY

Have you ever had the experience of waking up one day following a lousy night's sleep after several nightmares and thought to yourself: "this is going to be a crappy day", and at the end of the day concluded that your predictions were correct and this was exactly what happened? You may have been thinking to yourself that you completely predicted the outcome of your day, and that you probably should have stayed at home this day.

The self-fulfilling prophecy is a concept used by the American sociologist Robert Merton to describe how a statement may alter actions and therefore become true. In situations where many individuals act on the basis of an expectation, they may actually influence whether an incident will take place or not. When this is happening the individuals create the very conditions they actually believe exist.Even when where there is no reason to worry, the feared outcome may take place if enough people act as if there were some kind of basis for the fear.Self-fulfilling prophecies often lead to unfavourable outcomes. The dire expectation that an event may take place may have serious consequences, such as bankruptcies, scarcity of food and goods, pressures on the stock-markets, and may even lead to wars. People may for example, act on a false rumour that the stocks will decline, or that there will be a shortage of butter in the close future. If enough people act on these false rumours by selling their stocks and buying hugequantities of butter, they will actually cause the expected event tooccur.

One example of the self-fulfilling prophecy is the placebo effect. The placebo effect has been demonstrated in several studies, and may be described as the felt improvement in health but which is not attributable to the medication, or the given treatment. Instead, the patient's belief in the treatment will enhance the immune system, and lead to faster recovery.The self-fulfilling prophecy has also been demonstrated in experiments where people justify their prejudices toward members of other ethnic groups. This could be illustrated by the following statement: "We don't want those people herebecause they only stick to themselves anyway, they are so chauvinistic on behalf of themselves."While the self-fulfilling prophecy doesn't have the force to alter natural eventssuch as hurricanes or earthquakes, your personal attitude may influence smaller everyday situations as how you relate to other people and their response to your behavior. If you apply an optimistic mindset you may for example influence other people to perceive you in a positiveway.

People who tend to be caught in negative self-fulfilling prophecies often suffer from low self-esteem where they act upon an overly critical self-evaluation. They tend to have a pessimistic view on the world and their chances to influence their own situation for the better. This leads to a vicious cycle, where their negative mindset strengthens their self-fulfilling prophecies.

In sum, increased awareness of how to avoid the negative effects of self-fulfilling prophecies may be for the good not only for people in their daily lives, but also for society as a whole.

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TRUMP NOW SEES QATAR AS AN ALLY AGAINST TERRORISM

WASHINGTON - President Trump, who last year denounced the Persian Gulf state of Qatar as a "funder of terrorism" and backed its rivals in a contentious regional feud, welcomed its monarch to the Oval Office on Tuesday and portrayed him as a partner in the fight against extremists.The friendly visit represented a remarkable turnaround for a president who had once portrayed Qatar as part of the problem. But it reflected the success of an intenseand expensive effort by Qatar and its paid lobbyists, including a top fund-raiser for Mr. Trump, to change its image in Washington and present it as a partner with the United States in the war on terrorism.

"We're making sure that terrorism funding is stopped in the countries that we are really related to, because I feel related," Mr. Trump said as he hosted Emir Tamim binHamad Al-Thani of Qatar. "But those countries are stopping the funding of terrorism, and that includes U.A.E. and it includes Saudi Arabia, it includes Qatar and others. A lot of countries were funding terrorism and we're stopping it."

Turning to the emir, Mr. Trump added, "You've now become a very big advocate, and we appreciate that."

The emir did not accept the characterization that his country had just become an ally in the fight on terrorism.

"I want to make something very clear, Mr. President," he said. "We do not and we will not tolerate with people who fund terrorism. We've been cooperating with the United States of America to stop funding terrorism around the region." Last June, Mr. Trump stood in the Rose Garden and accepted the view of Qatar's regional rivals, including Saudi Arabia and the United Arab Emirates, that the small energy-rich emirate was providing money to terrorist groups, cozying up to Iran and harboring fugitives. The Saudis and others had instituted a boycott of Qatar, citing terrorism financing, and Mr. Trump echoed their conclusions during a meeting with reporters.

Qatar, he said then, was a "funder of terror at a very high level," and he demanded that it cut off that money flow to rejoin the circle of responsible nations. That put him at odds with Rex W. Tillerson, then his secretary of state, who sympathized with Qatar as it endured the Saudi-led boycott. Mr. Trump recently fired Mr. Tillerson for other reasons, but has now come around to his point of view.

Mr. Trump met with the emir in September on the sidelines of a United Nations meeting and promised to help broker a resolution to its dispute with its neighbors, an effort that went nowhere. Qatar, which hosts al-Udeid Air Base, home to nearly 10,000 American troops, has signed agreements with the United States for sharing information on terrorists and their money supplies.

Mr. Trump heaped praise on the emir on Tuesday, describing him as a “great friend.”

“He’s very popular in his country,” Mr. Trump said. “His people love him.We’re working on unity in that part of the Middle East, and I think it’s working out very well.”

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VIDEO GAMES LEVEL UP LIFE SKILLS

Playing games in a group can strengthen abilities such as communication and resourcefulness When gamers band together to defeat a three-headed zombie dragon boss, they may not be thinking much about school or work. Still, they are likely building skills that will come in handy in the real world, a new study finds. Researchers in Scotland found that playing video games in a group can improve young adults' communication skills and resourcefulness. It also can make them betterat *adapting* to new situations.

Sharpening those skills can help someone get a job or advance in a career. "Employers want you to think for yourself and adapt to changing situations," says Matthew Barr, who conducted the new study. He studies video games and gamer culture at the University of Glasgow in Scotland. He also played a lot of video games while growing up.

