

Single traumatic brain injury may prompt long-term neurodegeneration

A single traumatic brain injury may prompt long-term neurodegeneration, Penn study shows

PHILADELPHIA - Years after a single traumatic brain injury (TBI), survivors still show changes in their brains. In a new study, researchers from the Perelman School of Medicine at the University of Pennsylvania suggest that Alzheimer's disease-like neurodegeneration may be initiated or accelerated following a single traumatic brain injury, even in young adults.

Over 1.7 million Americans suffer a traumatic brain injury each year, and beyond the immediate effects, growing evidence demonstrates that a single TBI may initiate long-term processes that further damage the brain. TBI is an established risk factor for later development of cognitive impairments, such as Alzheimer's disease.

"A single traumatic brain injury is very serious, both initially, and as we're now learning, even later in life," said Douglas Smith, MD, professor of Neurosurgery and director of the Center for Brain Injury and Repair at Penn's Perelman School of Medicine, the study's co-senior author. "Plaques and tangles are appearing abnormally early in life, apparently initiated or accelerated by a single TBI."

The study appears online in *Brain Pathology*, and was done in conjunction with neuropathologist Dr. William Stewart, from the University of Glasgow and Southern General Hospital in Glasgow, UK.

The researchers found both tau tangles and amyloid-beta plaques in survivors, years after a single moderate-to-severe TBI. In repetitive head injury, previous studies have shown a tau accumulation as the signature pathology of a condition called chronic traumatic encephalopathy. In studies of people less than 4 weeks after dying from a single TBI, no similar tau pathology was found. In addition, while widespread amyloid-beta plaques have been found in about 30 percent of people shortly after injury, previous work showed that plaques disappeared within months.

In this study, researchers examined post-mortem brains from 39 long-term survivors of a single TBI, extending the survival time from 1-47 years survival after TBI, and compared them to uninjured, age-matched controls.

TBI survivors showed a high density and wide distribution of neurofibrillary tau tangles and amyloid-beta plaque pathology far beyond what was found in controls. Specifically, about a third of the cases showed tangle pathology years after a single TBI, similar in appearance to the tangles found after repetitive TBI and in neurodegenerative diseases such as Alzheimer's disease. Moreover, the amyloid-beta plaques were not only found years after TBI, but the majority of cases displayed diffuse as well as "neuritic" plaques with the same character as "senile" plaques also found in Alzheimer's disease. This suggests that years after a single TBI, amyloid-beta plaques may return and become neuritic.

The present findings, showing that two hallmark pathologies of Alzheimer's disease can be found years after a single TBI, may provide a pathological link with the epidemiological observation of an increased risk of developing Alzheimer's disease. Moreover, future research to better understand this long-term neurodegenerative process after a single TBI may reveal important targets for treatment with emerging anti-tau and anti-amyloid therapies. *The study was funded by the U.S. National Institutes of Health.*

http://www.eurekaalert.org/pub_releases/2011-07/ps-adc071811.php

Adult day care services provide much-needed break to family caregivers

Adult day care services significantly reduce the stress levels of family caregivers of older adults with dementia, according to a team of Penn State and Virginia Tech researchers.

"Family members who care for dementia patients are susceptible to experiencing high levels of stress," said Steven Zarit, professor and head, department of human development and family studies, Penn State. "One way of alleviating that stress is through the use of an adult day care center, which allows them a predictable break from caregiving responsibilities."

Not only do caregivers benefit from using such services, but dementia patients also gain from the break. Zarit and his colleagues showed that dementia patients who attend adult day care centers have fewer behavior problems and sleep better at night.

"The changes we have seen are as large as you'd get with medication, but with no side effects," he said.

Zarit and his team evaluated the stress levels of 150 caregivers by using a 24-hour daily diary to obtain baseline information prior to the use of an adult day care service. After the caregivers began the use of an adult daycare, the researchers gathered data at various times over a two-month period. The caregivers recorded entries in their diaries, both on days when their relatives went to an adult day care service and on days when their relatives stayed home. The researchers reported their results online in the *Journals of Gerontology Series B: Psychological and Social Sciences*.

"In the diaries, we asked the caregivers to discuss their moods and the moods of their relatives, how agitated or restless their relatives were, and how many sleep disturbances their relatives had, among other topics," said Zarit.

The team's results revealed that caregivers generally reported greater levels of stress exposure prior to the use of an adult day care service and on days when their relatives did not attend adult day care programs. The team also found that behavior problems and poor sleep were more likely to occur on days when dementia patients remained at home.

Zarit and his colleagues are now studying the possible physiological effects these services can have on family caregivers. They are using stress markers, such as the stress hormone cortisol, to examine the body's response to high-stress days when relatives with dementia stay home versus low-stress ones when relatives with dementia attend adult day care centers.

Other Penn State researchers involved in the study include Kyungmin Kim, graduate student, human development and family studies; Elia Femia, research associate, human development and family studies; David Almeida, professor of human development and family studies, and Peter Molenaar, professor of human development and psychology.

Also part of the study was Jyoti Savla, assistant professor of human development and gerontology, Virginia Tech. National Institute of Mental Health supported this work.

http://www.eurekalert.org/pub_releases/2011-07/tmsh-rih071811.php

Researchers identify how a gene linked to both Alzheimer's disease and type 2 diabetes works

Researchers at Mount Sinai School of Medicine have identified how a gene for a protein that can cause Type 2 diabetes, also possibly kills nerve cells in the brain, thereby contributing to Alzheimer's disease.

The gene, called SorCS1, controls the generation of amyloid-beta (Abeta) in the brain. Abeta plays a key role in the development of Alzheimer's disease. The researchers previously linked SorCS1 to Alzheimer's disease and identified where the molecules lived in the cell, but not how they control Abeta. The new data were presented today at the Alzheimer's Association's Annual International Conference in Paris.

Sam Gandy, MD, PhD, the Mount Sinai Professor in Alzheimer's Disease Research, Professor of Neurology and Psychiatry, and Associate Director of the Alzheimer's Disease Research Center at Mount Sinai School of Medicine, led the research team with Rachel Lane, PhD, a postdoctoral researcher in Dr. Gandy's lab.

The researchers determined various "traffic patterns" in the cell for the amyloid precursor protein (APP) that makes Abeta and uncovered how much APP is converted into the toxic, and ultimately nerve-killing, Abeta. In some experiments Drs. Lane and Gandy altered the dose of the diabetes gene, SorCS1, and evaluated how that changed the "traffic pattern" that APP used to move around the cell and generate Abeta. In other experiments, Dr. Lane made small changes in the SorCS1 gene's and again saw dramatic changes in the "traffic pattern" of APP around the cell.

These data suggest that SorCS1 controls the movement of APP within the cell between areas where Abeta is readily made to areas where Abeta is not so easily made. In turn, the "traffic pattern" of influences the amount of Abeta being made by cells. The implication is that people with deficiencies in SorCS1 are at higher risk of developing Alzheimer's disease because their APP spends too much time in the region of the cell where APP is broken down to make the toxic Abeta.

"The great thing about studying SorCS1," said Dr. Gandy, "is that we already have entirely new ideas about how to treat both Alzheimer's disease and type 2 diabetes. Our hunch is that SorCS1 also controls how the insulin receptor moves around the cell, but we have not yet proven that," he said. "With both diseases reaching epidemic proportions, this discovery is encouraging news that brings us one step closer to developing treatments." *This work was supported by the Cure Alzheimer's Fund.*

<http://medicalxpress.com/news/2011-07-grandparents-safer-drivers-mom-dad.html>

Are grandparents safer drivers than mom and dad?

(AP) -- Kids may be safest in cars when grandma or grandpa are driving instead of mom or dad, according to study results that even made the researchers do a double-take.

"We were surprised to discover that the injury rate was considerably lower in crashes where grandparents were the drivers," said Dr. Fred Henretig, an emergency medicine specialist at Children's Hospital of Philadelphia and the study's lead author.

Previous evidence indicates that car crashes are more common in older drivers, mostly those beyond age 65. The study looked at injuries rather than who had more crashes, and found that children's risk for injury was 50 percent lower when riding with grandparents than with parents.

The results are from an analysis of State Farm insurance claims for 2003-07 car crashes in 15 states, and interviews with the drivers. The data involved nearly 12,000 children up to age 15.

Henretig, 64, said the study was prompted by his own experiences when his first grandchild was born three years ago.

"I found myself being very nervous on the occasions that we drove our granddaughter around and really wondered if anyone had ever looked at this before," he said.

Reasons for the unexpected findings are uncertain, but the researchers have a theory. "Perhaps grandparents are made more nervous about the task of driving with the 'precious cargo' of their grandchildren and establish more cautious driving habits" to compensate for any age-related challenges, they wrote.

The study was released online Monday in the journal *Pediatrics*.

Northwestern University Professor Joseph Schofer, a transportation expert not involved in the research, noted that the average age of grandparents studied was 58. "Grandparents today are not that old" and don't fit the image of an impaired older driver, he said. "None of us should represent grandparents as kind of hobbling to the car on a walker."

Grandparents did flub one safety measure. Nearly all the kids were in car seats or seat belts, but grandparents were slightly less likely to follow recommended practices, which include rear-facing backseat car seats for infants and no front-seats. But that didn't seem to affect injury rates. Only about 10 percent of kids in the study were driven by grandparents, but they suffered proportionately fewer injuries.

