http://www.eurekalert.org/pub_releases/2010-12/tau-tar122310.php

Texas A&M research shows bacteria provide example of one of nature's first immune systems

COLLEGE STATION, Texas ***Studying how bacteria incorporate foreign DNA from invading viruses into their own regulatory processes, Thomas Wood, professor in the Artie McFerrin Department of Chemical Engineering at Texas A&M University, is uncovering the secrets of one of nature's most primitive immune systems.***

His findings, which appear in "Nature Communications," a multidisciplinary publication dedicated to research in all areas of the biological, physical and chemical sciences, shed light on how bacteria have throughout the course of millions of years developed resistance to antibiotics by co-opting the DNA of their natural enemies - viruses.

The battle between bacteria and bacteria-eating viruses, Wood explains, has been going on for millions of years, with viruses attempting to replicate themselves by – in one approach – invading bacteria cells and integrating themselves into the chromosomes of the bacteria. When this happens a bacterium makes a copy of its chromosome, which includes the virus particle. The virus then can choose at a later time to replicate itself, killing the bacterium—similar to a ticking time bomb, Wood says.

However, things can go radically wrong for the virus because of random but abundant mutations that occur within the chromosome of the bacterium. Having already integrated itself into the bacterium's chromosome, the virus is subject to mutation as well, and some of these mutations, Wood explains, render the virus unable to replicate and kill the bacterium.

With this new diverse blend of genetic material, Wood says, a bacterium not only overcomes the virus' lethal intentions but also flourishes at a greater rate than similar bacteria that have not incorporated viral DNA.

"Over millions of years, this virus becomes a normal part of the bacterium," Wood says. "It brings in new tricks, new genes, new proteins, new enzymes, new things that it can do. The bacterium learns how to do things from this.

"What we have found is that with this new viral DNA that has been trapped over millions of years in the chromosome, the cell has created a new immune system," Wood notes. "It has developed new proteins that have enabled it to resists antibiotics and other harmful things that attempt to oxidize cells, such as hydrogen peroxide. These cells that have the new viral set of tricks don't die or don't die as rapidly."

Understanding the significance of viral DNA to bacteria required Wood's research team to delete all of the viral DNA on the chromosome of a bacterium, in this case bacteria from a strain of E. coli. Wood's team, led by postdoctoral researcher Xiaoxue Wang, used what in a sense could be described as "enzymatic scissors" to "cut out" the nine viral patches, which amounted to precisely removing 166,000 nucleotides. Once the viral patches were successfully removed, the team examined how the bacterium cell changed. What they found was a dramatically increased sensitivity to antibiotics by the bacterium.

While Wood studied this effect in E. coli bacteria, he says similar processes have taken place on a massive, widespread scale, noting that viral DNA can be found in nearly all bacteria, with some strains possessing as much as 20 percent viral DNA within their chromosome.

"To put this into perspective, for some bacteria, one-fifth of their chromosome came from their enemy, and until our study, people had largely neglected to study that 20 percent of the chromosome," Wood says. "This viral DNA had been believed to be silent and unimportant, not having much impact on the cell.

"Our study is the first to show that we need to look at all bacteria and look at their old viral particles to see how they are affecting the bacteria's current ability to withstand things like antibiotics. If we can figure out how the cells are more resistant to antibiotics because of this additional DNA, we can perhaps make new, effective antibiotics."

http://www.eurekalert.org/pub_releases/2010-12/uoia-tom122110.php

Team overcomes major obstacles to cellulosic biofuel production

CHAMPAIGN, Ill. — ***A newly engineered yeast strain can simultaneously consume two types of sugar from plants to produce ethanol, researchers report.***

The sugars are glucose, a six-carbon sugar that is relatively easy to ferment; and xylose, a five-carbon sugar that has been much more difficult to utilize in ethanol production. The new strain, made by combining, optimizing and adding to earlier advances, reduces or eliminates several major inefficiencies associated with current biofuel production methods. The findings, from a collaborative led by researchers at the University of Illinois, the Lawrence Berkeley National Laboratory, the University of California and the energy company BP, are described in the Proceedings of the National Academy of Sciences. The Energy Biosciences Institute, a BP-funded initiative, supported the research.

Yeasts feed on sugar and produce various waste products, some of which are useful to humans. One type of yeast, Saccharomyces cerevisiae, has been used for centuries in baking and brewing because it efficiently ferments sugars and in the process produces ethanol and carbon dioxide. The biofuel industry uses this yeast to convert plant sugars to bioethanol. And while S. cerevisiae is very good at utilizing glucose, a building block of cellulose and the primary sugar in plants, it cannot use xylose, a secondary – but significant – component of the lignocellulose that makes up plant stems and leaves. Most yeast strains that are engineered to metabolize xylose do so very slowly.

"Xylose is a wood sugar, a five-carbon sugar that is very abundant in lignocellulosic biomass but not in our food," said Yong-Su Jin, a professor of food science and human nutrition at Illinois. He also is an affiliate of the U. of I. Institute for Genomic Biology and a principal investigator on the study. "Most yeast cannot ferment xylose." A big part of the problem with yeasts altered to take up xylose is that they will suck up all the glucose in a mixture before they will touch the xylose, Jin said. A glucose transporter on the surface of the yeast prefers to bind to glucose.

"It's like giving meat and broccoli to my kids," he said. "They usually eat the meat first and the broccoli later."

The yeast's extremely slow metabolism of xylose also adds significantly to the cost of biofuels production.

Jin and his colleagues wanted to induce the yeast to quickly and efficiently consume both types of sugar at once, a process called co-fermentation. The research effort involved researchers from Illinois, the Lawrence Berkeley National Laboratory, the University of California at Berkeley, Seoul National University and BP.

In a painstaking process of adjustments to the original yeast, Jin and his colleagues converted it to one that will consume both types of sugar faster and more efficiently than any strain currently in use in the biofuel industry. In fact, the new yeast strain simultaneously converts cellobiose (a precursor of glucose) and xylose to ethanol just as quickly as it can ferment either sugar alone.

"If you do the fermentation by using only cellobiose or xylose, it takes 48 hours," said postdoctoral researcher and lead author Suk-Jin Ha. "But if you do the co-fermentation with the cellobiose and xylose, double the amount of sugar is consumed in the same amount of time and produces more than double the amount of ethanol. It's a huge synergistic effect of co-fermentation."

The new yeast strain is at least 20 percent more efficient at converting xylose to ethanol than other strains, making it "the best xylose-fermenting strain" reported in any study, Jin said.

The team achieved these outcomes by making several critical changes to the organism. First, they gave the yeast a cellobiose transporter. Cellobiose, a part of plant cell walls, consists of two glucose sugars linked together. Cellobiose is traditionally converted to glucose outside the yeast cell before entering the cell through glucose transporters for conversion to ethanol. Having a cellobiose transporter means that the engineered yeast can bring cellobiose directly into the cell. Only after the cellobiose is inside the cell is it converted to glucose.

This approach, initially developed by co-corresponding author Jamie Cate at the Lawrence Berkeley National Laboratory and the University of California at Berkeley, eliminates the costly step of adding a cellobiose-degrading enzyme to the lignocellulose mixture before the yeast consumes it.

It has the added advantage of circumventing the yeast's own preference for glucose. Because the glucose can now "sneak" into the yeast in the form of cellobiose, the glucose transporters can focus on drawing xylose into the cell instead. Cate worked with Jonathan Galazka, of UC Berkeley, to clone the transporter and enzyme used in the new strain. The team then tackled the problems associated with xylose metabolism. The researchers inserted three genes into S. cerevisiae from a xylose-consuming yeast, Picchia stipitis.

Graduate student Soo Rin Kim at the University of Illinois identified a bottleneck in this metabolic pathway, however. By adjusting the relative production of these enzymes, the researchers eliminated the bottleneck and boosted the speed and efficiency of xylose metabolism in the new strain.

They also engineered an artificial "isoenzyme" that balanced the proportion of two important cofactors so that the accumulation of xylitol, a byproduct in the xylose assimilitary pathway, could be minimized. Finally, the team used "evolutionary engineering" to optimize the new strain's ability to utilize xylose.

The cost benefits of this advance in co-fermentation are very significant, Jin said.

"We don't have to do two separate fermentations," he said. "We can do it all in one pot. And the yield is even higher than the industry standard. We are pretty sure that this research can be commercialized very soon."

Jin noted that the research was the result of a successful collaboration among principal investigators in the Energy Biosciences Institute and a BP scientist, Xiaomin Yang, who played a key role in developing the co-fermentation concept and coordinating the collaboration.

Editor's note: *To reach Yong-Su Jin, call 217-333-7981; e-mail ysjin@illinois.edu.*

The paper, "Engineered Saccharomyces cerevisiae capable of simultaneous cellobiose and xylose fermentation," is available from the UI News Bureau.

http://www.physorg.com/news/2010-12-enzyme-cocktail-biofuel.html

Enzyme cocktail could eliminate a step in biofuel process

Conversion of biomass to fuel requires several steps: chemical pretreatment to break up the biomass – often dilute (sulfuric) acid, detoxification to remove the toxic chemicals required in pretreatment, and microbial fermentation to convert the soluble sugars to fuels.

Virginia Tech researchers have discovered an enzyme mixture that works in the presence of the toxic infused liquid biomass (hydrolysate), meaning that the detoxification step is unnecessary, reducing the cost of producing biofuels as well as increasing biofuel yields by avoiding the production of by-products and synthesis of cell mass. The research will be published in the January 2011 issue of the journal Chemistry & Biology.