From his own experience, Barr knows that video games demand quick thinking. "Games are always keeping you on your toes. You have to be able to figure out what to do if you're just dropped into a situation," he says. Multiplayer games also require good communication among players.Barr wanted to know whether these gaming skills carry over into real life. So he recruited 16 university students to play eight different video games. The students played in a computer lab over an eight-week period. They could come and go whenever they wanted to, but each had to play for a total of 14 hours.Another group of students did not play any games at the lab. This was the *control group.* To understand the effect of a change in behavior, scientists must compare at least two groups. One or more groups will change their behavior. The control group, in contrast, makes no changes.

The games covered a variety of genres. For example, *Borderlands 2* is an action- packed role-playing game. Players work together to defeat enemies and collect loot. *Minecraft*is a game about gathering resources and constructing a world.*Portal 2* is a puzzle game that requires creative thinking. Six of the games in the study included ways for players to work together in the game itself. Two of thegameswere single-player only. But the students talked through these games as they played. So all of the games prompted conversation and cooperation.

Both before and after the study, students in both groups filled out three questionnaires about their real-life skills. One measured their communication skills, such as talking and listening. Another measured adaptability.

This investigated how well people deal with changing situations. The third questionnaire looked at resourcefulness. This includes problem-solving and knowing when to ask for help.Each questionnaire included a series of statements. Participants rated how true each statement seemed. One statement related to communication skill, for example, was "I feel nervous in social

situations.” A statement related to resourcefulness was, “When faced with a difficult problem, I try to approach its solution in a systematic way.”Barr found that after two months of playing video games regularly, students’ scores on all three skills improved. Resourcefulness scores increased significantly for 81 percent of the gamers. Adaptability scores increased for 75 percent. And communication skills scores increased for 69 percent of gamers.In contrast, fewer than half of the students in the control group improved their scores in each of the three areas.

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VIOLENCE SPREADS LIKE A VIRUS

Friends of violent teens are more likely to become violent themselves

Choose your friends wisely. Teens who don't can wind up in violent situations. Having friends who get into fights nearly doubles a teen's chances of doing the same. And the spread of violence doesn't stop there. It moves through an individual's social networks, spreading like a virus. That's the finding of a new study by researchers at Ohio State University in Columbus."People learn aggression and violence the same way they learn other behaviors," says Brad Bushman - "through direct experience and by observing others."

Bushman is a psychologist. He studies the human mind. He worked on the new study with Ohio State political scientist Robert Bond. The pair used data from a long-term project called the National Longitudinal Study of Adolescent Health. This project is also known as Add Health. Three times over several years, researchers with Add Health interviewed 90,118 students from across the United States in grades 7 through 12. The interviews occurred at least one year apart.

Bond and Bushman focused on the first two sets of interviews, from the 1990s. At that time, the kids had still been in school. The researchers specifically looked at students who had at least one friend or sibling who had also been interviewed. They did that so they could probe any links between violence in social groups.

The scientists homed in on the answers to three questions. How often back then had the student been in a serious physical fight? Had the teen hurt someone badly enough that their victim had needed bandages or other medical care? And had the teen pulled a knife or gun on someone? The questions asked how often such events had happened during the year leading up to the interview. In the end, Bond and Bushman used 5,913 interviews that mentioned friends who were also in the study and 4,904 interviews that mentioned siblings.

Teens with friends who said during their own interviews that they had been in a serious fight were 48 percent more likely to get into one themselves. Having a sibling who had been in a fight similarly increased a teen's chances of getting into a fight - here, by 38 percent. Teens with friends who had hurt someone badly enough to need medical attention were almost twice as likely to hurt someone badlythemselves. And those whose friends had pulled a knife or gun were 40 percent more likely to do the same.Those findings are staggering enough. But they're just the start.

Not only were a violent teen's close friends at high risk of showing violence. To understand how violence spreads within social groups, the researchers used a type of statistical method called network analysis. It allowed them to probe whether incidents of violence cluster together. That network analysis showed that whenteens got into fights, violence increased among their friends' friends, and in the friends of those people too - up to four people away from the original teen.Bond and Bushman's results were published in the February *American Journal of Public Health*.

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VIOLENCE ALMOST APPEARS CONTAGIOUS

The researchers liken the spread of violence to infections. “Like other contagious diseases, one can prevent and treat violence,” Bushman notes. “Prevention comes in the form of avoiding exposure to violence.” The best way to treat the disease is to teach teens to use non-violent methods to resolve conflict. He suggests that teens who struggle with violence should learn how to negotiate and try to compromise.

Violence is typically not dealt with as a health issue. But this study takes a different approach to people and their problems, says Gary Slutkin, who was not involved with new study. Slutkin works at the University of Illinois in Chicago. There, he’s an epidemiologist, someone who typically studies the spread of disease. Slutkin’s work focuses on violence as a public health problem.

Slutkin agrees that “violence is a contagious disease.” It's a health problem that has been misdiagnosed, he says. “It is important to understand problems,” he says and to “not judge people.”

Violence isn't the only type of behavior that spreads through social networks, adds Bushman. Positive behaviors, such as cooperation, sharing and helping others can be contagious, too. So the next time a friend asks you to pitch in and help out, jump at the opportunity to spread a healthy contagion.

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WEIRD NEW DINO LOOKED MORE LIKE A DUCK

This ancient dinosaur was adapted to swim and hunt on the water.

A newly discovered creature walked like a duck and swam like a penguin. But this was no bird. The strange species is an ancient dinosaur. Researchers say it's the first one they know of that could both walk and swim.

Andrea Cau and his colleagues studied the fossil. Cau is a vertebrate paleontologist at the Geological and Palaeontological Museum in Bologna, Italy. The researchers named the new species *Halszkaraptor escuilliei* (HAHLZ-kuh-RAP-tur Es- KWEEL-ee-eye).