Overall, 1.05 percent of kids were injured when riding with parents, versus 0.70 percent of those riding with grandparents, or a 33 percent lower risk. The difference was even more pronounced - 50 percent - when the researchers took into account other things that could influence injury rates, including not using car seats, and older-model cars. Kids suffered similar types of injuries regardless of who was driving, including concussions, other head injuries and broken bones.

The study does not include data on deaths, but Henretig said there were very few. It also lacked information on the types of car trips involved; for example, driving in busy city traffic might increase chances for crashes with injuries.

Schofer, the Northwestern professor, said other unstudied circumstances could have played a role. For example, grandparents could be less distracted and less frazzled than busy parents dropping their kids off at school while rushing to get to work or to do errands. Driving trips might be "quality time" for older drivers and their grandchildren, Schofer said.

<http://www.newscientist.com/article/dn20709-where-did-the-gulfs-spilt-oil-and-gas-go.html>

Where did the Gulf's spilt oil and gas go?

20:00 18 July 2011 by Sujata Gupta

The puzzle over what happened to the oil and gas released during the Deepwater Horizon oil spill in the Gulf of Mexico last year has been partially solved.

Oil is composed of many thousands of different chemicals but the plume that stretched through the Gulf contained relatively few. Now chemists have worked out what happened to the rest.

Christopher Reddy, an environmental chemist at the Woods Hole Oceanographic Institution in Massachusetts, and colleagues, used a remotely operated submarine to collect samples directly from the leaking well in June 2010 and compared these with samples taken from elsewhere in the oil plume.

Reddy likens the oil and gas molecules gushing out of the wellhead to passengers on an elevator. "We wanted to know which compounds got off the elevator instead of going up," he says.

The team found that water-soluble compounds dissolved in neutrally buoyant seawater about 400 metres above the wellhead. These included benzene, toluene, ethylbenzene and xylene – a toxic suite collectively referred to as BTEX. And in this layer they stayed. By contrast, the compounds that reached the surface were mainly insoluble.

Deep difference

Reddy's work helps to answer one of the major questions from the oil spill – what happened to all that oil and gas, says David Valentine, a microbial geochemist at the University of California, Santa Barbara.

The results show how deep oil spills differ from surface spills, where many toxic compounds quickly evaporate rather than contaminating the water.

The team's measurements also show that BTEX concentrations reached up to 78 micrograms per litre. That level is several orders of magnitude higher than known toxicity levels for marine organisms, according to Judith McDowell, a zoologist also at Woods Hole.

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Hot and Cold: Long-Suspected Antarctic Undersea Volcanoes Discovered

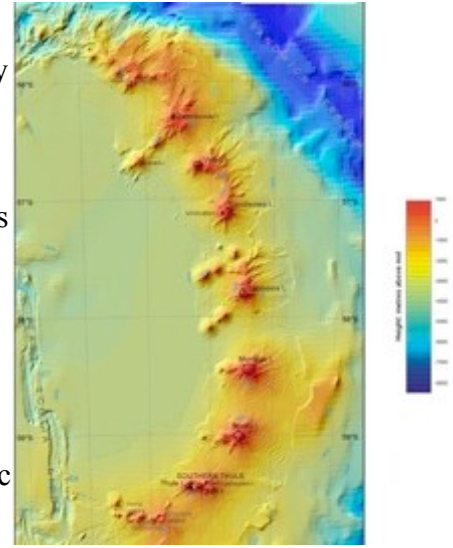
The British Antarctic Survey has mapped 12 submarine volcanoes, which have created hydrothermal vents that support previously unseen life

By Sophie Bushwick | Monday, July 18, 2011 | 8

Iceland is known as the "land of ice and fire," but new findings suggest that the South Sandwich Islands in the southern Atlantic Ocean could easily take over that title. In addition to the seven volcanic islands that make up this Antarctic archipelago, the British Antarctic Survey (BAS) recently discovered that 12 volcanoes lurk below the water's surface.

Despite their icy environs, the South Sandwich Islands have fiery origins thanks to the volcanoes, some of which are still active. "Eruptions have been observed over the last century or so," says BAS scientist Philip Leat. In addition to a large eruption observed in 1956, a low-level eruption that started in 2002 lasted for six years.

Between these two visible surface volcanic reactions, an underwater volcano blew in 1962. Although nobody directly observed that activity, scientists discovered the eruption when large amounts of pumice, a volcanic rock so filled with gas bubbles that it floats on water, washed up on the shores of Antarctica, New Zealand and South America.



UNDER THE SEA: *A map of the sea floor around the South Sandwich Islands has revealed undersea volcanoes. The peaks here are colored red, whereas the ocean depths are blue. Full-sized image can be found here.* Image: British Antarctic Survey

Because of the 1962 eruption, "we knew there were underwater volcanoes somewhere in the vicinity," Leat says. And when the BAS sent the RRS James Clark Ross on a seafloor survey around the South Sandwiches, using multi-beam sonar to map the area, the researchers found them. Sonar bounces sound waves off of objects and detects the echoes to determine the distance to those objects; using multiple sonar beams maps larger areas, so the James Clark Ross could cover a greater expanse of the ocean floor more quickly.

The research team announced at a July 13 poster session of the 11th International Symposium on Antarctic Earth Sciences that its survey discovered the presence of 12 active submarine volcanoes (some almost three kilometers high) and the remnants of more. The collapsed volcanoes had formed craters about five kilometers in width.

In addition to enhancing maps of the islands, the BAS survey may help scientists understand how undersea eruptions cause enormous reactions, such as tsunamis. The underwater volcanoes also create environments that are not only conducive to unique ecosystems, but also hold clues about an earlier era in Earth's history.

As a result of the volcanic activity around the South Sandwiches, molten rock lurks just under the seafloor. When ocean water leaks through cracks in the floor, it encounters that heat source, reacts, and spews back out as a mineral-rich, hot-water jet, creating a hydrothermal vent. Such vents, which are found in areas of the ocean where there is tectonic activity, create isolated hot-water ecosystems that are home to creatures very different from the more typical denizens of Antarctica's frigid waters.

"Above water it looks like a desert," says Andrew Clarke, a biologist formerly of BAS. "But below, it's far from it. There's a rich variety of life down there."

Although many of the species in Antarctic waters have adapted to live at near freezing temperatures, the denizens of hydrothermal vents have evolved to live comfortably in the heat. Water issues from a vent at temperatures that can exceed boiling. Moving away from a vent is a journey from one temperature extreme to the other, from boiling seas to ice water (think: a hot tub turned too high to a warm summer surf to just bearable New England waters in August to a winter swim at the same beach) - all within a range of several meters.

"Out of contact with light," Clarke says, "the whole system is driven by chemistry." The hot water emerging from the hydrothermal vents is rich in dissolved sulfur, which bacteria living around the vents oxidize to make energy, living off of chemical instead of solar energy. Meanwhile, larger predators such as crabs and shrimps feed off the bacteria.

"It's an ecosystem that builds up around the vents themselves," Leat says. The ecosystems of hydrothermal vents have been studied in oceans all over the world, from Samoa and Tonga to the Mid-Atlantic Ridge. Although there is a general set of organisms that tend to live around vents, each one supports a unique system. As Clarke says, "One of the interesting things is the animals growing around these things are quite different."

Although the map of the area has been released, BAS biologists are still studying the organisms living in the hydrothermal vents and will publish their results separately.

In addition to sulfur, the hot water also carries other minerals, such as the metals copper, lead, zinc and gold. When they drift to cooler water, they solidify and form deposits. Historically, many metal-bearing ores on land originated in a very similar environment to that of these hydrothermal vents. "Going back though history, there were huge numbers of these kinds of volcanoes," Leat says. Studying them can help us understand the process through which metals now inland gradually moved from the ocean to continental interiors.

http://www.eurekalert.org/pub_releases/2011-07/vumc-kdr071911.php

Kidney dopamine regulates blood pressure, life span

The neurotransmitter dopamine is best known for its roles in the brain – in signaling pathways that control movement, motivation, reward, learning and memory.

Now, Vanderbilt University Medical Center investigators have demonstrated that dopamine produced outside the brain – in the kidneys – is important for renal function, blood pressure regulation and life span. Their studies, published in the July Journal of Clinical Investigation, suggest that the kidney-specific dopamine system may be a therapeutic target for treating hypertension and kidney diseases such as diabetic nephropathy.

Previous studies had suggested a role for dopamine in regulating kidney function and total body fluid volume, "but how that mechanism works was not clear," said Raymond Harris, M.D., chief of the Division of Nephrology and Hypertension at Vanderbilt.

To explore dopamine's role in the kidney, Harris and Ming-Zhi Zhang, M.D., assistant professor of Medicine at Vanderbilt, eliminated kidney-specific dopamine production in mice (by knocking out a dopamine-generating enzyme only in the kidney) and studied the outcome.

They found that mice lacking kidney dopamine had high blood pressure at baseline and became more hypertensive when they consumed a high-salt diet, suggesting they may be a good model of salt-sensitive (essential) hypertension, Harris said. Alterations in the kidney dopamine system may predispose individuals to hypertension, he noted.

The investigators also showed that elimination of kidney dopamine increased renin production, which activates the angiotensin II system to increase salt and water reabsorption – and produce hypertension.