"Enzymes self-assemble a cell-free synthetic pathway; that is, we can put the desired biological reactions to work without the other complex interactions that take place within a cell," said Y.H. Percival Zhang, associate professor of biological systems engineering at Virginia Tech.

"In microbial fermentations, glucose serves as both a growth substrate and a source of energy for generating a reduced power -- NADPH. In fact, only a small fraction of glucose is allocated to NADPH generation," he says. "The cell-free synthetic pathway process increases efficiency and reaction rate."

"By using an enzyme cocktail consisting of 12 purified enzymes and coenzymes, this work has also demonstrated that the enzyme cocktail systems can work in the presence of microorganism-toxic compounds from dilute-acid pretreated biomass, suggesting that enzyme systems do not require high-purity substrates for biotransformation," said Zhang. "In other words, after pretreatment, we can do bioconversion directly, followed by chemical catalysis," he said.

The article, "Biohydrogenation from Biomass Sugar Mediated by in vitro Synthetic Enzymatic Pathways," was written by Yiran Wang, research scientist in biological systems engineering at Virginia Tech; Weidong Huang, visiting scholar from the University of Science and Technology of China; Noppadon Sathitsuksanoh and Zhiguang Zhu; biological systems engineering Ph.D. students at Virginia Tech; and Zhang.

A previously published article by Huang and Zhang compared the production of four biofuels – ethanol, butanol, fatty acide ethyl ester, and hydrogen, and report that hydrogen production through the synthetic pathway process is the most efficient for biofuels production. "Also, this analysis suggested that it was nearly economically impossible to produce advanced biofuels through aerobic fermentation as compared to anaerobic fermentations and enzyme cocktails," said Zhang.

More information: The article, "Analysis of biofuels production from sugar based on three criteria: thermodynamics, bioenergetics, and product separation," appears in the advanced online Dec. 16, 2010 edition of the journal Energy & Environmental Science (http://pubs.rsc.or … E/C0EE00069H). Provided by Virginia Tech

http://www.physorg.com/news/2010-12-ceiling-minn-coded-internet.html

Ceiling lights in Minn. send coded Internet data

(AP) -- ***Flickering ceiling lights are usually a nuisance, but in city offices in St. Cloud, they will actually be a pathway to the Internet.***

The lights will transmit data to specially equipped computers on desks below by flickering faster than the eye can see. Ultimately, the technique could ease wireless congestion by opening up new expressways for short-range communications. The first few light fixtures built by LVX System, a local startup, will be installed Wednesday in six municipal buildings in this city of 66,000 in the snowy farm fields of central Minnesota. The LVX system puts clusters of its light-emitting diodes, or LEDs, in a standard-sized light fixture. The LEDs transmit coded messages - as a series of 1s and 0s in computer speak - to special modems attached to computers.

A light on the modem talks back to the fixture overhead, where there is sensor to receive the return signal and transmit the data over the Internet. Those computers on the desks aren't connected to the Internet, except through these light signals, much as Wi-Fi allows people to connect wirelessly.

LVX takes its name from the Latin word for light, but the underlying concept is older than Rome; the ancient Greeks signaled each other over long distances using flashes of sunlight off mirrors and polished shields. The Navy uses a Morse-coded version with lamps. The first generation of the LVX system will transmit data at speeds of about 3 megabits per second, roughly as fast as a residential DSL line.

Mohsen Kavehrad, a Penn State electrical engineering professor who has been working with optical network technology for about 10 years, said the approach could be a vital complement to the existing wireless system.

He said the radio spectrum usually used for short-range transmissions, such as Wi-Fi, is getting increasingly crowded, which can lead to slower connections. "Light can be the way out of this mess," said Kavehrad, who is not involved in the LVX project. But there are significant hurdles. For one, smart phones and computers already work on Wi-Fi networks that are much faster than the LVX system.

Technology analyst Craig Mathias of the Farpoint Group said the problems with wireless congestion will ease as Wi-Fi evolves, leaving LVX's light system to niche applications such as indoor advertising displays and energy management.

LVX Chief Executive Officer John Pederson said a second-generation system that will roll out in about a year will permit speeds on par with commercial Wi-Fi networks. It will also permit lights that can be programmed to change intensity and color.

For the city, the data networking capability is secondary. The main reason it paid a $10,000 installation fee for LVX is to save money on electricity down the line, thanks to the energy-efficient LEDs. Pederson said one of his LED fixtures uses about 36 watts of power to provide the same illumination that 100 watts provides with a standard fluorescent fixture.

Besides installation costs, customers such as St. Cloud will pay LVX a monthly fee that's less than their current lighting expenses. LVX plans to make money because the LED fixtures are more durable and efficient than standard lighting. At least initially, the data transmission system is essentially a bonus for customers.

Pederson said the next generation of the system should get even more efficient as fixtures become "smart" so the lights would dim when bright sunlight is coming through a window or when a conference room or hallway is empty. Because the lights can also change color, Pederson said they could be combined with personal locators or tiny video cameras to help guide people through large buildings. The lights could show a trail of green lights to an emergency exit, for instance.

While Kavehrad and Mathias credited LVX for being the first company in the United States to bring the technology to market, Kavehrad said it trails researchers and consumer electronics companies in Japan and Korea in developing products for visible-light networks. Pederson's previous company, 911 EP, built high-powered LED roof lights for squad cars and other emergency vehicles. He said he sold the company in 2002. He said the visible-light network grew out his interest in LEDs that goes to the mid-1990s.

The Minneapolis-St. Paul International Airport, which pays for 24-hour lighting and replacing fluorescent bulbs on high ceilings, is considering an LVX system, said Jeffrey W. Hamiel, executive director of the Metropolitan Airports Commission. The system might include mounting cameras on the light fixtures to bolster the airport security system, but the real attraction is the savings on electricity and maintenance.

"Anything we can do to save costs is worth consideration," he said.

Michael Williams, the city administrator in St. Cloud, said the city had been considering LVX for some time.

"It's pretty wild stuff," he said. "They have been talking about it with us for couple of years, and frankly it took a while for it to sink in."

http://www.scientificamerican.com/blog/post.cfm?id=fossilized-food-stuck-in-neandertal-2010-12-27

Fossilized food stuck in Neandertal teeth indicates plant-rich diet

By Katherine Harmon

Ancient humans' lax dental hygiene has been a boon for researchers looking for clues about early diets. Traces of fossilized foodstuffs wedged between Neandertal teeth have revealed plentiful traces of grains and other plants, supporting the theory that these heavy-browed humans were not just meat-eaters.

"Many researchers have proposed biologically or technologically mediated dietary differences" between modern humans and Neandertals as a key cause of the latter's extinction, and "some scenarios have focused on the apparent lack of plant foods in Neandertal diets," a team of researchers noted in a new study. Scattered evidence has placed plant products on the scene of Neandertal sites, but these traces had been "fragmentary and not always unequivocally linked to diet."

Fortunately for paleobiologists, the mineralization process quickly "traps and preserves many components of the oral environment, including bacteria and food particles," leaving traces of Middle Paleolithic meals in the mouths that ate them.

After analyzing a selection of these particles from European and Middle Eastern Neandertal dental remains, the team found "direct evidence for Neanderthal consumption of a variety of plant foods." Researchers examined content found on seven teeth from three individuals—two unearthed in Belgium and one in Iraq. The study, led by Amanda Henry of the Center for the Advanced Study of Hominid Paleobiology, was published online December 27 in Proceedings of the National Academy of Sciences.

Some of the Paleolithic snacks seem to have included legumes, date palms and grass seeds. The grasses were from the Triticeae group, which includes wild varieties of barley, rye and wheat relatives.

In addition to profiling the types of found-foods these ancient humans were consuming, the researchers were also able to assess some of the preparation methods, which included cooking. This culinary step "represents a

significant shift in human behavior, by improving the nutritional quality of plant foods and potentially altering the social organization of human groups," the researcher noted.

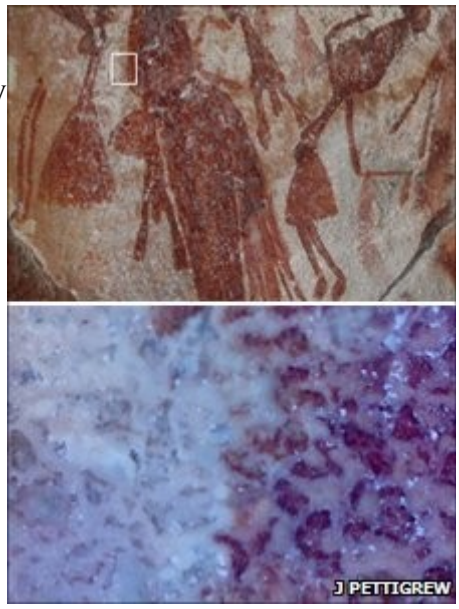
From the individual from the Iraq site (Shanidar Cave), for example, the team found that 42 percent of the recovered starch was from cooked materials, though Henry and her colleagues "expect that the actual proportion of cooked foods within the diet of this individual was probably much higher." To better assess starch grains from the samples, the researchers tried cooking similar plant products and found that heating the starches for more than half an hour rendered them largely unidentifiable, and thus they would not have been categorizable in fossil form.

The new findings suggest, "an overall sophistication in Neanderthal dietary regimes" and that "Neanderthals were capable of complex-food gathering behaviors that included both hunting of large game animals and the harvesting and processing of plant foods," the researchers concluded. Thankfully for the researchers, these early humans' tool selection did not likely include floss.

http://www.bbc.co.uk/news/science-environment-12039203

Ancient rock art's colours come from microbes

A particular type of ancient rock art in Western Australia maintains its vivid colours because it is alive, researchers have found.