The researchers wanted to study *H. escuilliei* in three dimensions. But Cau's team didn't want to risk rearranging or damaging the bones. So they studied the fossil while it was still partially embedded in rock. To do this, the group turned to a tool called synchrotron (SYNK-ro-tron) radiation scanning. It zapped the fossil with X- rays. Those highly energetic beams revealed tiny details of the bones without damaging them.

Like a swan, this dino had a long neck. It probably dipped its head underwater to fish. Weight near its hips balanced out the dinosaur's heavy neck. This let the animal stand upright. Its posture probably looked like that of short-tailed water birds, the scientists say, such as ducks. *H. escuilliei* also had forelimbs that looked like flippers. Such traits, the researchers report, suggest the animal spent much of its time in the water. They described their findings December 6 in *Nature*.

Today's birds are closely related to extinct dinos. Actually, birds are considered living dinosaurs. That's why scientists sometimes call birds "avian dinosaurs." Extinct dinos are "non-avian dinosaurs." But although lots of birds split their time between water and land, *H. escuilliei* is the only non-avian dinosaur scientists have found that likely did so, too.

This newly discovered dino lived 75 million and 71 million years ago in what's now Mongolia. That was a time known as the Late Cretaceous period. *H. escuilliei*belonged to a diverse group of two-legged animals called theropods. This group also include today's birds. Many extinct theropods, such as tyrannosaurs, were mainly meat eaters. But *H. escuilliei's* jaw, nose and number of teeth suggest this swimmer would have preferred to dine on fish.

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WHAT ARE DREAMS FOR?

The quick answer is that nobody knows what dreams are for. The long answer is that there are lots of different theories. Releasing deep secrets? Solving problems? No purpose at all. The quick answer is that nobody knows. The long answer is that are lots of different theories. So, if you're interested, read on!

Some theories of the purpose of dreams

Freud believed that we dream so that we can release the deep, secret desires that we are not allowed to express in real life because of the rules of polite society. Most people know about Freudian dream analysis – a dream about a train going into a tunnel is a dream about sexual intercourse. But couldn't it just be a dream about travelling on a train?

Another theory is that dreams allow us to solve problems that we can't solve in real life. We go to sleep with a problem and wake up with the answer. This may be more of a way to 'use' our dreams than a 'purpose' of dreaming. If you believe that your dreams are important then analysing them may help you to focus your mind on the problem and help you to find the solution.

The modern image is that dreams are the brain's way of cleaning up the computer's hard disk, organizing the events of the day into folders and deleting the rubbish that it doesn't want to keep. But we all know that very little of what we dream every night is concerned with what happened to us that day.

Another idea is that dreams are the brain's way of practising the behaviour that we need to survive. So we dream about being chased by a monster because one day it might happen! It's a bit like a pianist practising her scales every day even though she doesn't need to use them at that moment.

Others believe that dreaming is the brain's way of exercising the pathways between the brain cells. This may be an important element in why we sleep rather than why we dream. We die if we don't sleep but we can live without dreaming. Some
patients with brain injuries lose the ability to dream but don't seem to suffer any ill- effects.

REM and dreaming

Scientists used to think that dreaming only happened during Rapid Eye Movement sleep (REM). REM sleep is essential for all mammals. We all become irritable and depressed without it. If we don't have enough REM one night, we will compensate by having more the next. REM is generated by the brainstem – the oldest and most primitive part of the brain. So scientists used to believe that dreaming was also caused by activity in the brainstem. We now know that dreaming

can happen at any time during sleep. The only difference seems to be that it's easier to remember dreams that happen during REM.

Babies have a lot more REM activity than adults, but research shows that they dream less. The same may be true of animals. We know that they have REM activity but that doesn't mean they dream. It also seems that dreaming is a skill that develops as you get older, likelanguage for example. Young children's dreams are very different from older children's or adult's dreams.

New research

Modern technology has allowed scientists to map the parts of the brain that are active when we dream. The primitive brainstem is very active, but so are other important areas at the front of the brain. These are the frontal lobes that control emotion, memory, and experiences that come through the senses like hearing and vision. If these areas are injured, the person stops dreaming. On the other hand, the areas that control rational, logical thought are not active at all. This could explain why dreams are so strange. They have no logical sequence or time, which makes them very difficult to explain to other people when we wake up. Dreams combine recent events with long past events and our emotions while we are dreaming are often very strong.

Psychologists have also done studies on people who kept dream diaries for long periods of time (up to fifty years in some cases) and have found that what we dream is very much connected with how we think and behave when we are awake. So an extrovert, adventurous person will have extrovert, adventurous dreams. A shy person will be a shy person in her dreams. People who are important to us will often be in our dreams and so will things that worry us or make us happy.

So what's the conclusion?

Well, nobody really knows. But scientists are now suggesting that dreams have absolutely no purpose at all. When we are awake we are 'thinking' all the time.
Some of this thinking is useful and has a purpose. But we often just 'think' aboutnothing in particular while we're waiting for the bus or walking to work. And that's what the brain is doing when we are asleep - just thinking. Sometimes it'sinteresting and sometimes it's boring.

Doing the research for this article has made me more interested in my dreams rather than less. I might even start a dream diary! But nothing that I've read explains why I sometimes have an embarrassing dream about finding myself standing completely naked at a bus stop.
Fortunately, this has never happened to me in real life, and it isn't something that I think about when I'm awake. I'm told that it's an example of a 'universal dream' – a dream that is common to people all over the world. Dreaming about flying is another example. So what's the explanation? We can't all be 'just thinking' about the same thing, can we?