"These animals retain salt and water when they don't have sufficient dopamine production in the kidney," Harris said. "Our studies highlight this whole other hormonal system that appears to balance or put the brakes on the renin-angiotensin system."

Currently, the renin-angiotensin system is the major target for treating chronic kidney diseases. Discovering another target – the kidney dopamine system – is exciting, the researchers said. They are exploring whether specific drugs that enhance the kidney dopamine system are effective in blocking hypertension and treating progressive kidney diseases.

The investigators predicted changes in kidney function in the mouse model, but they were "very surprised" to discover that the modified mice only lived about half as long as normal mice (15 months versus 30 months). They found increases in stress-related proteins in the kidney, heart and vasculature, suggesting that elimination of kidney dopamine causes systemic effects, Harris said.

"This kidney-specific dopamine system is not only important for kidney function and blood pressure regulation, but also for the overall health of the animal," Harris said. "If the dopamine system in the kidney is altered, the animals have a markedly shortened life span."

The research was supported by the National Institutes of Health, the Vanderbilt O'Brien Center and by the Veterans Administration. Harris is the Ann and Roscoe R. Robinson Professor of Nephrology.

<http://www.bbc.co.uk/news/world-south-asia-14196372>

India: 'Massive' uranium find in Andhra Pradesh

India's southern state of Andhra Pradesh may have one of the largest reserves of uranium in the world, the country's chief nuclear officer says.

Studies show Tummalapalle in Kadapa district could have reserves of 150,000 tonnes of the mineral, Atomic Energy Commission chief S Banerjee said. India has estimated reserves of about 175,000 tonnes of uranium.

Analysts say the new reserves would still not be sufficient to meet India's growing nuclear energy needs.

Mr Banerjee said that studies at Tummalapalle have shown that the area "had a confirmed reserve of 49,000 tonnes and recent surveys indicate that this figure could go up even threefold" and become one of the world's largest uranium reserves. The uranium deposits in the area appeared to be spread over 35km (21 miles), he said, adding that exploration work was going on in the area.

Mr Banerjee said the new findings were a "major development", but India's own uranium reserves would still fall short of meeting its nuclear energy needs.

"The new findings would only augment the indigenous supply of uranium. There would still be a significant gap. We would still have to import," he was quoted as saying by The Hindu newspaper.

India is planning to set up some 30 reactors over as many years and get a quarter of its electricity from nuclear energy by 2050.

<http://news.sciencemag.org/sciencenow/2011/07/missing-gene-helps-mice-run-for-.html>

Missing Gene Helps Mice Run for Hours

by Sarah C.P. Williams on 18 July 2011, 12:00 PM

Lab mice usually take only an occasional jaunt on their exercise wheels. But mice missing a gene called IL-15R α run for hours each night, a new study reveals.

And the gene doesn't just make a difference to mice—it might also be linked to the ability of long-distance athletes to outperform the rest of us. Previous studies had suggested that IL-15R α is important for muscle strength. In experiments on cells grown in a Petri dish, the gene seemed to control the accumulation of proteins necessary for muscle contraction. But IL-15R α had never been studied in a living animal.

In the new research, physiologist Tejvir Khurana of the University of Pennsylvania and his colleagues genetically engineered mice to lack the IL-15R α gene. The changes were dramatic. Each night, according to sensors on the wheels in the mice's cages, the modified mice ran six times farther than normal mice.

But these behavioral quirks weren't quite enough to convince Khurana of the effect on muscles. Lack of the IL-15R α gene could just be making the mice jittery or giving them extra energy. So the researchers dissected muscles from the longer-running mice. The muscles sported increased numbers of energy-generating mitochondria and more muscle fibers, indicating that they tired less easily. And when the researchers stimulated them with electricity, the muscles continued to contract for longer than normal, taking longer to use up their energy stores, the team reports today in The Journal of Clinical Investigation.

Mice, like humans, have two types of muscles. Fast-twitch muscles, such as the muscles in our fingers, allow more precise movements but tire faster, whereas slow-twitch muscles, like those in our back, are more resistant to fatigue but don't allow such precise movements. Removing the IL-15R α gene, Khurana says, coaxed the mice's fast-twitch leg muscles to turn into slow-twitch muscles.

To study whether IL-15R α might also affect human endurance, Khurana collaborated with a group of researchers in Australia who keep a library of genetic samples from Olympic and world-class athletes. They found that certain variants of the IL-15R α gene were more common in endurance athletes like long-distance cyclists and rowers than they were in sprinters. More than three-quarters of long-distance triathletes had one type of variant, for example. Although researchers don't know yet what functional differences the gene variants might have, the finding suggests that the most successful endurance athletes might have a variant that gives their muscles extra endurance.

Biologist Ronald Evans of the Salk Institute for Biological Studies in San Diego, California, says the new study adds to the picture of how endurance is controlled at a molecular level. Evans has characterized the effects of a separate protein called PPAR δ , which gives mice extra running endurance as well as enhanced fat-burning abilities. Mice lacking IL-15R α showed an increase in PPAR δ activity, though it's not clear whether the genes directly interact and work through the same mechanisms.

Psychological factors could also be at play. "In a case like this, it's hard to know how to connect the hyperactivity component to the endurance component," Evans says. Even if the mice's muscles have extra endurance, he says, why do they voluntarily run so much more than normal mice?

Still, Khurana says the work raises the possibility that drugs blocking IL-15R α could one day enhance endurance. Of course, researchers don't know whether such a drug would have other side effects, because the IL-15R α gene is expressed in many tissues in the body, not just muscles. So for now, if you want to become a better athlete, it's probably best to just lace up your sneakers and get some old-fashioned exercise.

http://www.staradvertiser.com/news/20110716_Scientists_aglow_after_big_discovery_during_tsunami.html

Scientists aglow after big discovery during tsunami

By Jim Borg STAR-ADVERTISER

Researchers using a camera on Maui have photographed the glow from atmospheric pressure disturbances generated by the March 11 tsunami, raising hopes that the technique could be used to predict the arrival of future waves.

The first observation of its kind was made from the Air Force Maui Optical and Supercomputing Station atop Haleakala by scientists in France, Brazil and the United States. The March 11 earthquake in Japan generated a seismic sea wave that devastated parts of northern Honshu and caused millions of dollars of damage in Hawaii.

On the open ocean, such waves move at 500 mph but are only an inch high. Nevertheless, they put pressure on the atmosphere, scientists say. "The atmosphere gets less and less dense as you get higher, and that allows

the amplitude of the wave to grow," Jonathan Makela, a professor of electrical and computer engineering at the University of Illinois, Urbana-Champaign, said by phone Thursday.

At an altitude of 155 miles, the wave pressure interacts with the charged plasma of the ionosphere, which creates a faint red glow, Makela said. "The light that we're looking at is red, but it is very, very dim," he said. "It's not something you could see with the naked eye."

On March 11, Makela awoke at home in Illinois to find emails from French collaborator Philippe Lognonne, who had heard about the quake. He asked Makela to recalibrate the camera, called the Cornell All-Sky Imager, to pick up the tsunami phenomenon, which had been predicted in the 1970s but never observed.

Makela did so and hit pay dirt in the pre-dawn darkness atop the 10,023-foot peak.

Their findings appear in the online edition of Geophysical Research Letters.

Makela and colleagues found that the first ionospheric "chemiluminescence" preceded the ocean wave by about an hour, leading them to propose a space-based system for tsunami early warning.

The Haleakala camera can detect such ionospheric glow only on clear moonless nights, but a similar camera in geosynchronous orbit could detect it day or night, Makela said. Currently, scientists rely on ocean buoys and models to track and predict the path of a tsunami. Makela's normal research at Haleakala is focused on how the ionosphere affects radio signals.

The tsunami findings were a "happy accident," he said. "It shows the importance of having instruments out in the field taking data, because you never know what you're going to see," he said.

<http://popular-archaeology.com/issue/june-2011/article/early-human-ancestors-walked-fully-upright-earlier-than-scientists-thought-study-shows>

Early Human Ancestors Walked Fully Upright Earlier Than Scientists Thought, Study Shows

By Dan McLerran Tue, Jul 19, 2011

Early human ancestors walked fully upright about 2 million years earlier than scientists have long suggested, according to the results of a recent study.

A team of researchers at the University of Liverpool, along with scientists at the University of Manchester and Bournemouth University, applied a new statistical technique often used in functional brain imaging to obtain a three-dimensional average of the famous 11 footprints discovered at Laetoli, Tanzania, discovered by Mary Leakey in 1976. The footprints are interpreted to have been left originally in soft volcanic ash by a group of three individuals of the *Australopithecus afarensis* species following the eruption of the nearby Sadiman Volcano approximately 3.7 million years ago. *Australopithecus afarensis* is an early species thought to be ancestral to the Human, or *Homo*, evolutionary line and popularized by "Lucy", the benchmark fossilized partial skeleton discovery made in the Afar region of Ethiopia by Donald Johanson in 1974. The data was compared to other data from footprint formation and under-foot pressure studies of walking modern humans and living great apes, as well as data from computer simulations of the same taken from different reconstructed gaits of the *Australopithecus afarensis* species that produced the original Laetoli prints.

What they found was eye-opening. Says Robin Crompton of Liverpool's Institute of Aging and Chronic Disease: "It was previously thought that *Australopithecus afarensis* walked in a crouched posture, and on the side of the foot, pushing off the ground with the middle part of the foot as today's great apes do. We found, however, that the Laetoli prints represented a type of bipedal walking that was fully upright and driven by the front of the foot, particularly the big toe, much like humans today, and quite different to bipedal walking of chimpanzees and other apes."