While some rock art fades in hundreds of years, the "Bradshaw art" remains colourful after at least 40,000 years. Jack Pettigrew of the University of Queensland in Australia has shown that the paintings have been colonised by colourful bacteria and fungi. These "biofilms" may explain previous difficulties in dating such rock art.

Professor Pettigrew and his colleagues studied 80 of these Bradshaw rock artworks - named for the 19th-Century naturalist who first identified them - in 16 locations within Western Australia's Kimberley region.

They concentrated on two of the oldest known styles of Bradshaw art - Tassel and Sash - and found that a vast majority of them showed signs of life, but no paint. The team dubbed the phenomenon "Living pigments".

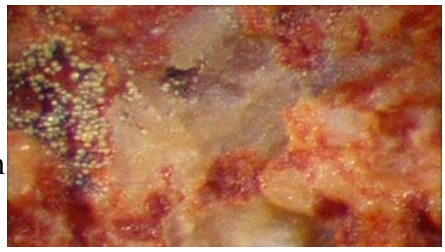
"'Living pigments' is a metaphorical device to refer to the fact that the pigments of the original paint have been replaced by pigmented micro-organisms," Professor Pettigrew told BBC News.

"These organisms are alive and could have replenished themselves over endless millennia to explain the freshness of the paintings' appearance."

Bradshaw art (J Pettigrew) The indicated region (white box) shows black fungi at a sharp boundary

Among the most frequent inhabitants of the boundaries of the artwork was a black fungus, thought to be of the group of fungi known as Chaetothyriales. Successive generations of these fungi grow by cannibalising their predecessors. That means that if the initial paint layer - from tens of thousands of years ago - had spores of the fungus within it, the current fungal inhabitants may be direct descendants.

The team also noted that the original paint may have had nutrients in it that "kick-started" a mutual relationship between the black fungi and red bacteria that often appear together. The fungi can provide water to the bacteria, while the bacteria provide carbohydrates to the fungi.



The exact species involved in these colourations have yet to be identified, and Professor Pettigrew said that the harsh conditions in the Kimberley region may hamper future research. However, even the suggestion of these "living pigments" may explain why attempts to date some rock art has shown inconsistent results: although the paintings may be ancient, the life that fills their outlines is quite recent.

Close-up of Bradshaw art (J Pettigrew) Black fungi with yellow "fruiting bodies" (left), alongside red bacteria, give one work its colours

"Dating individual Bradshaw art is crucial to any further understanding of its meaning and development," Professor Pettigrew said. "That possibility is presently far away, but the biofilm offers a possible avenue using DNA sequence evolution. We have begun work on that but this will be a long project."

Didier Bouakaze-Khan, a rock art expert from University College London, said that "there's a general consensus that what we're looking at might not purely be pigment as it was applied when the depictions were made", but that studies like this one would help archaeologists worldwide to take into account what effects life itself may be having on the art. "It's very interesting and very exciting what they're showing - that there's some

microorganisms going into the pigments and not destroying them, which is usually what's associated with the effect," he told BBC News.

Speaking about African rock artists, he said that "they had an intimate knowledge of ingredients theye were using and knew how long they would last, the rate of decay and how dark they would go and so on - not necessarily them controlling it, but they were definitely aware."

As such, Dr Bouakaze-Khan said it would be interesting to investigate whether the Bradshaw artists knew about the long-term effects of the specific pigments they used in their works.

http://www.nytimes.com/2010/12/28/health/research/28longevity.html

Aging: Paying the Physical Price for Longer Life

By NICHOLAS BAKALAR

Americans are living longer, but those added years are more likely to be a time of disease and disability.

An analysis of government data has found that while life expectancy has steadily increased over the past decade, the prevalence of heart disease, stroke, cancer and diabetes has also increased, and disability has grown as well.

For example, in 1998 about 16 percent of men in their 70s had a mobility problem — that is, they failed one of four commonly used physical tests. By 2006, almost 25 percent failed at least one.

Writing in the January issue of The Journal of Gerontology B, the authors conclude that people live longer not because they are less likely to get sick, but because they survive longer with disease.

As a result, a 20-year-old man today can expect to live about a year longer than a 20-year-old in 1998, but will spend 1.2 years more with a disease, and 2 more years unable to function normally.

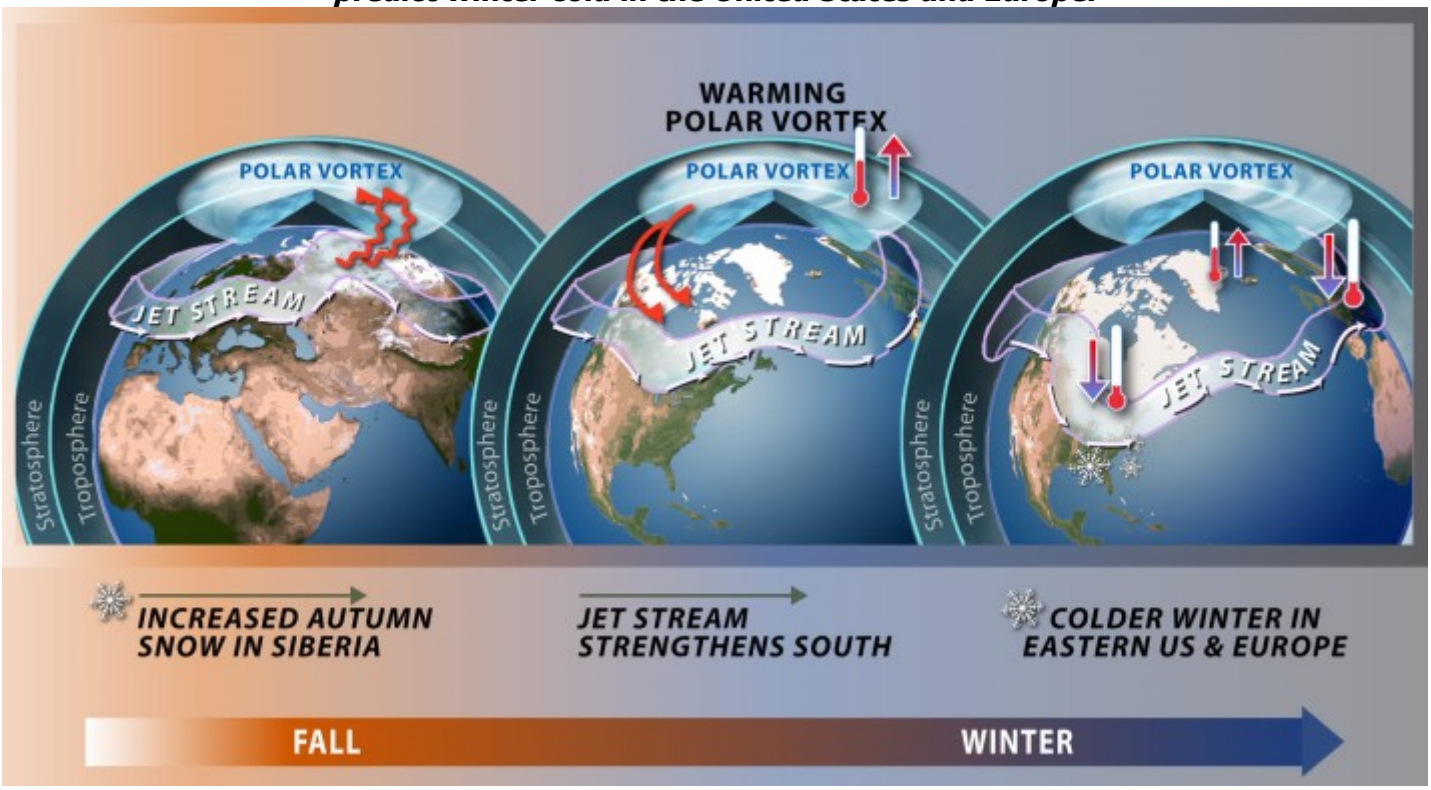
The lead author, Eileen M. Crimmins, a professor of gerontology at the University of Southern California, said that while we have been very successful in increasing the length of life, it comes at a cost.

“Longer life is what we want,” she said. “But we’re going to have to pay for it with more treatment of diseases and accommodations for disability.”

http://www.nsf.gov/news/mmg/mmg_disp.cfm?med_id=66461&from=mmg

New Model for Predicting Snowfall

Researchers have validated a new weather prediction model that uses autumn snowfall to predict winter cold in the United States and Europe.



Researchers have validated a new weather prediction model that uses autumn snowfall to predict winter cold in the United States and Europe. When snowfall is high in Siberia, the resultant cold air enhances atmospheric disturbances, which propagate into the upper level of the atmosphere, or stratosphere, warming the polar vortex. When the polar vortex warms, the jet stream is pushed south leading to colder winters across the eastern United states and Europe. Conversely, under these conditions the Arctic will have a warmer than average winter.

http://www.climatecentral.org/gallery/graphics/arctic-paradox-warmer-arctic-may-mean-colder-winters-for-some/

Arctic Paradox: Warmer Arctic May Mean Cold Blasts for Some

Blasts of cold and snow have gripped Europe and the United States in recent weeks, from Minneapolis to Paris. These weather conditions are leading to speculation about the role climate change may be playing in altering such extreme events.

Recent scientific studies have shown that the dramatic warming that has been occurring in the Arctic during the past few decades, along with the associated loss of sea ice cover, may be changing atmospheric circulation patterns throughout the northern hemisphere.