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WHAT IF YOUR BLOOD COULD KILL MOSQUITOES?

A commonly used anti-parasite drug could be the next weapon in the fight against malaria.

Researchers from Kenya and the United Kingdom report that dosing people with ivermectin, commonly used in heartworm pills, makes them deadly targets for the mosquitoes that transmit malaria. Nearly all of the mosquitoes in the experiment died after drinking ivermectin-laced blood, they say.

Deadly Blood

While malaria rates have been dropping historically, the disease still afflicts over 200 million people a year, mostly in the developing world, and was responsible for nearly half a million deaths in 2015, according to the WHO. And there are worries that resistance to artemisinin, the drug of choice for combating malaria, could continue to spread beyond southeast Asia, where most resistant strains are currently found.

Ivermectin could be another solution, and one that's easily applicable given the prevalence of the drug. In the study, published last monthin *The Lancet*, the researchers gave 47 malaria patients 600-milligram doses of ivermectin for three consecutive days. That's around three times the normal dose, but the drug
possesses few side effects, and had already been shown to be deadly to mosquitoes when in the bloodstream.

After feeding blood from the patients to mosquitoes, the researchers report that 97 percent of the blood-suckers died after two weeks, and the blood remained deadly for up to 28 days. The patients, meanwhile reported little in the way of side effects. A separate group of patients received doses of 300 mg per day, but the mosquito- killing effect wasn't as strong.

It remains to be seen how safe the drug is for children at such high doses, and the authors do note that their participants were all malaria patients, so the effects could differ in healthy people. And worries of drug resistance could hound ivermectin as well - if it begins to see widespread use, mosquitoes may begin to evolve immunity. Further studies will be needed, *NPR*reports, and would likely be only part of an effective campaign to eradicate malaria.

Nevertheless, the drug represents a cheap, easily obtainable method of mosquito control that could help curtail the spread of one of the world's most deadly diseases.

And becoming a mosquito-killing machine? That's just extra.

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WHY CRITICISM HURTS

Do you often find yourself feeling really bad after being criticized? Do certain comments from other people keep lingering in your mind for days and even weeks? In order to handle criticism from people in the surroundings, it is important to be aware of why it affects us in such a negative way.

If you feel familiar with the above, criticism may be such a big problem that it can affect your quality of life in an extremely negative way. Criticism is often considered one of the main sources of psychological pain. You are probably not alone if you have experienced that just one single comment can get you in a bad mood, or simply make you feel down. Some people may even spend sleepless nights thinking about the critical comments they get.

Firstly, it is important to point out that there are many types of criticism. Some criticism may even be constructive, such as when the critic wants to give you well- meaning advice in order to help you to progress. Learning from criticism can actually allow you to improve yourself and open you up to new perspectives and new ideas you may not have considered before.

Whenever someone challenges you, they help expand your thinking. However, at other times the criticism is just nagging, and a pointless sum up of all your shortcomings or failings. The pathological critic often says that the criticism is
"constructive", while in reality he or she is only trying to appear smarter, better or more right than you.

Even if we may be consciously aware of the person's unfair motives we can still be negatively influenced by it. So why do we still feel so bad after being criticized?
The biggest problem with criticism is not really the critic's words, but rather how they are processed in your mind. If you continue to feel bad for weeks after hearing a negative remark, it is most likely that your bad feelings is caused by distortions in your way of perceiving reality.

Put in another way; you may *believe* that the criticism actually says something about you as a person, while it is really about your *bad habits of thought* that repeatedly interpret reality in an unreal way.

Cognitive distortions

These negative thinking styles are within psychology known as *cognitive distortions*. These inaccurate thoughts may *seem* rational and accurate but in reality they only serve to reinforce negative thinking or emotions, keeping us from feeling good about ourselves. In this section I will go through four of the most common distortions.

Overgeneralization takes place if you take one fact or event and make a general rule out of it, without testing the rule. This thought process may for example be triggered by your boss at work when he criticizes you for making one single mistake in one particular situation, and you start to believe that you are likely to repeat the same mistake over and over again.

Global labelling is similar to overgeneralization but even worse. This happens when you instead of analyzing an error in the context of a specific situation, attach a negative label to yourself. You may for example have performed a poor presentation at your job, and afterwards thought to yourself that the errors made shows what an incompetent person you are. You are likely to believe that you in the future won't be able to achieve well in any tasks in your job, and even within other areas of life.

Personalization takes place when you believe that everything others say to you is some kind of direct, personal reaction to you as person, instead of assuming thata person will help you out of aproblem.

When you indulge in *polarized thinking*, you live in a universe where everything is either black-or-white, with no colors or shades of gray. You either look at yourself or others as perfect or as failures, as heroes or as saints. There is nothing in between and people are placed in either/or categories, without allowing for the complexity that characterizes most people. There is only one right way to live, and all the others are wrong. If you fail in one situation you see yourself as a total failure.

The main point in this article is that you cannot always be in control of what is happening around you. However you can be more in control of how you respond to negative input from the critics in the environment. By learning how to be more aware of your cognitive distortions you will create an opportunity to perceive yourself more realistically, experience enhanced emotional life, and have less destructive mood swings.

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WHY FIRST IMPRESSION MATTERS

Did you know that people just use a few seconds to evaluate you when they first see you? In this short time the other person forms an opinion about you basedon your appearance, how you talk, your body language, and how you aredressed.
These first impressions can be difficult to revers or undo, and how you present yourself is therefore extremely important. Why do we immediately like some people and dislike others, even without being aware of the reasons why?