"The foot function represented by the prints is therefore most likely to be similar to patterns seen in modern humans. This is important because the development of the features of human foot function helped our ancestors to expand further out of Africa."

These findings are significant because many scientists have long held that fully upright walking among human ancestors did not evolve until about 1.9 million years ago in the early *Homo* genus of species, the genus that contains the species *Homo erectus*. *Homo erectus* is the species that, based on the fossil evidence, effectively colonized the globe. According to Dr. Bill Sellers, a leading team member from the University of Manchester, "the Laetoli footprint trail is a snapshot of how early human ancestors used their feet 3.7 million years ago.....we can see that the evidence points to surprisingly modern foot function very early on in the human lineage."

But there is a fly in the ointment. According to many paleoanthropologists (the specialists that study early human biology, culture and environment), the fully upright walking capability and longer legs helped make it possible for humans to travel longer distances and to run farther and faster than before; however, unlike *Homo*, *Australopithecus afarensis* did not sport the longer legs and shorter torso characteristic of species like *Homo*

erectus or Homo sapiens (modern humans). Her torso was long and her legs were short, more like that of an ape, "which makes it probable," says Crompton, "that it could only walk or run effectively over short distances."

Many scientists, including those that produced the results of a previous Liverpool study, have suggested that bipedal locomotion (upright walking) began evolving in a tree-living ancestor of both great apes and modern humans. The more recent study results appear to support the hypothesis, providing indicators that even short-legged, long-torsoed Australopithecus exhibited the locomotive capacities more akin to that of modern humans, even though they (the Australopithecines) may have been limited to shorter distances and speeds.

Says Crompton, "we now need to determine when our ancestors first became able to walk or run over the very long distances that enabled humans to colonize the world."

The study was funded by the Leverhulme Trust and the Natural Environment Research Council. Detailed results were published as a report in the Royal Society Journal, Interface.

http://www.eurekalert.org/pub_releases/2011-07/jhmi-boc071811.php

Benign or cancerous? Gene test predicts cancer potential in pancreatic cysts
Johns Hopkins scientists have developed a gene-based test to distinguish harmless from precancerous pancreatic cysts.

The test may eventually help some patients avoid needless surgery to remove the harmless variety. The investigators estimate that fluid-filled cysts are identified in more than a million patients each year, most of whom have undergone CT or MRI scans to evaluate non-specific symptoms, such as abdominal pain and swelling. A report on the development is published in the July 20 issue of Science Translational Medicine.

Bert Vogelstein, M.D., co-director of the Ludwig Center at Johns Hopkins and a Howard Hughes Medical Institute investigator, and his colleagues analyzed precancerous cysts from 19 patients and searched for mutations in 169 cancer-causing genes. They found mutations in the KRAS gene, well-known for its prevalence in pancreatic cancers, and the GNAS gene, which had not previously been associated with pancreatic cancer. In both KRAS and GNAS, the mutations occur at a single coding spot in the DNA, the equivalent of a typo in a word within an entire encyclopedia. KRAS and GNAS genes produce signaling proteins, relaying signals from the cell surface to areas within the cell.

The researchers then tested a total of 132 precancerous pancreatic cysts for mutations in KRAS and GNAS. GNAS mutations were found in more than half of the samples (87 of them), and KRAS mutations occurred in 107 samples. Nearly all (127) had mutations in GNAS, KRAS or both. The mutations occurred in large and small, high- and low-grade cysts, and in all major types of the most common precancerous pancreatic cysts. There were no major differences in age, gender or smoking history for people with GNAS or KRAS mutations in their cysts' cells.

Finally, the investigators tested tissue from pancreatic cancers that had developed in eight people with GNAS-mutated cysts. Seven of the eight had GNAS mutations in their cancer, as well as cells in the cysts.

GNAS and KRAS mutations were not found in benign cysts, although KRAS mutations did appear occasionally in a rare type of cyst with a relatively low potential to become cancerous. These rare, mostly benign cysts are less challenging to diagnose because of their location within the pancreas and type of patient, according to the investigators.

"There has long been a need for accurate, quantitative ways to identify cysts that are more worrisome and to help patients avoid unnecessary surgeries for harmless cysts," says Vogelstein, the Clayton Professor of Oncology at the Johns Hopkins Kimmel Cancer Center.

"Most cysts are benign," says pathologist Ralph Hruban, M.D., director of Hopkins' Sol Goldman Pancreatic Cancer Research Center, "but distinguishing between the harmless and dangerous ones is challenging for doctors and patients alike."

Generally, patients with a cyst that appears harmless and is less than 3 cm in size are monitored to watch for growth of the cyst or other concerning features such as a solid nodule. With cysts that appear more worrisome, surgical removal is often recommended, but the procedure requires removal of a portion of the pancreas as well, and complications like a pancreatic fistula (fluid from the pancreas leaks through the surgical incision), eating difficulties and prolonged recovery can develop, according to Christopher Wolfgang, M.D., Ph.D., associate professor of surgery, pathology and oncology and director of pancreatic surgery at Johns Hopkins.

CT scans, MRI imaging, and enzyme and secreted antigen levels in cyst fluid are imprecise markers for precancerous potential, adds Wolfgang. Genetic analysis of the kind reported in the new study offers a new way to sort the potential of these cysts to cause malignant trouble. The investigators caution that cyst fluid removal, an invasive procedure, also has its caveats and can cause bleeding, infection and inflammation in a very small percentage of patients.

Further studies on a larger number of patients must be done before the gene-based test can be widely offered. However, Vogelstein says that the technology for developing a gene-based test in this case is relatively straightforward because "the mutation occurs at one spot in both of the genes."

Major funding for the study was provided by the Lustgarten Foundation, a private foundation dedicated to funding pancreatic cancer research. Other funding was provided by the Virginia and D.K. Ludwig Fund for Cancer Research, the Sol Goldman Center for Pancreatic Cancer Research, the Joseph L. Rabinowitz Fund, the Michael Rolfe Foundation, the Indiana Genomics Initiative of Indiana University, which is supported in part by Lilly Endowment Inc., the J.C. Monstra Foundation, Swim Across America and the National Institutes of Health.

Johns Hopkins University has filed a patent application on inventions described in the study mentioned in this news release. Additional scientists participating in the research included Jian Wu, Hanno Matthaei, Anirban Maitra, Marco Dal Molin, Laura Wood, James Eshleman, Michael Goggins, Marcia Canto, Richard Schulick, Barish Edil, Alison Klein, Luis Diaz, Kenneth Kinzler, and Nickolas Papadopoulos from Johns Hopkins; Peter Allen from Memorial Sloan-Kettering Cancer Center; and C. Max Schmidt from Indiana University.

http://www.eurekalert.org/pub_releases/2011-07/acs-saa072011.php

Seaweed as a rich new source of heart-healthy food ingredients

In an article that may bring smiles to the faces of vegetarians who consume no dairy products and vegans, who consume no animal-based foods, scientists have identified seaweed as a rich new potential source of heart-healthy food ingredients.

Seaweed and other "macroalgae" could rival milk products as sources of these so-called "bioactive peptides," they conclude in an article in ACS's Journal of Agricultural and Food Chemistry.

Maria Hayes and colleagues Ciarán Fitzgerald, Eimear Gallagher and Deniz Tasdemir note increased interest in using bioactive peptides, now obtained mainly from milk products, as ingredients in so-called functional foods. Those foods not only provide nutrition, but have a medicine-like effect in treating or preventing certain diseases. Seaweeds are a rich but neglected alternative source, they state, noting that people in East Asian and other cultures have eaten seaweed for centuries: Nori in Japan, dulse in coastal Europe, and limu palahalaha in native Hawaiian cuisine.

Their review of almost 100 scientific studies concluded that that some seaweed proteins work just like the bioactive peptides in milk products to reduce blood pressure almost like the popular ACE inhibitor drugs. "The variety of macroalga species and the environments in which they are found and their ease of cultivation make macroalgae a relatively untapped source of new bioactive compounds, and more efforts are needed to fully exploit their potential for use and delivery to consumers in food products," Hayes and her colleagues conclude.

http://www.eurekalert.org/pub_releases/2011-07/uonr-nso072011.php

Nevada School of Medicine researcher finds caffeine consumption, female infertility link **RENO, Nev. – Caffeine reduces muscle activity in the Fallopian tubes that carry eggs from a woman's ovaries to her womb.**

"Our experiments were conducted in mice, but this finding goes a long way towards explaining why drinking caffeinated drinks can reduce a woman's chance of becoming pregnant," says Sean Ward, professor of physiology and cell biology, at the University of Nevada School of Medicine, who conducted the study.

Ward's study was recently published in the British Journal of Pharmacology.

Human eggs are microscopically small, but need to travel to a woman's womb if she is going to have a successful pregnancy. Although the process is essential for a successful pregnancy, scientists know little about how eggs move through the muscular Fallopian tubes. It was generally assumed that tiny hair-like projections, called cilia, in the lining of the tubes, waft eggs along assisted by muscle contractions in the tube walls.