This could be contributing to the recent outbreaks of unusually cold and snowy weather. Sea ice loss during the spring and summer melt season, which leaves a thinner and more sparse ice cover throughout the fall and early winter, is a key suspect in influencing winter weather patterns.

When the ice melts, it allows incoming solar radiation to warm water and air temperatures, which in turn has an influence on atmospheric pressure and circulation, and may help shift Arctic air southward, while the Arctic remains unusually warm.

One meteorologist has described the pattern this way: "This pattern is kind of like leaving the refrigerator door ajar — the refrigerator warm up, but all the cold air spills out into the house."

Scientists refer to weather patterns featuring an abnormally mild Arctic and an unusually cold U.S. and Europe as the "Warm Arctic/Cold Continents Pattern," which is the subject of ongoing research. There are many sources of natural climate variability, such as the North Atlantic Oscillation, that also play a key role in favoring cold and snowy conditions in parts of the U.S. and Europe.

http://www.eurekalert.org/pub_releases/2010-12/wuso-php122810.php

Protein helps parasite survive in host cells

Researchers at Washington University School of Medicine in St. Louis have learned why changes in a single gene, ROP18, contribute substantially to dangerous forms of the parasite Toxoplasma gondii.

The answer has likely moved science a step closer to new ways to beat Toxoplasma and many other parasites. In a study published in Cell Host & Microbe, scientists show that the ROP18 protein disables host cell proteins that would otherwise pop a protective bubble the parasite makes for itself.

Toxoplasma gondii and other related parasites surround themselves with a membrane to protect against factors in host cells that would otherwise kill them. Scientists at Washington University School of Medicine in St. Louis have identified a parasite protein that protects this membrane from host proteins that can rupture it. Accoding to the researchers, disabling the parasite's defensive protein could help give hosts an advantage in the battle against infection. **Credit: Wandy Beatty/Washington University School of Medicine in St. Louis**

The parasite puts the bubble on like a spacesuit by forming a membrane around itself when it enters host cells. This protects it from the hostile environment inside the cell, which would otherwise kill it.

"If we can find therapies that block ROP18 and other parasite proteins like it, that could give the host the upper hand in the battle against infection," says first author Sarah Fentress, a graduate student in the laboratory of L. David Sibley, PhD, professor of molecular microbiology.

Infection with Toxoplasma, or toxoplasmosis, is most familiar to the general public from the recommendation that pregnant women avoid changing cat litter. Cats are commonly infected with the parasite, as are some livestock and wildlife.

"The exact role of ROP18 and related proteins in human disease remains to be studied," says Sibley. "But mice are natural hosts of Toxoplasma, so studies in laboratory mice are relevant to the spread of infection."

Epidemiologists estimate that as many as one in every four humans is infected with Toxoplasma. Infections typically cause serious disease only in patients with weakened immune systems. In some rare cases, though, infection in patients with healthy immune systems leads to serious eye or central nervous system disease, or congenital defects or death in the fetuses of pregnant women.

In the new study, Fentress showed that the ROP18 protein binds to a class of host proteins known as immunity-related GTPases. Tests in cell cultures and animal models showed that this binding leads to a reaction that disables the GTPases, which normally would rupture the parasite's protective membrane.

"With one exception, humans don't have the same family of immunity-related GTPases," Fentress notes. "But we do have a similar group of immune recognition proteins called guanylate-binding proteins, and we are currently testing to see if ROP18 deactivates these proteins in human cells in a similar manner."

The findings could be applicable to other parasites and pathogens. Toxoplasmosis belongs to a family of parasites that includes the parasite Plasmodium, which causes malaria. All surround themselves with protective membranes when they enter host cells.

"Plasmodium doesn't make ROP18, but it does secrete related proteins called FIKK," says Fentress. "It's possible they also act to thwart host defense mechanisms like GTPases and guanylate-binding proteins."

Fentress SJ, Behnke MS, Dunay Ir, Mashayekhi M, Rommereim LM, Fox BA, Bzik DJ, Taylor GA, Turk BE, Lichti CF, Townsend RR, Qiu W, Hui R, Beatty WL, Sibley LD. Phosphorylation of immunity-related GTPases by a Toxoplasma gondii-secreted kinase promotes macrophage survival and virulence. Cell Host & Microbe, Dec. 22, 2010.

This research was supported by the National Institutes of Health and the Veteran's Administration.

http://www.jpost.com/Sci-Tech/Article.aspx?id=201076

Homo sapiens lived in Eretz Yisrael 400,000 years ago

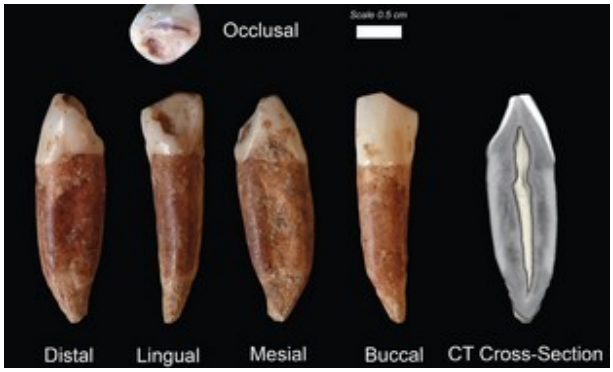
By JUDY SIEGEL-ITZKOVICH

Teeth found near Rosh Ha'ayin older than anything uncovered in Africa.

Eight human teeth dating back as far as 400,000 years ago and found at the prehistoric Qesem Cave near Rosh Ha'ayin – discovered recently by Tel Aviv University researchers – are "the world's earliest evidence" of modern man (Homo sapiens).

Until now, remains of humans from only 200,000 years ago have been found in Africa, and the accepted approach has been that modern man originated on that continent.

Long before the land was called Israel and the residents Jews, Homo sapiens lived here twice as long ago as was previously believed, the researchers wrote in the latest (December) edition of the American Journal of Physical Anthropology.



Teeth found at the Qesem cave near Rosh Ha'ayin **Photo by: Prof. Israel Hershkowitz/TAU**

The cave was uncovered in 2000 by Prof. Avi Gopher and Dr. Ran Barkai of TAU's Institute of Archeology. Later, Prof. Israel Hershkowitz of the Department of Anatomy and Anthropology at TAU's Sackler School of Medicine and an international team of scientists performed a morphological analysis on the teeth found in the cave. The examination included CT scans and X-rays indicating the size and shape of the teeth are very similar to those of modern man. The teeth found in the cave are also very similar to evidence of modern man dated to around 100,000 years ago that had previously been discovered in the Skhul Cave on Mount Carmel and the Qafzeh Cave in the Lower Galilee near Nazareth.

The Qesem Cave is dated between 400,000 and 200,000 years ago, and archeologists working there believe that the findings indicate significant changes in the behavior of ancient man. This period of time was crucial in the history of mankind from cultural and biological perspectives, and the fact that teeth of modern man were discovered indicates that these changes are apparently related to evolutionary changes taking place at that time, they maintained.

Gopher and Barkai noted that the findings that characterize the culture of those who dwelled in the Qesem Cave – the systematic production of flint blades, the habitual use of fire, evidence of hunting, cutting and sharing of animal meat, mining raw materials to produce flint tools from subsurface sources and much more – reinforce the hypothesis that this was, in fact, innovative and pioneering behavior that corresponds with the appearance of modern man.

The specimens, date back to the Middle Pleistocene era, include permanent and deciduous teeth. They were thus placed chronologically earlier than the bulk of fossil hominin specimens previously known from southwest Asia. Although none of the Qesem teeth resemble those of pre-Homo sapiens Neanderthals, a few traits may suggest some affinities with members of the Neanderthal evolutionary lineage, but the balance of the evidence suggests a closer similarity with the Skhul-Qafzeh dental material, said Gopher and Barkai.

According to the researchers, the discoveries made in the Qesem Cave may change the perception that has been widely accepted to date in which modern man originated on the continent of Africa. In recent years, archeological evidence and human skeletons have been discovered in Spain and China that are liable to undermine this perception, but the findings now uncovered at Qesem are significant and invaluable, and their early age is undoubtedly an extraordinary archeological discovery, said Gopher and Barkai.

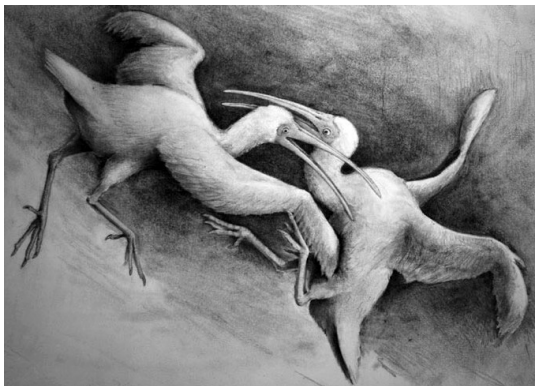
As excavations at the cave continue, the researchers hope to uncover additional discoveries that will enable them to confirm the findings published up to now and to enhance their understanding of the evolution of mankind and especially the appearance of modern man.

http://news.discovery.com/animals/extinct-birds-club-weapon-101228.html#mkcpgn=rssnws1

Extinct Bird Swung Wings Like a Club

Before humans wiped them out, these fighting birds would clobber each other over territory.

By Jennifer Viegas | Tue Dec 28, 2010 07:01 PM ET



Some dinosaurs had club-like tails that they smacked into foes, and now researchers have discovered that the wings of an extinct Jamaican bird evolved into similar structures that the bird would use to clobber rivals during fights. The bird, Xenicibis xympithecus, is the first known animal that had limbs modified to serve as a club/flail, according to the authors of the study. The paper is published in the latest Proceedings of the Royal Society B.