The impressions we make of other people is based on cognitive representations, which is a term used to describe the body of knowledge an individual has stored in his or her memory. When we meet people for the first time we start to search for visible cognitive cues that make it easier to form an impression. These cues may be described as hints that make the world easier to organize and understand. The cues you look after may be a persons' physical appearance, nonverbal communication, or whether you spot some familiarity in him or her. The purpose of forming impressions of other people is to better guide us through our actions.

Human beings have a tendency to search for patterns and categorize information.
Studies of how people perceive the physical and the social worldhave demonstrated how the brain structures information. Structuring makes the world easier to understand, and the human tendency toward categorizing may also lead to negative outcomes such as seeing things in black and white. This isthe main cause behind prejudice and racism.

Personal criteria and first impressions

Research have demonstrated that there are certain objective criteria all individuals search for when they meet a new person. Although, the picture may also be
more complicated than this. Individual psychology was a school developed by Alfred Adler, and from this perspective first impression depends on whether a person can help us to reach specific goals. Since people´s goals and experiences vary a lot from person to person there are no universal or general rules. People may interpret the cues differently, since the cues have no meaning in themselves. This means that how we interpret the cues depends on our stored knowledge and earlier experience of people, behaviors, traits, and social situations.

For example, if a man has positive earlier experiences with blonde women he may unconsciously have a tendency to form more favorable first impressions of blondes than of brunettes. His first impression is colored by his previous experience, while his bias doesn't say anything objectively about blondes or brunettes.

Why is it sometimes difficult to form a consistent and stable impression of another person? Research shows that our first impressions of other people often are quite accurate. However, sometimes you may experience that your impression of a person changes from moment to moment while you are spending time with her,and your brain may find it difficult to organize stable and consistent impressions. As a consequence, you may perceive this person as a mystery while the person´s behavior rather could be a symptom of personal instability. How we form impressions may then help explain why we tend to perceive certain types of personalities asmysterious.

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WHY LEOPARDS EAT IN TREES

Many animals, including Africa's Big Five, roam the savannas of the Sabi Sand Game Reserve in South Africa. Sometimes, these animals turn up in unexpected places – such as the young giraffe that game guides found up in a tree, hung over a fork, dead.

A large male leopard straddled the giraffe, its mouth blood-red. Apparently, the leopard hadhoistedthegiraffeseveral metresupthetree.Thecatfeastedforafewdays,leaving only bones, skin and bits of flesh scatteredaround.

The giraffe weighed 300kg, about five times heavier than its killer. To match the leopard's feat of food-lifting, a man would have to heave almost 2000 Big Macs up two floors in one go.It seems an utterly bizarre thing to do, but the leopard has a good reason for doing all this heavy lifting. If a leopard does not bother to hoist its kill into the tree, it risks losing its meal to hyenas and lions.

The study by Panthera – a non-profit organisation that focuses on wild cat conservation -found that leopards in the Sabi Sands Game Reserve hunt at least 40 species of prey, from fowls to young giraffes. Leopards hoist half of their kills, and hoisted kills were 67% less likely to be stolen. Still, leopards lose one out of five kills to other predators like spotted hyenas, lions and even other male leopards.

The game guides' familiarity with the leopards gave the scientists a "unique opportunity" to study the animals, says lead author Guy Balme. "The guides know the leopards as well as we know our neighbours." It also helps that "for the most part, leopards accept the game drive vehicles and just ignore them."

Balme and his team collated the guides' observations of leopards and their kills, which they record at the end of every day. Altogether, they analysed information on 104 leopards and 2,215 feeding events between 2013 and 2015.

The scientists found that leopards tend to hoist prey that arebetween half and one-and-a- half times their own weight. Kills too small or too large were often eaten on the ground. The likelihood of hoisting also spiked if hyenas or other male leopards show up.

If a leopard decides to hoist its prey and senses no competitor nearby, Balme says, it would drag it to find "a tree with a good fork or branch to drape the prey". This sometimes meant hauling it several hundred metres. Once there, the leopard leaps on tothe trunk and hoists the prey up to 10m upwards. "These are very powerful cats.

Incredibly impressive."

However, the situation is sometimes more urgent. "If there's a hyena nearby, the leopard will immediately drag the prey and leap into the first tree it can find to keep the food safe," says Balme.

Spotted hyenas can hear the noises of a leopard kill, and they approach quickly. But hyenas do not just sit and wait for a kill. "Very often we see hyenas tracking leopards, because the chance of a free meal is high," says Balme. Hyenas commit half of all kill thefts from leopards. "They are a total nuisance for leopards in this area."

The hyenas are completely brazen about it. "They just ignore the leopard and go running in to grab the prey," says Balme. "We have seen only a handful of occasions where a large male leopard can fend off hyenas." On the ground, hyenas beat leopards most of the time, and sometimes even kill the cat. Fortunately for leopards, hyenas cannot climb trees. That means leopards can guzzle in a tree while hyenas hustle below.However, the hyenas can still have the last laugh. The study noted 39 cases of hyenas running off with food that leopards accidentally dropped from trees.

Also, trees offer little protection against robbers that climb, like lions and male leopards. While lions claim only one-tenth of thefts, male leopards commit four times that, stealing mostly from female leopards. The result surprised Balme, but he thinks that male leopards can easily spot another leopard eating in a tree across the plains. "Male leopards patrol large territories. Females feeding in a tree for several days makesit more likely for males to findthem."

For the female leopards, a lost kill extorts more than a few days' hunger. The more kills a female has lost, the fewer cubs she could raise. Balme's study shows that leopards hoist their prey in response to the immediate threat of a competitor. In Botswana, where hyenas also reach high numbers, leopards hoist almost 40% of their kills. Where there are fewer competitors or thicker vegetation to hide – as in India – leopards hoist less often.

There are several other potential reasons for leopards to hoist their prey. For example, a hoisted prey might spoil slower, or allow the leopard to hunt elsewhere then return to feed. But Balme found little or no support for these alternative explanations.