By studying tubes from mice, Ward and his team discovered that caffeine stops the actions of specialized pacemaker cells in the wall of the tubes. These cells coordinate tube contractions so that when they are inhibited, eggs can't move down the tubes. In fact these muscle contractions play a bigger role than the beating cilia in moving the egg towards the womb.

"This provides an intriguing explanation as to why women with high caffeine consumption often take longer to conceive than women who do not consume caffeine," said Ward.

Discovering the link between caffeine consumption and reduced fertility has benefits.

"As well as potentially helping women who are finding it difficult to get pregnant, a better understanding of the way Fallopian tubes work will help doctors treat pelvic inflammation and sexually-transmitted disease more successfully," said Ward.

It could also increase our understanding of what causes ectopic pregnancy, an extremely painful and potentially life-threatening situation in which embryos get stuck and start developing inside a woman's Fallopian tube.

Fast-Evolving Brains Helped Humans out of the Stone Age

People were once thought to have ancient psyches ill-suited to modern existence, but they have adapted much more quickly than early theories had predicted

By Katherine Harmon | Wednesday, July 20, 2011 | 14

cave paintings stone age mind evolutionary psychology Prehistoric sensibilities?: Earlier evolutionary psychology suggested that changes in the human brain lagged behind changes in our environment, but the field itself has been undergoing some rapid evolution. Image: iStockphoto/lolloj

Just like our animal skin-clad ancestors, we gather food with zeal, lust over the most capable mates, and have an aversion to scammers. And we do still wear plenty of animal skins. But does more separate us from our Stone Age forebears than cartoonists and popular psychologists might have us believe?

At first blush, parsing the modern human in terms of behaviors apparently hardwired into the brain over eons of evolution seems like a tidy, straightforward exercise. And 30 years ago, when the field of evolutionary psychology was gaining steam, some facile parallels between ancient and modern behaviors lodged themselves in the popular conceptions of human evolution. "It's very easy to slip into a very simplistic view of human nature," says Robert Kurzban, an associate professor of psychology at the University of Pennsylvania, citing the classic Flintstones stereotype.

Advances in neuroscience and genetics now suggest that the human brain has changed more rapidly—and in different ways—than was initially thought, according to a new paper published online July 19 in PLoS Biology.

"There's been a lot of recent evolution—far more than anyone envisioned in the 1980s when this idea came to prominence," says Kevin Laland, a professor at the University of Saint Andrew's School of Biology in Scotland and co-author of the new paper. He and his colleagues argue that today's better understanding of the pace of evolution, human adaptability and the way the mind works all suggest that, contrary to cartoon stereotypes, modern humans are not just primitive savages struggling to make psychological sense of an alien contemporary world.

Brain changes

A few decades ago, when researchers were laying the groundwork for the field of evolutionary psychology, the idea that evolution was primarily a gradual, almost geologically paced force "was a tenable view," Laland says. More recent studies, however, have found evidence of speedy evolutionary change in animals—as well as hundreds of changes in the human genome that appeared within tens of thousands, rather than over hundreds of thousands or even millions of years.

"It seems implausible that all of that change has been going on without changing how the brain works," Laland says. And if the brain has been changing over the millennia, along with the climate, culture and other environmental conditions, then there might be far less so-called "adaptive lag" than early evolutionary psychology researchers—and the broader public—had previously assumed.

Laland acknowledges that rapid evolution of the brain is not "inevitable by any stretch of the imagination." But he and his co-authors noted that relatively recent changes from "culturally facilitated changes in diet, to aspects of modern living that inadvertently promoted the spread of diseases" have left their mark on the human genome. And those changes have included "genes expressed in the human brain," they wrote.

Creating creature comforts

The inner sanctum of the suburban shopping mall might bear little resemblance to the African savanna on which our ancestors are thought to have evolved. But Laland notes that it is unlikely humans, imperfect though we might be, would consistently design environments to which we are ill suited.

A traditional, more passive take on evolutionary psychology "fails to recognize that humans are changing their environment," and not at all randomly or haphazardly, Laland says. "We've built environments that are well suited to our biology, so we don't find ourselves massively maladapted for the contemporary world."

As much as pop psychology has drawn from the notion that because of our tribal past on the savannas of Africa, we humans are best suited to live in small clusters spread thinly across vast spaces, an evolutionary view of population numbers refutes that notion. Although many other developments and technologies have come along to help us reproduce almost like rabbits, Laland argues that "if it were the case that humans were adapted to environments in the Pleistocene [epoch ending more than 10,000 years ago] but not the Holocene [modern era, which followed], you would expect human populations would have shrunk when they moved into urban environments."

Instead, the variety of environments in which humans seem to thrive highlights the "extraordinary level of adaptive plasticity afforded by our capacities for learning and culture," Laland and his co-authors noted in their paper.

To decipher these dizzying potentials, Laland and his colleagues advocate first taking a functional, neurological approach, tracking down activity in the brain via MRI scans and genetic studies. Figuring out how the brain does what it does on a more fine-grained scale will help, in turn, guide future research to track just how quickly and in what ways the Homo sapiens brain has changed since we regularly engaged in the cliched behavior of clubbing animals or communicating via grunts.

Adaptable brain science

Scientific views of the nature of the human mind may be changing rapidly in sync with better understanding of our capabilities. Early evolutionary psychologists have often favored something like a "jukebox" model of the brain, in which it contains any number of evolved, preprogrammed behaviors waiting to be set off by various stimuli, as if at the touch of a button. Laland and his colleagues instead argue for "a very different model of how the mind works," he says, in which the human mind is much more plastic, and perhaps more akin to a collection of musical instruments awaiting a jam session; the tune they will play depends more on developmental and cultural experiences than on engrained compositions. That flexibility may be what helped our ancestors cope with the world changing around them—and to participate in those changes by further remodeling their environment to their own ends.

Not unlike the brain, the field of evolutionary psychology might have been evolving more quickly than many have realized. "The discipline has been perceived as simplifying," says Kurzban, who was not involved in the new paper. "Human nature is really complicated, and the brain is the most complicated thing we know of."

As an evolutionary and developmental psychologist who has also studied economics and anthropology, Kurzban says that he finds his field has already become quite multidisciplinary. "One of the things that evolutionary psychology illustrates is the importance and productivity of integrating information across disciplines," he says.

Laland hopes that an ever-widening spiral of scientists will help to create an even more robust understanding of how our behaviors came to be. Future research into developmental psychology, neuroscience and genetics might help to crack the code of what we have long taken for granted as "human nature." Already some researchers are using these disciplines to work out "the anatomy of what we used to call 'instincts,'" Laland says.

"It's still a young field," Kurzban says. And it might stay convoluted for quite some time. But like the brain itself, that might not be a bad thing. "As it grows there will be a larger surface area for collaborative work," he says.

<http://www.bbc.co.uk/news/health-14220382>

Tall people 'more likely to develop cancer'

By James Gallagher Health reporter, BBC News

Being tall has been linked to a greater risk of 10 common cancers by University of Oxford researchers.

For every four inches (10cm) above five feet a person was, the researchers said they had a 16% increased cancer risk. The study of more than one million women, published in The Lancet Oncology, suggested chemicals that control growth might also affect tumours. Cancer Research UK said tall people should not be alarmed by the findings.

The study followed 1.3 million middle-aged women in the UK between 1996 and 2001. It linked 10 cancers to height - colon, rectal, malignant melanoma, breast, endometrial (uterus), ovarian, kidney, lymphoma, non-Hodgkin lymphoma and leukaemia. Those in the tallest group, over 5ft 9in, were 37% more likely to have developed a tumour than those in the shortest group, under 5ft.

Although the study looked only at women, the researchers said the height link was also present in men. They combined 10 other research studies which showed a similar link in men.

Reason unknown

Dr Jane Green, lead researcher and from the University of Oxford, told the BBC: "Obviously height itself cannot affect cancer, but it may be a marker for something else."

Scientists believe that as there is a link across many cancers there "may be a basic common mechanism". They think, but have not proved, that growth hormones - such as insulin-like growth factors - may be the explanation.

Higher levels of growth factors could do two things. They could result in more cells - taller people are made of more stuff so there are more cells which could mutate and become tumours. Alternatively, they could increase the rate of cell division and turnover, increasing the risk of cancer.

But as Dr Green admitted: "The point is we don't know."

Cancer Research UK's Sara Hiom said: "Tall people need not be alarmed by these results. Most people are not a lot taller, or shorter, than average, and their height will only have a small effect on their individual cancer risk."

Dr Caitlin Palframan, policy manager at Breakthrough Breast Cancer, said: "The big question is why this connection exists. If we can unravel why height affects the risk of cancer it will lead us closer to understanding how some cancers develop."

The researchers suggested that height could also have contributed to increasing cancer incidence. In Europe, average height is thought to have increased by around 1cm every decade during the 20th Century. They argued that the height increase in that time could have resulted in a 10-15% more cancers than if heights had remained the same.

http://www.eurekalert.org/pub_releases/2011-07/sfhe-hbo072111.php

Hospital bacteria outbreak linked to nasal spray

Chicago, IL—Infection control researchers investigating a rare bacterial outbreak of *Burkholderia cepacia* complex (Bcc) identified contaminated nasal spray as the root cause of the infections, leading to a national recall of the product.

An article in the August issue of Infection Control and Hospital Epidemiology, the journal of the Society for Healthcare Epidemiology of America (SHEA), describes how researchers were able to trace the outbreak back to the nasal decongestant spray.