Before the flightless bird went extinct around 10,000 years ago, it must have engaged in some fierce fighting at its island nation home. Unearthed fossilized remains retain signs of traumatic injuries sustained from delivering or receiving blows.

Two of these extinct birds appear in-flight in the middle of a fight in this illustration. Nick Longrich

"I would guess that they would try to grab each other using the beak and then just proceed to pound each other using the wings," lead author Nicholas Longrich told Discovery News.

Longrich, a post doctoral associate in the Department of Geology and Geophysics at Yale University, and colleague Storrs Olson made the determination after analyzing the remains of the bird, which was a relatively large long-billed, long-legged wading ibis. They immediately noticed the bird's "bizarre" wings.

"The arm is long and spindly, and the hand bones are enlarged, curved and expanded so that the hand looks like a banana," Longrich said, adding that both females and males had these unusually modified wings.

He and Olson believe the wings functioned like handled clubs and flails, with the arms being the "handles" of the weapons, increasing the angular velocity of the weighted "club" at the end. The bird could then swing its wings, delivering sharp blows whenever the enlarged hand bones struck an opponent.

Since ibises are monogamous and there probably weren't a lot of animal predators going after the bird, the researchers suspect most fights had to do with staking out home turf.

"There were a lot of birds fighting over the same territories," Longrich explained. "The best fighters -- the ones with the best weapons -- were able to secure a good territory and reproduce."

A number of birds use their wings as weapons. The scientists note that some birds, including screamers, certain jacanas, the spur-winged goose, the torrent duck and nine species of lapwing, employ sharp spurs. Other birds, such as steamer ducks, sheathbills, stone curlews and swans, bear a bony knob on their wings. Two jacanas, Actophilornis and Irediparra, even have triangular blades on their wings. But no bird -- and no other vertebrate living or extinct -- possessed limbs modified to serve as a jointed club or flail that could be swung, according to the scientists. The unique method of defense was likely no match for humans, however, since the extinction of Xenicibis likely happened after people colonized Jamaica.

"Humans wiped out flightless birds like the dodo and the moa wherever they went, so my guess is that Xenicibis shared their fate," Longrich said.

Richard Prum, chair of Yale's Department of Ecology & Evolutionary Biology, told Discovery News that Longrich and Olson make "a good argument for a novel combat function for the flightless forelimbs of this weaponized ibis. Clearly there is much more to learn about avian diversity."

Helen James, curator of birds at the Smithsonian National Museum of Natural History, believes "the authors are correct that the wing had evolved to serve as a specialized weapon."

"I can just imagine the rapid-fire blows that these ibises could deliver with their flail-like wings," she added.

http://www.voanews.com/english/news/science-technology/Scientists-Using-Giant-Rats-to-Diagnose-TB-112376629.html

Scientists Using Giant Rats to Diagnose TB

Jessica Berman | Washington23 December 2010

Scientists say they've found a method for detecting tuberculosis: an African rat.

Researchers say the sniffing powers of the African pouched rat can help detect TB in sputum samples more efficiently and at a lower cost than lab technicians using microscopes. Researchers at a non-profit medical research facility in Tanzania, called APOPO had a hunch about the African pouched rat.

Knowing that the rodent has a keen sense of smell, APOPO researchers wondered if they could train the rats to detect the odor of the tuberculosis bacterium in infected samples of human sputum.

The rodent, which weighs about a kilogram and gets its name from giant cheek pouches it stuffs full of food, is native to sub-Saharan Africa, where the tuberculosis infection rate is the highest in the world. Investigators conducted a head-to-head comparison of the rats' ability to smell tuberculosis against the skills of laboratory technicians testing more than 10,500 sputum samples gathered from patients from five TB treatment centers in Tanzania. Using conventional microscopic analysis, technicians found that just over 13 percent of the sputum samples were positive for tuberculosis.

The same samples were then analyzed by a group of 10 rats in a special sniffer cage, and the second-line screening by the animals picked up an additional 620 new TB-positive patients, a 44 percent increase over the tuberculosis detection rate by technicians. Alan Poling, a psychologist at Western Michigan University in Kalamazoo, led the study. Poling is not prepared at this point to say that the pouched rats are better at detecting TB than trained technicians using microscopes. But he says the animals are a lot quicker.

"They can test hundreds of samples a day," said Poling. "And we essentially get results immediately. A microscopist can do 20 to 40 samples a day, so it's very slow for microscopists. It's also not very accurate. They miss a lot of positives."

The rats work in a long, narrow stainless steel cage with ten small wells, or holes set into the floor. Each hole contains a sputum sample. The animals walk the length of the cage, sniffing each hole.

They have been trained to stop and linger at a hole if it contains a sputum sample that is TB-positive. If the rodents stop for at least five seconds at a hole, they are rewarded with a treat, according to Poling, who says the rats are tireless workers. "They work for bananas. They love bananas. So, they'll work endlessly for a mouthful of banana," added Poling.

The best diagnostic test for tuberculosis is to culture a sputum sample to check for the presence of growing bacteria. But that process can take weeks because the tuberculosis bacterium grows very slowly.

Health experts are not sure about the value of recruiting rats in the global campaign against TB. Peter Hotez, president of the American Society of Tropical Medicine and Hygiene in Washington, says using rats to detect TB is fine, but other methods may be needed. "I don't know if this giant rat approach - pouched rats - is going to be the be all and end all of detecting tuberculosis," said Hotez. "I think we can do even better than that in terms of a test that is widely applicable. But it points out the importance of being innovative and trying to maximize our approaches."

If it turns out that the pouched rats are more accurate for first line detection of tuberculosis than laboratory microscopy, investigator Alan Poling of Western Michigan University envisions taking the rats to remote areas to diagnose TB. A study of the use of giant African rats to detect tuberculosis in lab samples is published in the December issue of the American Journal of Tropical Medicine and Hygiene. TB accounts for 3 million deaths annually.

http://www.bbc.co.uk/news/technology-12012082

Earth project aims to 'simulate everything'

By Gareth Morgan Technology reporter

It could be one of the most ambitious computer projects ever conceived.

An international group of scientists are aiming to create a simulator that can replicate everything happening on Earth - from global weather patterns and the spread of diseases to international financial transactions or congestion on Milton Keynes' roads. Nicknamed the Living Earth Simulator (LES), the project aims to advance the scientific understanding of what is taking place on the planet, encapsulating the human actions that shape societies and the environmental forces that define the physical world.

"Many problems we have today - including social and economic instabilities, wars, disease spreading - are related to human behaviour, but there is apparently a serious lack of understanding regarding how society and the economy work," says Dr Helbing, of the Swiss Federal Institute of Technology, who chairs the FuturICT project which aims to create the simulator.

Knowledge collider

Thanks to projects such as the Large Hadron Collider, the particle accelerator built by Cern, scientists know more about the early universe than they do about our own planet, claims Dr Helbing. What is needed is a knowledge accelerator, to collide different branches of knowledge, he says. "Revealing the hidden laws and processes underlying societies constitutes the most pressing scientific grand challenge of our century."

The result would be the LES. It would be able to predict the spread of infectious diseases, such as Swine Flu, identify methods for tackling climate change or even spot the inklings of an impending financial crisis, he says.

But how would such colossal system work?

For a start it would need to be populated by data - lots of it - covering the entire gamut of activity on the planet, says Dr Helbing. It would also be powered by an assembly of yet-to-be-built supercomputers capable of carrying out number-crunching on a mammoth scale.

Although the hardware has not yet been built, much of the data is already being generated, he says.

For example, the Planetary Skin project, led by US space agency Nasa, will see the creation of a vast sensor network collecting climate data from air, land, sea and space.

In addition, Dr Helbing and his team have already identified more than 70 online data sources they believe can be used including Wikipedia, Google Maps and the UK government's data repository Data.gov.uk.

Drowning in data

Integrating such real-time data feeds with millions of other sources of data - from financial markets and medical records to social media - would ultimately power the simulator, says Dr Helbing.

The next step is create a framework to turn that morass of data in to models that accurately replicate what is taken place on Earth today. That will only be possible by bringing together social scientists and computer scientists and engineers to establish the rules that will define how the LES operates.

Such work cannot be left to traditional social science researchers, where typically years of work produces limited volumes of data, argues Dr Helbing.

Nor is it something that could have been achieved before - the technology needed to run the LES will only become available in the coming decade, he adds.

Human behaviour

For example, while the LES will need to be able to assimilate vast oceans of data it will simultaneously have to understand what that data means. That becomes possible as so-called semantic web technologies mature, says Dr Helbing.

Today, a database chock-full of air pollution data would look much the same to a computer as a database of global banking transactions - essentially just a lot of numbers. But semantic web technology will encode a description of data alongside the data itself, enabling computers to understand the data in context.

What's more, our approach to aggregating data stresses the need to strip out any of that information that relates directly to an individual, says Dr Helbing. That will enable the LES to incorporate vast amounts of data relating to human activity, without compromising people's privacy, he argues.

Once an approach to carrying out large-scale social and economic data is agreed upon, it will be necessary to build supercomputer centres needed to crunch that data and produce the simulation of the Earth, says Dr Helbing.

Generating the computational power to deal with the amount of data needed to populate the LES represents a significant challenge, but it's far from being a showstopper. If you look at the data-processing capacity of Google, it's clear that the LES won't be held back by processing capacity, says Pete Warden, founder of the OpenHeatMap project and a specialist on data analysis.