"I'm pretty convinced [that avoiding food theft] is the primary reason for leopards hoisting their kills," says Balme.

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WHY ORDINARY PEOPLE PARTICIPATE IN GENOCIDE

The presence of inhumanity throughout history and even today is incontrovertible. Often, the perpetrators are ordinary people who change their behavior andbecome evil massmurderers.

The last century has been nicknamed the "age of genocide". It started with the killing of 80 percent of the Heroro population in Namibia in 1905–07, followed by the Armenian holocaust and the Greek genocide where the Ottoman government was the culprit, the extermination of Jews by the Nazis, the persecutions of Germans by the hands of the Communist regimes of Eastern Europe, the Rwandan genocide, up to the more recent South African farm attacks.

These atrocities are carried out by ordinary people. One day they will carry out gruesome acts of pillage and plunder, and the next day be ever so nice to their family, pets, and neighbors.

The Nature of Groups

One way to explain such evil is to focus on the groups that make it possible. According to James E. Waller Jr. who is chair of Holocaust and Genocide Studies at Keene State College groups can "develop characteristics that create a potential for extraordinary evil." The reason for this is that groups moral constraints are less pronounced and groups become more competitive toward other groups. As illustrated by World War 2, different sections of the Nazi system "competed" with each other in being effective, something which produced a highly efficient system of evil.

Waller also brings in the aspect of extreme ideological influence. However, research show that there is little evidence that for example German anti-Semitism was of a genocidal nature, and the same is found with regard to atrocities in Balkans in the 1990s.

Cost-Benefit

Professor Gerald Schneider at the University of Konstanz states that one needs to take into account cost-benefit calculations performed by the perpetrators of mass killings. Most terrifying acts are actually based on conscious decisions, at least by the organizers of the killings.

One is often blinded by the reciprocal nature that mass killings and plunder has in many conflicts,

and are thus mistakenlyinterpreted as revenge.Schneider points out that most authors in the social sciences maintain that such acts are based on clear choices. Genocide is in other words used by governments as a means to deter revolt.

Several Factors Play a Part

In the end, there is no "one right answer" to why ordinary people participate in such action. Waller points out that there is a built in xenophobia and desire for social dominance in many people, and these characteristics can be strengthened by a culture promoting violence. If the victims have suffered a social death inadvance, like the Jews in Nazi Germany or the Germans in post-war Europe, and the killings are organized in a system, the outcome may very well begenocide.

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WHY PEOPLE FAVOR THEIR OWN ETHNIC GROUP

Altruism as a concept has mainly focused on why people favor others than the individual itself. From an evolutionary perspective altruism is contra-intuitive because an individual is not supposed to go against his own genetic interests. However, altruism is selective, and research indicate that people tend to be far more altruistic toward people from one´s own ethnic group. This could indicate that people are more altruistic toward people who are genetically similar to themselves. This article explains the genetic mechanisms behind this human tendency.

Research has demonstrated that homogenous societies invest more in public welfare than heterogenous societies do, and that ethnic diversity within nations may be an obstacle to economic growth. Tatu Vanhanen has empirically examined the relationship between a societies` degree of ethnic homogeneity and ethnic conflicts. He found that more ethnically heterogeneous nations had more ethnic conflicts. The degree of democratization explained very little, except that very authoritarian states, such as the former Soviet Union and Yugoslavia, could suppress ethnic conflicts. Ethnic conflicts were only slightly less common in more economically developed countries. They appeared within all racial groups, cultures, and geographical regions.

In Vanhanen's view, people have a genetic tendency to easily learn ethnic attitudes and psychological mechanisms leading to prejudice, scapegoating, and discrimination.

Ethnic altruism

What are the mechanisms behind these patterns? The concept of ethnic nepotism may explain why humans see people who share their ethnicity as an extended kin. The theory states that there is a biological basis for the phenomenon where people of the same ethnic group favor others of the same ethnicity or race. This may explain the human tendency to favor members of their own group.

The theory builds on knowledge from other animal species where individuals are more altruistic toward ones` own kin, in order to replicate more copies of their common genes. We may also detect ethnic nepotism within human societies where people tend to favor people with same ethnicity, with the prime example being discrimination on the labour market. The term is based on
William Hamilton's theory of kin selection, and a concrete example of nepotism is ethnic altruism.

How to use this knowledge

In order to try to reduce ethnic tension it is vital to gather knowledge around what triggers hostility in the first place. Even if our biology may indicate some basic prejudiced tendencies, we may try to find solutions that take into account the predispositions of our human nature. In a globalized world there is a dramatic increase of contact between different ethnic groups. In order to reduce the potential sources of conflict it is important to reduce the in-built boundaries from our nature. One solution could be to create new identities that surpass these boundaries, for example the construct of identities that go beyond the conventional ethnic constructs, such as nationality, race andreligion.

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WHY RECYCLING DOES NOT WORK

Have you ever taken out the trash, and at the same time asked yourself: Why do I have to spend time putting paper with paper and glass with glass? The answer given is that by doing this you are saving the environment and preserving natural resources.

Well, this could not be further from the truth. According to Professor Bjørn Lomborg at Copenhagen Business School “recycling is often just a feel-good gesture that provides little environmental benefit at a significant cost”.

Lomborg uses the recycling of paper as an example. People are thought that by recycling we are saving trees. What they do not take into account is that the paper we use is not uncritically taken out of the rain forests. In fact, it comes from well-managed forest areas in Scandinavia, Canada, and similar countries. When the trees are cut down, the fields are replanted. We thus see an increase in trees rather than de-forestation.