Bcc is a group of Gram-negative bacteria that can cause hard-to-treat infections. Patients with underlying medical conditions such as lung disease and weakened immune systems are at greater risk of contracting Bcc. When patients in a Denver children's hospital began testing positive for the bacteria in 2003, investigators suspected that a batch of Major Twice-a-Day Nasal Spray, a brand that each of the patients had used, might be to blame. However, standard tests of the spray did not find any bacteria initially.

Noticing some peculiarities in the initial tests, the investigators decided to retest the spray using a non-standard culture medium. The second set of tests was positive for Bcc, the same strain as was identified in patients. The nasal spray contained a preservative agent that can interfere with standard bacterial cultures and the second set of tests neutralized the preservative, allowing the detection of the bacteria.

The spray was voluntarily recalled by the manufacturer, but the findings raise lingering questions about how manufacturers should test nasal spray products before distribution. "If standard culturing methods were used by the manufacturer then they may not have [discovered] this organism," the researchers write.

"Nasal spray products are among the most widely used over-the-counter pharmaceuticals, but to date they are not required by the FDA to be sterile," said Susan Dolan, one of the article's authors. "Given the implications of Bcc infections we question this decision."

Other products, such as mouthwash, nebulization therapy, tap water, disinfectants, and reusable temperature probes have previously been implicated as Bcc outbreak sources.

Susan A. Dolan, Elaine Dowell, John LiPuma, Sondra Valdez, Kenny Chan, and John F. James, "An Outbreak of Burkholderia cepacia Complex Associated with Intrinsically Contaminated Nasal Spray." Infection Control and Hospital Epidemiology 32:8 (August 2011).

http://www.eurekalert.org/pub_releases/2011-07/gumc-dr071811.php

**Dolphins' 'remarkable' recovery from injury offers important insights for human healing
Georgetown scientist teams up with dolphin experts to explore the sea animals' 'mysterious' wound healing abilities**

Washington, DC – A Georgetown University Medical Center (GUMC) scientist who has previously discovered antimicrobial compounds in the skin of frogs and in the dogfish shark has now turned his attention to the remarkable wound healing abilities of dolphins. dolphin's ability to heal quickly from a shark bite with apparent indifference to pain, resistance to infection, hemorrhage protection, and near-restoration of normal body contour might provide insights for the care of human injuries, says Michael Zasloff, M.D., Ph.D.

For a "Letter" published today in the Journal of Investigative Dermatology, Zasloff, an adjunct professor at GUMC and former Dean of Research, interviewed dolphin handlers and marine biologists from around the world, and reviewed the limited literature available about dolphin healing to offer some new observations about what he calls the "remarkable" and "mysterious" ability of dolphins to heal. "Much about the dolphin's healing process remains unreported and poorly documented," says Zasloff. "How does the dolphin not bleed to death after a shark bite? How is it that dolphins appear not to suffer significant pain? What prevents infection of a significant injury? And how can a deep, gaping wound heal in such a way that the animal's body contour is restored? Comparable injuries in humans would be fatal. "

Zasloff explains the dolphin healing process by synthesizing scattered reports of known aspects of dolphin biology. For example, he proposes the same diving mechanism (diving reflex) that diverts blood from the periphery of the body during a dolphin's deep plunge down in water depths also could be triggered after an injury. Less blood at the body's surface means less blood loss.

As for pain, Zasloff's review suggests the dolphin's apparent indifference "clearly represents an adaptation favorable for survival." Still, he says, the neurological and physiological mechanisms engaged to reduce pain remain unknown.

The prevention of infection is perhaps less of a mystery. Despite gaping wounds and deep flesh tears, those who observe dolphins following shark bites have not noted significant rates of infection. Zasloff says it's likely that the animal's blubber holds key answers.

Blubber and its composition have been studied extensively for many years because it accumulates many toxic pollutants of human origin, such as heavy metals from its food sources, which allows scientists to monitor environmental pollution, Zasloff says. It is therefore well documented that blubber also contains natural organohalogens which are known to have antimicrobial properties and antibiotic activity.

"It's most likely that the dolphin stores its own antimicrobial compound and releases it when an injury occurs," Zasloff predicts. "This action could control and prevent microbial infection while at the same time prevent decomposition around the animal's injury."

Finally, Zasloff explores the ability of the dolphin's wound to heal in a way that restores the dolphin's body contour. He says the dolphin's healing ability is less like human healing and more like regeneration.

"The repair of a gaping wound to an appearance that is near normal requires the ability of the injured animal to knit newly formed tissues with the existing fabric of adipocytes, collagen and elastic fibers," he explains. "The dolphin's healing is similar to how mammalian fetuses are able to heal in the womb."

Brent Whitaker, M.S., D.V.M., deputy executive director for biological programs at the National Aquarium in Baltimore describes Zasloff's letter as "thought provoking." Zasloff consulted with Whitaker as part of his research. "It makes sense that the dermal tissues of the dolphins would evolve mechanisms to protect them from the microbes ever present in the water in which these animals live," Whitaker says. "Other aquatic animals have developed protective strategies that allow them to cope with water-borne microflora. [Dr. Zasloff's] letter suggests a unique and intriguing hypothesis which may begin to explain how dolphins, and perhaps other cetaceans, survive significant soft-tissue wounds in the wild without the aid of antibiotics or clinical care."

"It is very clear from working with marine mammals that the ability to heal is 'enhanced' from what we see with terrestrial mammals," says Leigh Ann Clayton, DVM, DABVP, director of the Department of Animal Health at the National Aquarium, who also advised Zasloff. "Dr. Zasloff proposes some fascinating mechanisms of action in healing. It is exciting to begin exploring these mechanisms more completely." In his letter, Zasloff presents the case histories of two shark-bitten dolphins, Nari and Echo, at the Tangalooma Wild Dolphin Resort in Moreton Island, Australia. The reports document the healing process of the dolphins with photos to eloquently demonstrate how and how quickly two dolphins heal from severe shark injuries. "The Tangalooma dolphin care team is continuously astounded at the remarkable natural ability of the dolphins that visit us, in overcoming severe shark bite injuries with what seems to be indifference," says Trevor Hassard, director of Tangalooma. "We learn so much from the lives of other animals. Perhaps Dr Zasloff's contribution will bring the dolphin's remarkable healing capacities to the attention of the medical research community."

"My hope is this work will stimulate research that will benefit humans," says Zasloff. "I feel reasonably certain that within this animal's healing wounds we will find novel antimicrobial agents as well as potent analgesic compounds."

http://www.eurekalert.org/pub_releases/2011-07/cp-wsg071511.php

With secondhand gene, house mice resist poison

Since the 1950s, people have tried to limit the numbers of mice and rats using a poison known as warfarin.

But, over the course of evolution, those pesky rodents have found a way to make a comeback, resisting that chemical via changes to a gene involved in vitamin K recycling and blood clotting. Now, researchers reporting online on July 21 in *Current Biology*, a Cell Press publication, show that European mice have in some cases acquired that resistance gene in a rather unorthodox way: they got it secondhand from an Algerian mouse.

"House mice not only have become resistant to rat poisons in the 'usual' way, but also in a very 'unusual' way, through interbreeding with a separate mouse species that is removed by 1.5 to 3 million years," said Michael Kohn of Rice University. "Our work is perhaps the first to catch this unusual process in the act."

The findings show that, as in microbes, there is more than one way for new traits to evolve in animals: via new mutations arising within a species, and via the transfer of genes between species, the researchers say. They also help to explain how rodents have foiled some of our best attempts to kill them so rapidly, and with such apparent ease.

The researchers made their discovery by tracing the evolution of vitamin K epoxide reductase enzyme complex (VKOR), and specifically the subcomponent of that enzyme responsible for warfarin sensitivity or

resistance, in the genomes of house mice (*Mus musculus domesticus*) and Algerian mice (*M. spretus*). They also showed in laboratory experiments that the gene variant derived from Algerian mice does indeed lend house mice resistance to warfarin.

Kohn's team suspects that *M. spretus* is naturally resistant to warfarin because they inhabit arid steppe-like terrain and live mostly on dry plant matter and seeds, all poor sources for vitamin K. Once the *M. spretus* gene variant was introduced into house mice via hybridization between the two species, they too were "pre-adapted" for warfarin resistance.

Kohn said he belongs to the camp that thinks such breaches between species barriers shouldn't happen all that often. But, on an evolutionary time scale, even rare events can change the course of evolution in significant ways.

In this case, it's clear that humans had a heavy influence: we not only introduced a poison that temporarily increased the fitness of mouse hybrids over their parents to allow the eventual transfer of a warfarin resistance gene from one species to another, but we also brought the mice together in the first place with the spread of agriculture from the Fertile Crescent, Kohn said.

"Nature will respond to challenges in the most creative ways, even if challenges are human-made and presumably foolproof," Kohn said. On the other hand, he added, evolution might be more predictable in some ways than we had imagined. After all, the very same gene and gene pathway has evolved multiple times to confer resistance to warfarin in both mice and rats. "Understanding such constraints and the mechanisms by which evolution proceeds will be critical for our continued ability to stay one step ahead of evolved resistances in the animals, plants, and microbes that we wish to control," he said.

<http://www.physorg.com/news/2011-07-china-4000m.html>

China sub makes first dive to below 4,000m

A Chinese submersible conducted the country's deepest manned dive ever Thursday in the latest milestone for China's deep-sea ambitions as it seeks to exploit the vast resources of the ocean floor.