While Google is somewhat secretive about the amount of data it can process, in May 2010 it was believed to use in the region of 39,000 servers to process an exabyte of data per month - that's enough data to fill 2 billion CDs every month.

Reality mining

If you accept that only a fraction of the "several hundred exabytes of data being produced worldwide every year… would be useful for a world simulation, the bottleneck won't be the processing capacity," says Mr Warden.

"Getting access to the data will be much more of a challenge, as will figuring out something useful to do with it," he adds. Simply having lots of data isn't enough to build a credible simulation of the planet, argues Warden. "Economics and sociology have consistently failed to produce theories with strong predictive powers over the last century, despite lots of data gathering. I'm sceptical that larger data sets will mark a big change," he says. "It's not that we don't know enough about a lot of the problems the world faces, from climate change to extreme poverty, it's that we don't take any action on the information we do have," he argues.

Regardless of the challenges the project faces, the greater danger is not attempting to use the computer tools we have now - and will have in future - to improve our understanding of global socio-economic trends, says Dr Helbing. "Over the past years, it has for example become obvious that we need better indicators than the gross national product to judge societal development and well-being," he argues.

At it's heart, the LES is about working towards better methods to measure the state of society, he says, which would account for health, education and environmental issues. "And last but not least, happiness."

http://www.eurekalert.org/pub_releases/2010-12/hfss-dsb122310.php

Doctors should be required to disclose sleep deprived status to patients before elective surgeries

While regulations have been put in place to restrict the work hours of doctors in training, no such regulations exist for fully trained physicians. An editorial in this week's New England Journal of Medicine argues that sleep-deprived physicians should not be permitted to proceed with an elective surgery without a patient's informed, written consent.

According to the authors, "This approach would represent a fundamental shift in the responsibility patients are asked to assume in making decisions about their own care and might prove burdensome to patients and physicians and damaging to the patient-physician relationship." They further write that "this shift may be necessary until institutions take the responsibility for ensuring that patients rarely face such dilemmas."

Studies have shown that sleep deprivation impairs psychomotor performance as severely as alcohol intoxication. A 2009 study in the Journal of the American Medical Association showed a significant increase in the risk of complications in patients who underwent elective daytime surgical procedures performed by attending surgeons who had less than a six-hour opportunity for sleep during a previous on-call night. Further complicating the matter, people who are sleep-deprived are often not able to accurately assess their degree of self-impairment. Surveys have also revealed that the majority of patients undergoing elective surgery would request a different provider if they knew that their surgeon was sleep deprived.

"Sleep deprivation affects clinical performance. It increases the risks of complications. And it is clear from survey data that patients would want to be informed if their physician was sleep deprived and that most patients would request a different provider," said Michael Nurok, M.D., Ph.D., an anesthesiologist and intensive care physician at Hospital for Special Surgery who is first author of the editorial. "We think that institutions have a responsibility to minimize the chances that patients are going to be cared for by sleep-deprived clinicians."

These days, some hospitals take steps to minimize the likelihood that a surgeon will be scheduled to conduct an elective surgery in a sleep-deprived state. For example, some busy practices prohibit scheduling surgeries for physicians on post-call days. But not enough is being done. "A lot of institutions are not going to be able to take that leap immediately, so as an interim step, we believe that patients need to be informed," Dr. Nurok said. "This is going to be a policy issue that develops. Elective surgery is the low hanging fruit because there is no urgency to doing it and it can be rescheduled – ideally as a priority with institutional support. It's a nice place to start to think about policy approaches."

The editorial argues that sleep-deprived physicians should be required to inform patients of their condition and the potential hazards that can come with this impairment. If patients opt to proceed as planned, they should be required to sign a consent form on the day of the procedure in front of a witness. Patients should be given the opportunity to go ahead with the procedure, proceed with a different physician if possible, or reschedule. The Sleep Research Society and American Academy of Sleep Medicine have argued that legislation is needed to address fatigue.

The editorial authors identify a number of barriers that may make this informed consent and surgery rescheduling unpopular with patients and physicians. Patients may have made logistical provisions for their surgery and may be unhappy if they have to reorganize their schedule again. Clinicians may lose cases to colleagues and thus income. Departments and institutions may lose income if patients reschedule and seek treatment elsewhere.

And while the study authors acknowledge that there may be financial and administrative costs associated with any informed consent plan, they argue that the costs may be offset by improved surgical outcomes and reduced complications. "There has been widespread discomfort with the idea that patients are having procedures performed by physicians who are fatigued," Dr. Nurok said. "New policies are needed."

Dr. Nurok is also a member of the Department of Global Health and Social Medicine at Harvard Medical School. Co-authors of the study include Charles A. Czeisler, M.D., Ph.D., of the Division of Sleep Medicine at Brigham and Women's Hospital and Division of Sleep Medicine at Harvard Medical School; and Lisa Soleymani Lehmann, M.D., Ph.D., from the Center for Bioethics at Brigham and Women's Hospital and the Division of Medical Ethics at Harvard Medical School.

http://www.eurekalert.org/pub_releases/2010-12/nyph-cag122910.php

Coma and general anesthesia demonstrate important similarities

NEJM review into brain circuit mechanisms may lead to more accurate coma diagnosis and improved therapies

NEW YORK - The brain under general anesthesia isn't "asleep" as surgery patients are often told -- it is placed into a state that is a reversible coma, according to three neuroscientists who have published an extensive review of general anesthesia, sleep and coma, in the Dec. 30 issue of the New England Journal of Medicine. This insight

and others reported in their review article could eventually lead to new approaches to general anesthesia and improved diagnosis and treatment for sleep abnormalities and emergence from coma.

The researchers explain that a fully anesthetized brain is much closer to the deeply unconscious low-brain activity seen in coma patients, than to a person asleep. Essentially, general anesthesia is a coma that is drug-induced, and, as a consequence, reversible. The states operate on different time scales -- general anesthesia in minutes to hours, and recovery from coma in hours to months to years, if ever. The study of emergence from general anesthesia and recovery from coma could help to better understand how both processes occur.

Understanding that these states have more in common with each other than differences -- that they represent a continuum of activity with common circuit mechanisms being engaged across the different processes of awakening from sleep or emerging from coma or general anesthesia -- "is very exciting, because it gives us new ways to understand each of these states," says study co-author, Dr. Nicholas D. Schiff, a professor of neurology and neuroscience at Weill Cornell Medical College and a neurologist at NewYork-Presbyterian Hospital/Weill Cornell Medical Center. Co-authors of the study are Dr. Emery Brown of Massachusetts General Hospital, Massachusetts Institute of Technology and Harvard Medical School, and Dr. Ralph Lydic from the University of Michigan.

Knowing more about the brain circuit mechanisms may also help researchers develop therapeutic agents to "tweak the circuits as needed, to help us in the areas where we don't do well, such as abnormalities of sleep and, especially, emergence from a coma," Dr. Schiff says. "And while use of general anesthesia is an incredibly safe technique, it can have effects on the elderly, such as slower recovery time and impaired cognitive function afterwards."

In their review, which took three years to develop, the researchers synthesized the newest studies in these three areas, including work of their own. Among their other specialties, Dr. Brown's expertise is general anesthesia, Dr. Lydic's is sleep, and Dr. Schiff's is recovery from coma.

"We think this is, conceptually, a very fresh look at phenomena we and others have noticed and studied in sleep, coma and use of general anesthesia," Dr. Schiff says. "By reframing these phenomena in the context of common circuit mechanisms, we can make each of these states understandable and predictable."

"These findings show that general anesthesia is a reversible coma, and learning about the different ways we can safely place the brain into this state, with fewer side effects and risks, could be an important advance in general anesthesiology," explains Dr. Brown. "Also, in a scientific sense, monitoring brain function under general anesthesia gives us new insights into how the brain works in order to develop new sleep aids and new ways for patients to recover from coma."

Describing the Switching Circuit

One critically important circuit the authors describe involves specific brain areas. One major player is the cortex, which is made up of layers of neural tissue at the outer edge of the brain, and another is the thalamus, a ball of neural tissue at the center of the brain. These areas are connected to each other through nerve cell axons, which act like information highways, passing signals. The cortex and the thalamus "talk" to each other in different ways over a 24-hour cycle.

Also part of the circuit is the basal ganglia, within the front of the brain, which is used to control certain actions. It does this in part by setting up two feedback loops. One is a negative feedback release on behavior, and that part of the circuit is always active when overall brain activity is reduced, Dr. Schiff says. For example, it works to stop a sleeping person from physically acting out their dreams.

The second feedback loop, however, releases the brake imposed by the first feedback loop, the researchers say. Certain drugs, such as the sleep aid zolpidem (Ambien), and propofol, a powerful general anesthetic with similar pharmacologic properties, can trigger that loop to function, producing what is known as "paradoxical excitation."

This phenomenon described in transitions observed in the early stages of general anesthesia appears to be common across all three states, because the drugs are triggering this same feedback loop, the authors explain. Most people given propofol become agitated and confused shortly after falling unconscious. Some people who use Ambien walk, eat and carry out other complex behaviors in an altered state of consciousness arising from sleep. Surprisingly, Ambien has also been reported to restore communication and behavioral responsiveness in some severely brain injured patients. The linkage of these disparate observations within a common circuit model is one of the key insights in the authors' integrative review.

Eventually the brake is switched back on in these three states -- giving way to sedation and deeper sleep, or in the case of the severely brain patient, the return to a state of diminished responsiveness.