By recycling one actually hurts these responsible industries, paving the way for less environmentally friendly business.Other types of recycling are also counterproductive, especially when viewed from a social-economic perspective. These actions represent a misuse of money and manpower, which could be more useful in other sectors.What we instead should be focusing on is the fight against poverty and promoting peace, especially in the developing world. This is not dine by spending countless hours recycling paper.

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WHY VICTORIOUS FAILURE IS BETTER THAN NOT LOSING

We have all experienced it; a great idea pops up in your head and you just can´t wait to get started on this new project. It could be anything from a possible new invention, to something more trivial yet equally important to yourself, like getting into shape, or pursuing a new hobby.

Sadly, most of your great thoughts fail; they never seem to get past the first negative and discouraging comments from your family, friends, or co-workers.

Why do we give up so easily? Why do we assume that the skeptics are right and know more about the issue than ourselves?

The reason is that our focus is at the wrong place. Our focus is on the possibility of failure rather than on the reward of success. We are not willing to expose ourselves to possible humiliation and risk more negativity, unless we are guaranteed success.

No guaranteed success

Well, guess what? There is no such thing as guaranteed success, and it is important that we accept this. However, there is a *possibility* for success if you try. That is, if you carry through with your project despite initial negative feedback.

It is important to stress that what I´m writing about here is *not* those trying to give constructive and friendly positive advice. What I mean are comments like "that's a really bad idea" or "*you* can never achieve that."

Even if you fail, you are still the victor

For sure, you will not become an A-student or run a marathon instantly. But what you *can* and *should*do is to remain focused on your goal and at the same time celebrate your small victories along the way. And even if you should fail, *you are still the victor*.

Fair enough, you did not get an A on the exam. But you *did* get a B. And that, when you think about it, is a fairly nice reward for the months you spent studying.

Similarly, you may realize that you will never be able to run a marathon. But you can run five miles, and you are in the best shape of your life. And that isn't so bad, is it?

Your first step toward achieving great success or, the second best, *victorious failure*, is to learn to ignore the naysayers. The next time you receive unfounded negative feedback on one of your great ideas or personal goals, you should ask yourself the following question: “What makes this guy an expert on the topic?”

Truth is, naysayers are only experts of naysaying.

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WHY WE LAUGH AT THINGS THAT ARE NOT FUNNY

The positive effects of humor and laughter on physical health is well established and well documented. But what is humor and what makes us laugh? Every day you laugh at things that are not funny at all. The reason for this is that humor serves several social functions that do not have anything to do with what is really funny.

There are different explanations and theories on why we laugh. First of all we have the relief theory that postulates that laughter serves a homeostatic mechanism by which psychological tension is reduced. According to this theory humor relieves tension caused by fears. You have probably observed how you tend to become more creative and make funny remarks when confronted with situations that are packed with tension and discomfort, such as right before you are about to give a public presentation, or right before an exam. We also use dark humor to distance ourselves from horrifying images and stories of war and human atrocities.

So one of the reasons why we laugh is that humor relieves tension, thereby releasing hormones that are good for our general well-being. But this does not account for all kinds of humor. The *Superiority Theory* of humor states that humor derives from feelings of superiority. The general idea is that a person
laughs about misfortunes of others because these misfortunes assert the person's superiority on the background of shortcomings of others. An individual will use humor when the objects of the humor are different from us, especially when the humor targets people or groups that we do not empathize with. We may for example use sarcastic remarks toward people that have a lifestyle that differs from us, or other political views than ours.

The evolution of humor

Evolutionary psychologist Geoffrey Miller contends that humor would have had no survival value to early humans living in the savannas of Africa. He contends that humor has evolved as a means of facilitating sexual selection. Further, he argues that humor emerged as an indicator of other traits that were of survival value, such as human intelligence.

According to Robert Provine there is a relation between laughter and social status. Women´s desire for men that make them laugh may be a veiled request for dominant males. This indicates that it may not be dominant males potential to exhibit great humorous qualities, but instead it may be easier for males with higher social status to make women laugh. This means that social status and humor must be seen in relation to each other in that people in general laughmore of people with high social status.

Imagine this situation; you are in a meeting at your work and your dominant boss makes an average remark that everyone in the room laughs at, even if the remark in itself is not funny at all. If a person lower in the hierarchy makes the same remark it may not elicit nearly the same response.

The main point in this article is that whether something is funny or not, is in itself not so important to social relationships. The importance is that laughter seems to structure hierarchies. Laughter may also be used to display hostility and as a means to distance ourselves to other people or groups we do not like. On the other hand it could also signal mutual liking and well-being.

As an exercise you could try to count how many times each day you laugh of things that are not funny at all, and probably find that most of the time laughter only serves a social function.

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WITH SCANT PRECEDENT, WHITE HOUSE INSISTS TRUMP COULD FIRE MUELLER HIMSELF

WASHINGTON - As President Trump continued to fume on Tuesday about theJustice Department's raids on the office and hotel room of his longtime personal lawyer, the White House press secretary, Sarah Huckabee Sanders, made a provocative claim: The president, she said, believes he has the legal authority to fire Robert S. Mueller, the special counsel leading the Russia investigation.

The assertion by Ms. Sanders was surprising because the general understanding has been that Mr. Trump himself cannot directly fire Mr. Mueller, and that he would instead have to order the deputy attorney general, Rod J. Rosenstein, who is the acting attorney general for the purpose of the Russia inquiry, to do so. Attorney General Jeff Sessions recused himself from any involvement in the investigation.

Mr. Rosenstein has repeatedly said that he will refuse any order to fire Mr. Mueller unless he decides the special counsel committed misconduct. If the general understanding is correct, then, Mr. Trump would probably have to fire Mr. Rosenstein and hunt for a successor willing to carry out the order - echoing the "Saturday NightMassacre" during the Watergate scandal.