A Chinese submersible conducted the country's deepest manned dive ever Thursday in the latest milestone for China's deep-sea ambitions as it seeks to exploit the vast resources of the ocean floor. The Jiaolong undersea craft -- named after a mythical sea dragon -- reached 4,027 metres (13,211 feet) below sea level in a test dive in the northeastern Pacific, the State Oceanic Administration said in a statement. "The success of this test dive has laid a solid foundation for completing the mission of diving to 5,000 metres," it said.

Chinese technical capabilities have gathered pace in recent decades, exemplified by a fast-growing space programme that in 2003 made China just the third nation to conduct manned space flight.

The Jiaolong's range theoretically gives China access to nearly all of the world's deep-sea areas, and state news agency Xinhua quoted the administration's director Li Cigui as saying the vessel was a "marvel" of Chinese engineering. The craft is designed to reach a maximum depth of 7,000 metres and in a dive in the South China Sea last year it made China only the fifth country to go deeper than the 3,500-metre mark.

The craft carried three people in Thursday's test and was due to attempt to reach 5,000 metres in another dive on Friday. Xinhua news agency reported however that the dive was cancelled early Friday morning due to "unfavorable sea conditions", citing the State Oceanic Administration (SOA).

The conditions were expected to remain rough in the coming three days and the SOA was waiting for a suitable time to re-attempt the dive, Liu Feng, the mission's commander-in-chief, was quoted by Xinhua as saying.

The deepest dive ever conducted was by the US Navy, which reached the bottom of the Mariana Trench -- the deepest point in the world's oceans at 11,000 metres -- in 1960 in a manned undersea craft.

China has pushed hard in recent years to obtain oil, minerals and other natural resources needed to fuel its growth. It has said its development of submersible technology is aimed at scientific research and the peaceful exploration and use of natural resources.

But China's appetite for resources, rapid expansion of its military capabilities and increasingly strident territorial claims in the ocean have caused concern. During the vessel's dive to the bottom of the disputed South China Sea last year it planted a Chinese flag in the seafloor in what was seen by some as a provocative act.

The South China Sea, which is believed to be rich in oil and gas, is claimed in whole or in part by China, Taiwan, the Philippines, Vietnam, Brunei and Malaysia. Tensions in the region have spiked in recent months after several incidents at sea involving China and its neighbours.

Scientists say the ocean's floors contain rich deposits of a range of potentially valuable minerals. However, some concerns also have been raised that deep-sea vessels could be used to tap into or sever communications cables.

Xinhua has quoted officials saying the Jiaolong's crew would conduct tests in the Pacific, including taking photos, shooting video, surveying seabeds and taking samples from the ocean floor. It also would examine possible sites for a potential future test dive to its maximum depth of 7,000 metres, Xinhua said, giving no timetable.

<http://medicalxpress.com/news/2011-07-chinese-medicine-parkinson-hk.html>

Chinese medicine could treat Parkinson's: HK study

Chinese medicine may be effective in battling certain symptoms of Parkinson's disease, and lessening side effects from the drugs used to treat the condition, according to a new study.

Researchers at Hong Kong Baptist University said Gouteng, a traditional Chinese herb used to treat hypertension, helped patients better communicate and made them less prone to depression and sleeping difficulties.

"There is no cure for Parkinson's right now, but the study showed Chinese medicine can help treat the disease," a university spokesman told AFP Thursday.

Parkinson's is a progressive motor-system disorder which usually affects people over the age of 50, although it can strike earlier, often causing severe symptoms including body trembling, stiffness and loss of balance.

The condition is usually treated with a drug called levodopa, which the brain converts into dopamine to relieve the symptoms, but it can also cause nausea and hallucinations.

The Baptist University study found that patients who took Gouteng together with levodopa experienced fewer side effects from the drug while showing a marked improvement in their communication skills.

Li Min, an associate professor who led the study, said the findings could also help boost the profile of Chinese medicine.

"They provide not only pharmacological proof of the efficacy of Gouteng in treating Parkinson's disease, but will also help promote the effectiveness and safety of Chinese medicine to the international medical arena," she said.

Li -- whose team has applied for a US patent -- told the South China Morning Post that she expects the herb would start being used to treat the disease after the second phase of the study in 2013.

<http://www.scientificamerican.com/article.cfm?id=caspari-neandertals-and-the-first-grandparents>

Ahead of Their Time: Neandertals and the First Grandparents

Neandertals and early modern humans showed fits and starts of creativity before archaeology's big bang

By Kate Wong | Thursday, July 21, 2011 | 5

Sometime around 35,000 years ago in Europe our ancestors embarked on what might be described as a creativity bender. They began making art, jewelry, musical instruments and complex tools in abundance, as evidenced by the remains of these items at sites across the continent. Archaeologists call this cultural period the Upper Paleolithic and it stands in marked contrast to the Middle Paleolithic that preceded it, during which anatomically modern humans and their archaic contemporaries, the Neandertals, focused their manufacturing efforts on a handful of relatively simple tool types. Experts have long debated exactly what sparked this creative explosion. As Central Michigan University paleoanthropologist Rachel Caspari describes in this article in the August issue, grandparents may have played a key role.

Today people routinely live long enough to become grandparents. But analyses of fossil teeth conducted by Caspari and her colleagues indicate that this is a relatively recent development. For most of human evolution, our ancestors mostly lived fast and died young. Reaching grandparent age, they show, did not become common until the Upper Paleolithic, and it may explain the sudden and dramatic shift in behaviors between the Middle and Upper Paleolithic. Having grandparents around in large numbers would have significantly increased population size, thus fostering innovation and self-expression, and it would have facilitated the transfer of valuable knowledge and cultural traditions to the next generation.

The symbolic objects and sophisticated implements of the Upper Paleolithic are not the oldest of their kind, however. In recent years researchers have discovered older examples at early modern human sites in Africa. Archaeologist Curtis Marean of Arizona State University in Tempe has found fancy tools and pigments presumably used for body paint at sites in Mossel Bay, South Africa, that date as far back as 164,000 years ago. At another site in South Africa called Blombos Cave archaeologist Christopher Henshilwood of the University of Bergen in Norway has recovered shell beads and engraved pieces of iron oxide as well as tools wrought from bone, dating back to 71,000 years ago. There are several such glimpses of modern behavior at sites in Africa and western Asia that precede the Upper Paleolithic by a long shot.

Neandertals also dabbled in such advanced practices on occasion. Several sites have yielded tools made by Neandertals using materials and techniques once attributed to anatomically modern humans alone. Our archaic

cousins also had artistic leanings. For example, João Zilhão, an archaeologist at the University of Barcelona, has found in Spanish caves dating to nearly 50,000 years ago indications that the Neandertals there were wearing body paint and shell jewelry. And this past February Italian researchers reported that they had found evidence that 44,000 years ago Neandertals were harvesting wing feathers from a variety of birds at a site called Fumane Cave for decorative purposes. Experts refer to such decorations—along with sculpture, cave paintings and other art forms—as symbolic behaviors, which are a defining characteristic of the modern mind.

Although such examples of precociousness might seem to undermine Caspari's argument, they actually support it. The difference between these behaviors in the Middle Paleolithic (and its African equivalent, the Middle Stone Age) and the Upper Paleolithic is that in the former these traditions are relatively rare and fleeting, in the latter they are ubiquitous and sustained. The failure of these early glimmerings of art and sophisticated weaponry to spread and become permanent fixtures of the Middle Paleolithic and the Middle Stone Age seems to have been the result of small population sizes and local extinctions of these populations and their traditions. The Upper Paleolithic, with its burgeoning numbers of grandparents, allowed modern human behavior—the capacity for which arose long beforehand—to finally find a firm foothold.

<http://www.physorg.com/news/2011-07-paleoecologists-mass-extinction-due-huge.html>

Paleoecologists suggest mass extinction due to huge methane release

Scientists contend that the mass extinction that occurred at the end of the Triassic period, was due to a "sudden" increase in the amount of methane in the atmosphere

(PhysOrg.com) -- Micha Ruhl and colleagues from the University of Copenhagen's Nordic Center for Earth Evolution have published a paper in *Science* where they contend that the mass extinction that occurred at the end of the Triassic period, was due to a "sudden" increase in the amount of methane in the atmosphere due to the effects of global warming that resulted from the spewing of carbon dioxide from volcanoes.

Prior to this research, most scientists have believed that the sudden extinction of nearly half of all life forms on the planet was due solely to the emissions from volcanic eruptions that were occurring in what was to become the Atlantic Ocean. Ruhl et al contend that instead, what happened, was that the small amount of atmospheric heating that occurred due to the exhaust from the volcanoes, caused the oceans to warm as well, leading to the melting of ice crystals at the bottom of the sea that were holding on to methane created by the millions of years of decomposing sea life. When the ice crystals melted, methane was released, which in turn caused the planet to warm even more, which led to more methane release in a chain reaction, that Ruhl says, was the real reason for the mass extinction that led to the next phase in world history, the rise of dinosaurs.

Ruhl and his team base their assertions on studies they've made of the isotopes of carbon in plants (found in what is now the Austrian Alps) that existed during the period before the mass extinction. In so doing they found two different types of carbons and the molecules that were produced during that time frame. After extensive calculations, Ruhl and his team came to the conclusion that some 12,000 gigatons of methane would have had to have been pumped into the atmosphere to account for the differences in the isotopes; something the team believes could only have happened if the methane were to come from the sea floor.