There is another phenomenon that results from this circuit, the authors say. "Emergence delirium is the flip side," says Dr. Brown. "For example, when bringing a person out of general anesthesia, the brain is woken up

enough to be active, but it is not coherent or organized, which can explain the slower recovery time we see in some patients."

It is these two areas -- losing consciousness and returning to consciousness -- that the researchers believe they might be able to target to provide better therapies for sleep, emergence from coma, and general anesthesia with fewer side effects. And it is by studying general anesthesia -- a process that can be well controlled as well as monitored and studied -- that researchers will likely make progress in understanding all three states of mind, Dr. Schiff says. For example, because coma patients each have individualized damage to their brains due to injury or stroke or hemorrhages, studying recovery from general anesthesia may offer potential opportunities for developing general strategies for intervention, Dr. Schiff says.

"The quantitative neurobehavioral metrics used to monitor recovery from coma could be used to track the emergence from general anesthesia from a functional state that can approximate brain-stem death to states similar to a vegetative state and eventually to a minimally conscious state," the authors write.

"Moreover, understanding this circuit will help us understand the relationship of brain function to consciousness in general -- what it is, how it is produced, and what the variety of brain states truly are," Dr. Schiff says. "Consciousness is a very dynamic process, and now we have a good way of studying it."

The study was supported by National Institutes of Health grants as well as a National Institutes of Health Director's Pioneer Award, and by grants from the James S. McDonnell Foundation.

http://www.physorg.com/news/2010-12-dead-flu-cases-widen-france.html

Two dead as flu cases widen in France

French health watchdogs said on Wednesday the country was officially in the grip of a flu epidemic after 176,000 people had fallen sick, two of whom have died.

To be classified as an epidemic, new cases of influenza recorded by doctors have to number more than 174 per 100,000 people per week. This threshold was breached last week, when there were 280 cases per 100,000 people.

Three viral strains are to blame, including A(H1N1) 2009, which emerged last year as the novel "swine" flu, according to the epidemiological networks Regional Flu Observation Groups (GROG) and Sentinelles, which is operated by the National Institute of Health and Medical Research (Inserm).

On December 23, Britain's health authorities said 27 people had died of flu, 24 of them from swine flu.

Agencies in both countries have urged people in at-risk groups -- particularly the elderly and those with respiratory problems -- to get vaccinated.

So-called "seasonal" flu epidemics are annual health problems in temperate countries with the onset of winter.

According to the World Health Organisation (WHO), flu epidemics result globally in about three to five million cases of severe illness per year and 250,000-500,000 deaths.

http://news.discovery.com/earth/plant-database-library-101229.html

World's Largest Plants Database Assembled

The extensive catalog was created to help conservationists, drug designers and others avoid confusion over plant names.

Capping the UN's International Year of Biodiversity, botanists in Britain and the United States on Wednesday unveiled a library of plant names aimed at helping conservationists, drug designers and agriculture researchers. The database, accessible at The Plant List, identifies 1.25 million names for plants, ranging from essential food crops such as wheat, rice and corn to garden roses and exotic jungle ferns, and provides links to published research.

The aim is to clear up a century-old taxonomic jumble in which non-standard names sowed ignorance, rivalry and sometimes damaging confusion about the world's plant wealth.

Without accurate names, understanding and communication about global plant life would descend into inefficient chaos, costing vast sums of money and threatening lives in the case of plants used for food or medicine," Britain's Royal Botanic Gardens (RBG) said.

The project brought together scores of experts at RBG's famous Kew Gardens in London with the Missouri Botanical Garden in St. Louis. It traces its origins to a 1999 botanical congress which called for a clear picture of plant biodiversity to help preserve species under threat.

The Plant List is described as a working list that will require fine tuning.

"(It) is really a major step forward," said Peter Wyse Jackson, president of the Missouri Botanical Garden.

"It provides for the first time a basic checklist of what plants there are on the planet, and it can be used for so many purposes, planning conservation, action looking at the economic importance of plants and so on."

Of the 1.25 million names, 1.04 million are of species rank while the remainder are "infraspecific," meaning they are families or sub-groups of species.

The longest name is Ornithogalum adseptentrionesvergentulum, for a group of species that includes the Star of Bethlehem plant. The shortest names include Poa fax, or scaly poa, a purplish flower native to Western Australia.

Only 300,000 names for species have been accepted as standard terms by the experts, and 480,000 others have been deemed "synonyms," or alternatives to accepted names.

A whopping 260,000 names are "unresolved," meaning that data is too sketchy to determine swiftly whether the claim for a new plant find is backed by the facts. This part of the list will be whittled down by experts over the years to come.

Under a plan adopted in Nagoya, Japan, last October, members of the UN's Biodiversity Convention agreed to set up a complete plant database by 2020. One in five of the world's known plant species is under threat of extinction, the International Union for Conservation of Nature (IUCN) said in September. Habitat loss, climate change, pollution and invasive species are the major perils.

http://www.physorg.com/news/2010-12-donor-1st-successful-transplant-dies.html

Donor in 1st successful transplant dies in Maine

(AP) -- ***Ronald Lee Herrick, who donated a kidney to his dying twin brother 56 years ago in what's recognized as the world's first successful organ transplant, has died of complications following heart surgery. He was 79.***

Herrick died Monday at the Augusta Rehabilitation Center in Augusta, said his wife, Cynthia. He had been in deteriorating health since his October surgery, she said.

Herrick gave a kidney to his twin brother, Richard, at what is now Brigham and Women's Hospital in Boston. The 5 1/2-hour operation on Dec. 23, 1954, kept Herrick's brother alive for eight years and was the first successful organ transplant, according to the United Network for Organ Sharing. Lead surgeon Dr. Joseph Murray went on to win a Nobel Prize.

The operation proved that transplants were possible and led to thousands of other successful kidney transplants and ultimately the transplant of other organs. Doctors had tried a handful of transplants worldwide without success up to that point, said Murray, who went on to perform another 18 transplants between identical twins.

In this June 4, 1955 file photo, Richard Herrick, left, and his twin brother Ronald, from Northborough, Mass., sing at the annual meeting of the Mended Hearts Club at a hotel in Boston. The identical twin brothers made medical history when Ronald donated one of his kidneys to Richard for a Dec. 23, 1954 kidney transplant that was recognized as the world's first successful organ transplant. Richard lived eight years after receiving the transplant. Ronald died Monday, Dec. 27, 2010, in Augusta, Maine. He was 79. **(AP Photo/File)**

"This operation rejuvenated the whole field of transplantation," Murray, 91, told The Associated Press in a phone interview from his home in Wellesley, Mass. "There were other people studying transplants in four or five different countries, but the fact that it worked so well with the identical twins was a tremendous stimulus."

Herrick was raised on a family farm in Rutland, Mass., where he graduated high school. He later served in the U.S. Army. At 23, Herrick was glad to give up a kidney if it would help his brother, who was dying from chronic nephritis, an inflammation of the kidneys. Murray thought the odds of a transplanted organ being accepted would be enhanced since they were identical twins.

Before the operation, many people opposed the idea of transplanting a body organ, equating it with desecration of a body. Others felt it was unethical to operate on healthy humans, and respected editors of medical journals wrote that it was contrary to the Hippocratic Oath's vow to never do harm to anyone, Murray said.

But Herrick never wavered and the operation went on as planned with no complications. Richard Herrick met his future wife, Clare, in the recovery room, where she was a nursing supervisor.

"He was the only one in the world who could save his brother's life, so he was going to do it," said Cynthia Herrick. "There was no question about it."

Ronald and Cynthia married in 1959, and they moved to Maine in 1968. He taught math for 37 years, in both Massachusetts and Maine. He also raised cows and cut hay for decades on a small farm he bought in Mount Vernon. In 1997, he and his wife sold their farm and moved to a house in Belgrade.

Herrick rarely mentioned the operation to people he knew, but he was known in the medical world for his pioneering role.

He and Murray marked the 50th anniversary of the operation at the National Kidney Foundation's 2004 U.S. Transplant Games in Minnesota, said foundation spokeswoman Ellie Schlam. Herrick and Murray together lit the flame to kick off the games, an Olympic-style event for athletes who have received organ transplants.

"He was a humble man. You got the sense he didn't think he'd done anything extraordinary, but that he had done what a brother would do," Schlam said. "He wasn't too impressed with himself, but he was impressive."

http://news.nationalgeographic.com/news/2010/12/101229-bees-collapse-viruses-animals-science/

Bee Viruses Spread via Flower Pollen

Other pollinating insects also carry disease, study finds.

Rachel Kaufman for National Geographic News

Viruses that could play a role in the recent decline in honeybee colonies may be spreading through flower pollen, new research finds. What's more, a number of wild pollinators, such as bumblebees, yellowjackets, and wasps, can also become infected with viruses in the pollen.

In hives affected by colony collapse disorder—a phenomenon that surfaced in U.S. honeybee colonies in 2006—worker bees vanish en masse. Some studies have suggested that Israeli acute paralysis virus (IAPV), first identified in 2002, may be contributing to the bees' demise.

Scientists knew that several viruses that infect honeybee colonies are transmitted from one bee to another within the hive through the bugs' saliva or from an infected queen to her eggs. But how the viruses moved from hive to hive was relatively unknown, said study leader Diana Cox-Foster, an entomologist at Pennsylvania State University. "People suspected the viruses were being transmitted by bees visiting other colonies, but no one really knew there was evidence for the virus moving into other [insect] species," she said.

Contaminated Pollen Infecting Bees

Bees collect nectar to make into honey and to make "bee bread"—pollen packed by workers into tiny balls with a bit of nectar added.