In 1973, President Richard M. Nixon decided to force the Justice Department to fireArchibald Cox, the first special counsel investigating Watergate. Both the attorney general and the deputy attorney general resigned rather than carry out those orders before the solicitor general, then the No. 3 official in the department, finally agreed to do so. The episode was a milestone in the eventual decision by the House to begin impeachment proceedings.

Ms. Sanders's initial remark on Tuesday was vague. But when pressed to clarify whether she meant only that Mr. Trump could direct Mr. Rosenstein to fire Mr. Mueller, she insisted instead that "a number of individuals in the legal community and including at the Department of Justice" have said that Mr. Trump himself has the power to oust him.

"We've been advised that the president certainly has the power to make that decision," she added.

But there is scant precedent supporting the notion that Mr. Trump has lawful authority to bypass the acting attorney general and directly fire Mr. Mueller, legal scholars said.

Martin S. Lederman, a Georgetown University law professor who served in the Office of Legal Counsel during the Obama administration, pointed to a series of Supreme Court cases in which justices across generations have said that the power to remove a government employee resides with the official - or a successor - who appointed the person, unless Congress has enacted a statute making an exception.

Among them, in a seminal 1839 case, the Supreme Court said the heads of departments appointed inferior officials and had the power to remove them, adding "the president has certainly no power to remove." As recently as in a 2010 case, Chief Justice John G. Roberts Jr., observed that if Congress had vested in a department head the power to appoint an inferior officer, "it is ordinarily the department head, rather than the president, who enjoys the power of removal."

Against that backdrop, Mr. Lederman argued: "Surely if Richard Nixon could have fired Archie Cox himself, he would have done so to avoid the Saturday Night Massacre. He didn't because he didn't have the authority to do so."

Still, Jack L. Goldsmith, a Harvard Law School professor and former head of the Office of Legal Counsel in the Bush administration, said the previous Supreme Court statements did not arise in a context exactly like a situation in which Mr. Trump said he had the constitutional power to fire Mr. Mueller directly and then tried to do it. Mr. Goldsmith said it was unclear what would happen then.

"I agree that the proper and most legally sound route would be to order Rosenstein to dismiss Mueller and then fire him if he doesn't comply," Mr. Goldsmith said. "That is clearly the right way under the law. That is the right way under the precedents. And that would be the legally safer way to do it. But there is an argument that he could do so directly and that question has never been tested in a context exactly like this."

Further complicating matters is the question of how much the Justice Department's regulation for special counsels is protecting Mr. Mueller.

People who do not want the Trump administration to fire Mr. Mueller have taken comfort from the fact that when Mr. Rosenstein appointed Mr. Mueller, he stated that a portion of those regulations - including a provision that says only the attorney general can fire a special counsel and only for misconduct - would be "applicable" to Mr.Mueller.

In a statement criticizing Ms. Sanders's statement on Tuesday, Matt House, a spokesman for the Senate minority leader, Senator Chuck Schumer, Democrat of New York, said, "The D.O.J. regulations could not be more clear."

In the 1974 case over the Watergate tapes, the Supreme Court cited a similar regulation protecting Mr. Cox's successor, Leon Jaworski, from being fired without good reason and said that unless it was rescinded, "the executive branch is bound by it."

Still, one novel question is whether a president must obey a JusticeDepartment regulation.

Another is whether the regulation is actually protecting Mr. Mueller from arbitrary firing by anyone other than Mr. Rosenstein, specialists said. The last question israised by the fact that Mr. Rosenstein did not technically appoint Mr. Mueller under that regulation.

Rather, he invoked statutes in which Congress authorized the attorney general to appoint special lawyers for specific investigations, but those statutes include no special protections.

That has left it murky whether Mr. Rosenstein's statement that the regulation applies to Mr. Mueller is legally binding or was more like a personal promise about the approach he would follow as Mr. Mueller's supervisor. Still, Mr. Lederman said the distinction might make little difference in practice, since any successor to Mr. Rosenstein who was determined to fire Mr. Mueller could also just rescind Mr. Mueller's appointment letter or the regulation itself.

"You're already way out there if you're willing to fire Mueller, so if you have to get rid of the regulation or the appointment letter to do so, that person, whoever thatwould be, would probably be happy to do so," hesaid.

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WOODPECKER BRAINS HOST PROTEIN LINKED WITH HUMAN BRAIN DAMAGE

Long-held belief that the birds don't get concussions may not be true Woodpeckers drill into trees to get lunch - a meal of insects that live inside the wood. The birds also peck to make holes deep enough for nesting. And when the birds peck, they peck hard. Very hard. They hammer their beaks into those treesso hard that their brains may get banged up. That's the finding of a newstudy.

The study turned up a protein in the birds' brains that in people would suggest the presence of brain damage.

This is surprising. A woodpecker's brain experiences a force 14 times greater than what would cause a concussion in a human. A concussion is caused by a severe blow to the head. Scientists had long assumed woodpeckers are not harmed by that pecking. In fact, some sporting-goods companies have modeled their helmets after woodpecker skulls.

Severe or repeated concussions can cause brain damage in people. And one sign of that is the buildup in the human brain of a protein called tau. It can accumulate after a concussion. Alzheimer's disease and other disorders that attack the brain also can lead to a buildup of tau.

While researchers have found tau in plenty of human brains, no one had ever looked for it - or other signs of brain injury - in woodpeckers, says George Farah. He is a biologist who studies the brain. "That's what science is about," he says - "questioning everything."

Farah led the new study while he was a graduate student at Boston University in Massachusetts. His team's findings appear February 2 in *PLOS ONE*.