This new research, though dire sounding, may or may not have implications for modern Earth. While it is true that humans have pumped significant amounts of carbon into the atmosphere, amounts that are approaching what Ruhl and his team say led to the earlier methane release, it doesn't necessarily mean we are on the same path, because as Ruhl points out, things are much different today, the very structure of the planet has changed so much that it would be impossible to transfer what might have been learned about events in Earth's history 200 million years ago, to what is going on today.

More information: Atmospheric Carbon Injection Linked to End-Triassic Mass Extinction, Science 22 July 2011: Vol. 333 no. 6041 pp. 430-434 DOI:10.1126/science.1204255

ABSTRACT

The end-Triassic mass extinction (~201.4 million years ago), marked by terrestrial ecosystem turnover and up to ~50% loss in marine biodiversity, has been attributed to intensified volcanic activity during the break-up of Pangaea. Here, we present compound-specific carbon-isotope data of long-chain n-alkanes derived from waxes of land plants, showing a ~8.5 per mil negative excursion, coincident with the extinction interval. These data indicate strong carbon-13 depletion of the end-Triassic atmosphere, within only 10,000 to 20,000 years. The magnitude and rate of this carbon-cycle disruption can be explained by the injection of at least $\sim 12 \times 10^3$ gigatons of isotopically depleted carbon as methane into the atmosphere. Concurrent vegetation changes reflect strong warming and an enhanced hydrological cycle. Hence, end-Triassic events are robustly linked to methane-derived massive carbon release and associated climate change.

<http://www.newscientist.com/article/dn20726-next-mars-rover-will-climb-a-mountain.html>

Next Mars rover will climb a mountain

It's official: The next Mars rover will explore a 5-kilometre-high mountain of sediment inside a crater called Gale, NASA announced today.

The Curiosity rover is scheduled to launch between 25 November and 18 December. It will examine Martian rocks and soil to learn about the history of the planet's climate and to look for chemical traces of life.

There has been vigorous debate about where to send the rover. At a meeting in May, competing camps made their final arguments for each of the four sites then on the shortlist.

"These are all like different flavours of ice cream – all fantastic but slightly different," said John Grant of the National Air and Space Museum in Washington DC, one of the organisers of the May meeting, at a NASA press conference today. In recent weeks, NASA said it had narrowed that list to two craters: Gale and Eberswalde.

Runner-up

Eberswalde contains a beautifully preserved fan of sediment from an ancient river delta. On Earth, organic material gets concentrated in such sediment, so this would be a good place to look for signs of past life on Mars. But on Friday, NASA announced it will send Curiosity, also known as the Mars Science Laboratory (MSL), to Gale crater instead.

There, a giant mound of layered sediment rises 5 kilometres from the crater floor. It is not known exactly how it got there, but the sediment contains clays, a sure sign that it was exposed to liquid water at some point.

"If you start at the bottom of the pile of layers and you go to the top, it's like reading a novel," said John Grotzinger, the rover's project scientist at the California Institute of Technology in Pasadena. "And we think Gale crater is going to be a great novel about the early environmental evolution of Mars."

Multiple sites

It is too dangerous to land on the mountain itself, so Curiosity will touch down on a flatter part of the crater floor, then drive up the mountain. But first, it will take a look at sediment deposited at the landing site by a river that once flowed into the crater. That sediment and the clays in the mountain are two of the places in Gale that may have been habitable and left organics behind.

But organics could also be preserved in several other places where life may once have existed. One is an ancient river canyon that cuts into the mountain. There are also layers in the mountain containing sulphate minerals, which require water to form. And there are also cracks in the mountain that appear to have been waterlogged in the past.

"There was a real preference for Gale in that it's not a one-trick pony," said Michael Meyer of NASA Headquarters in Washington DC. "There's several different environmental settings that can be explored [there], any one of which might have some possibility of preserving organics."

Organic hunt

Grotzinger agrees: "It has exceptionally high diversity for different kinds of habitable environments and it is possible that some of those might preserve organic carbon."

"Organic carbon" means any complex carbon-based molecules, whether they come from living things or some other source. For example, Mars has probably received organic carbon from meteorite impacts.

Grotzinger noted that finding organic carbon will be "a very, very difficult challenge" based on experience with Earth geology. Even though life is abundant on our home planet, ancient rocks very rarely preserve organic material, he says. "We hope to be able to look for organic carbon," he said. "What we can promise to deliver with MSL is an understanding of the environmental history of Mars."

<http://www.physorg.com/news/2011-07-japan-test-drill-seabed-ice.html>

Japan to test-drill for seabed 'burning ice'

Methane hydrates are found in environments with high pressure and low temperatures such as the ocean floor

Japan will seek to extract natural gas from seabed deposits of methane hydrate, also known as "burning ice", in the world's first such offshore experiment, a news report said Monday.

The test is scheduled for a stretch of ocean southwest of Tokyo, between Shizuoka and Wakayama prefectures, over several weeks in the fiscal year to March 2013, the Nikkei financial daily said.

The Ministry of Economy, Trade and Industry is preparing to request more than 10 billion yen (\$127.5 million) for the project, the report said. The government will support further research and aims for commercial drilling to start early in the next decade, the newspaper said.

Methane hydrates are found in environments with high pressure and low temperatures such as the ocean floors, often near continental faultlines, where the gas crystallises on contact with cold sea water.

The offshore experiment, if successful, would be the world's first, the Nikkei said. Methane was previously extracted from methane hydrate on land in Canada in 2008 using technology developed in Japan. Japan has been looking to diversify its energy resources since the powerful March 11 earthquake and tsunami triggered the world's worst nuclear accident in 25 years at the Fukushima Daiichi plant northeast of Tokyo. Resource-poor Japan relies heavily on energy imports from the Middle East and until recently met one third of its electricity needs with nuclear power, but now plans also to boost renewables such as solar and wind power.

http://www.eurekalert.org/pub_releases/2011-07/babs-ek072211.php

Epigenetic 'memory' key to nature versus nurture

Researchers explain how an organism can create a biological memory of some variable condition

Researchers funded by the Biotechnology and Biological Sciences Research Council (BBSRC) at the John Innes Centre have made a discovery, reported this evening (24 July) in *Nature*, that explains how an organism can create a biological memory of some variable condition, such as quality of nutrition or temperature. The discovery explains the mechanism of this memory – a sort of biological switch – and how it can also be inherited by offspring.

The work was led by Professor Martin Howard and Professor Caroline Dean at the John Innes Centre, which receives strategic funding from BBSRC. Funding for the project came from BBSRC, the European Research Council, and The Royal Society.

Professor Dean said "There are quite a few examples that we now know of where the activity of genes can be affected in the long term by environmental factors. And in some cases the environment of an individual can actually affect the biology or physiology of their offspring but there is no change to the genome sequence."

For example, some studies have shown that in families where there was a severe food shortage in the grandparents' generation, the children and grandchildren have a greater risk of cardiovascular disease and diabetes, which could be explained by epigenetic memory. But until now there hasn't been a clear mechanism to explain how individuals could develop a "memory" of a variable factor, such as nutrition.

The team used the example of how plants "remember" the length of the cold winter period in order to exquisitely time flowering so that pollination, development, seed dispersal and germination can all happen at the appropriate time.

Professor Howard said "We already knew quite a lot about the genes involved in flowering and it was clear that something goes on in winter that affects the timing of flowering, according to the length of the cold period."

Using a combination of mathematical modelling and experimental analysis the team has uncovered the system by which a key gene called FLC is either completely off or completely on in any one cell and also later in its progeny. They found that the longer the cold period, the higher the proportion of cells that have FLC stably flipped to the off position. This delays flowering and is down to a phenomenon known as epigenetic memory.

Epigenetic memory comes in various guises, but one important form involves histones - the proteins around which DNA is wrapped. Particular chemical modifications can be attached to histones and these modifications can then affect the expression of nearby genes, turning them on or off. These modifications can be inherited by daughter cells, when the cells divide, and if they occur in the cells that form gametes (e.g. sperm in mammals or pollen in plants) then they can also pass on to offspring.

Together with Dr Andrew Angel (also at the John Innes Centre), Professor Howard produced a mathematical model of the FLC system. The model predicted that inside each individual cell, the FLC gene should be either completely activated or completely silenced, with the fraction of cells switching to the silenced state increasing with longer periods of cold.

To provide experimental evidence to back up the model, Dr Jie Song in Prof. Dean's group used a technique where any cell that had the FLC gene switched on, showed up blue under a microscope. From her observations, it was clear that cells were either completely switched or not switched at all, in agreement with the theory.

Dr Song also showed that the histone proteins near the FLC gene were modified during the cold period, in such a way that would account for the switching off of the gene.

Professor Douglas Kell, Chief Executive, BBSRC said "This work not only gives us insight into a phenomenon that is crucial for future food security – the timing of flowering according to climate variation – but it uncovers an important mechanism that is at play right across biology. This is a great example of where the research that BBSRC funds can provide not only a focus on real life problems, but also a grounding in the fundamental tenets of biology that will underpin the future of the field. It also demonstrates the value of multidisciplinary working at the interface between biology, physics and mathematics."