When Cox-Foster's team collected university-owned honeybees as the insects were harvesting pollen, they found that some bees were healthy but their pollen loads were contaminated. This indicated that at least one type of virus—deformed wing virus, another fatal bee disease—was spreading from the pollen to the bees, and not always the other way around.

In a separate experiment, the team collected and examined wild bumblebees and wasps and discovered molecular evidence of viruses that can infect honeybees. When bees from a healthy hive visited the same flowers previously visited by sick bumblebees, the colony contracted the virus within a week, the team found.

Cox-Foster noted that bee viruses in general don't have to be lethal: "It's sort of like the common cold. If you're healthy, you may not catch the cold your neighbors have. We need to ask why the bees are more susceptible to these viruses." For instance, other stressors, such as pesticides and a lack of good nutrition, may be behind the bees' lack of resistance, she said.

Other Pollinators Not a Solution

The research may suggest that as honeybees continue to decline, turning to other species for pollinating crops in the U.S. is not the best alternative.

Bee pollination accounts for $15 billion in added crop value, particularly for specialty crops such as almonds and other nuts, berries, fruits, and vegetables, according to the U.S. Department of Agriculture.

"People thought, The honeybees are disappearing, let's just use a different species" for pollinating plants, Cox-Foster said. But the new research shows that the viruses can spread to other pollinators—"and they're likely exposed to the same stressors." *The bee-virus study appeared in the December 22 issue of the journal PLoS ONE.*

http://www.eurekalert.org/pub_releases/2010-12/nsf-wtm123010.php

What triggers mass extinctions? Study shows how invasive species stop new life

Collapse of Earth's marine life 378 to 375 million years ago holds key

An influx of invasive species can stop the dominant natural process of new species formation and trigger mass extinction events, according to research results published today in the journal PLoS ONE.

The study of the collapse of Earth's marine life 378 to 375 million years ago suggests that the planet's current ecosystems, which are struggling with biodiversity loss, could meet a similar fate.

Although Earth has experienced five major mass extinction events, the environmental crash during the Late Devonian was unlike any other in the planet's history. The actual number of extinctions wasn't higher than the natural rate of species loss, but very few new species arose.

"We refer to the Late Devonian as a mass extinction, but it was actually a biodiversity crisis," said Alycia Stigall, a scientist at Ohio University and author of the PLoS ONE paper. "This research significantly contributes to our understanding of species invasions from a deep-time perspective," said Lisa Boush, program director in the National Science Foundation (NSF)'s Division of Earth Sciences, which funded the research.&

"The knowledge is critical to determining the cause and extent of mass extinctions through time, especially the five biggest biodiversity crises in the history of life on Earth. It provides an important perspective on our current biodiversity crises."

The research suggests that the typical method by which new species originate--vicariance--was absent during this ancient phase of Earth's history, and could be to blame for the mass extinction. Vicariance occurs when a population becomes geographically divided by a natural, long-term event, such as the formation of a mountain range or a new river channel, and evolves into different species. New species also can originate through dispersal, which occurs when a subset of a population moves to a new location.

In a departure from previous studies, Stigall used phylogenetic analysis, which draws on an understanding of the tree of evolutionary relationships to examine how individual speciation events occurred.

She focused on one bivalve, Leptodesma (Leiopteria), and two brachiopods, Floweria and Schizophoria (Schizophoria), as well as a predatory crustacean, Archaeostraca. These small, shelled marine animals were some of the most common inhabitants of the Late Devonian oceans, which had the most extensive reef system in Earth's history. The seas teemed with huge predatory fish such as Dunkleosteus, and smaller life forms such as trilobites and crinoids (sea lilies). The first forests and terrestrial ecosystems appeared during this time; amphibians began to walk on land.

As sea levels rose and the continents closed in to form connected land masses, however, some species gained access to environments they hadn't inhabited before. The hardiest of these invasive species that could thrive on a variety of food sources and in new climates became dominant, wiping out more locally adapted species.

The invasive species were so prolific at this time that it became difficult for many new species to arise.

"The main mode of speciation that occurs in the geological record is shut down during the Devonian," said Stigall. "It just stops in its tracks."

Of the species Stigall studied, most lost substantial diversity during the Late Devonian, and one, Floweria, became extinct. The entire marine ecosystem suffered a major collapse. Reef-forming corals were decimated and reefs did not appear on Earth again for 100 million years. The giant fishes, trilobites, sponges and brachiopods also declined dramatically, while organisms on land had much higher survival rates.

The study is relevant for the current biodiversity crisis, Stigall said, as human activity has introduced a high number of invasive species into new ecosystems. In addition, the modern extinction rate exceeds the rate of ancient extinction events, including the event that wiped out the dinosaurs 65 million years ago.

"Even if you can stop habitat loss, the fact that we've moved all these invasive species around the planet will take a long time to recover from because the high level of invasions has suppressed the speciation rate substantially," Stigall said. Maintaining Earth's ecosystems, she suggests, would be helped by focusing efforts and resources on protection of new species generation. "The more we know about this process," Stigall said, "the more we will understand how to best preserve biodiversity."

The research was also funded by the American Chemical Society and Ohio University.

http://blog.mylookout.com/2010/12/geinimi_trojan/

The Lookout Blog

Security Alert: Geinimi, Sophisticated New Android Trojan Found in Wild

A new Trojan affecting Android devices has recently emerged in China

The Threat:

A new Trojan affecting Android devices has recently emerged in China. Dubbed “Geinimi” based on its first known incarnation, this Trojan can compromise a significant amount of personal data on a user’s phone and send it to remote servers. The most sophisticated Android malware we’ve seen to date, Geinimi is also the first Android malware in the wild that displays botnet-like capabilities. Once the malware is installed on a user’s phone, it has the potential to receive commands from a remote server that allow the owner of that server to control the phone.

Geinimi is effectively being “grafted” onto repackaged versions of legitimate applications, primarily games, and distributed in third-party Chinese Android app markets. The affected applications request extensive permissions over and above the set that is requested by their legitimate original versions. Though the intent of this Trojan isn’t entirely clear, the possibilities for intent range from a malicious ad-network to an attempt to create an Android botnet.

Lookout has already delivered an update for its Android users to protect them against known instances of the Trojan. If you are already a Lookout user (free or premium), you are protected and no action is needed.

How it Works:

When a host application containing Geinimi is launched on a user’s phone, the Trojan runs in the background and collects significant information that can compromise a user’s privacy. The specific information it collects

includes location coordinates and unique identifiers for the device (IMEI) and SIM card (IMSI). At five minute intervals, Geinimi attempts to connect to a remote server using one of ten embedded domain names. A subset of the domain names includes www.widifu.com, www.udaore.com, www.frijd.com, www.islpast.com and www.piajesj.com. If it connects, Geinimi transmits collected device information to the remote server.

Though we have seen Geinimi communicate with a live server and transmit device data, we have yet to observe a fully operational control server sending commands back to the Trojan. Our analysis of Geinimi's code is ongoing but we have evidence of the following capabilities:

* Send location coordinates (fine location)
* Send device identifiers (IMEI and IMSI)
* Download and prompt the user to install an app
* Prompt the user to uninstall an app
* Enumerate and send a list of installed apps to the server

While Geinimi can remotely initiate an app to be downloaded or uninstalled on a phone, a user still needs to confirm the installation or uninstallation.

Geinimi's author(s) have raised the sophistication bar significantly over and above previously observed Android malware by employing techniques to obfuscate its activities. In addition to using an off-the-shelf bytecode obfuscator, significant chunks of command-and-control data are encrypted. While the techniques were easily identified and failed to thwart analysis, they did substantially increase the level of effort required to analyze the malware. The Lookout Security team is continuing to analyze capabilities of new and existing Geinimi variants and will provide more information as we uncover it.

Who is affected?

Currently we only have evidence that Geinimi is distributed through third-party Chinese app stores. To download an app from a third-party app store, Android users need to enable the installation of apps from "Unknown sources" (often called "sideloading"). Geinimi could be packaged into applications for Android phones in other geographic regions. We have not seen any applications compromised by the Geinimi Trojan in the official Google Android Market.

There are a number of applications—typically games—we have seen repackaged with the Geinimi Trojan and posted in Chinese app stores, including Monkey Jump 2, Sex Positions, President vs. Aliens, City Defense and Baseball Superstars 2010. It is important to remember that even though there are instances of the games repackaged with the Trojan, the original versions available in the official Google Android Market have not been affected. As the Lookout team finds more variants of the Geinimi Trojan grafted onto legitimate applications, we'll provide timely updates.

As stated above, Lookout has already delivered an update for its Android users to protect them against known instances of the Trojan.

How to Stay Safe:

***** Only download applications from trusted sources, such as reputable application markets. Remember to look at the developer name, reviews, and star ratings.

***** Always check the permissions an app requests. Use common sense to ensure that the permissions an app requests match the features the app provides.

***** Be aware that unusual behavior on your phone could be a sign that your phone is infected. Unusual behaviors include: unknown applications being installed without your knowledge, SMS messages being automatically sent to unknown recipients, or phone calls automatically being placed without you initiating them.

***** Download a mobile security app for your phone that scans every app you download. Lookout users automatically receive protection against this Trojan.

With the discovery of this new malware, it is more important than ever to pay attention to what you're downloading. Stay alert and ensure that you trust every app you download. Stay tuned for more details on this threat.

http://news.nationalgeographic.com/news/2010/12/101230-new-prehistoric-crocodile-science-paleontology/

New Prehistoric Crocodile Found in "Kitchen Counters"

Fossils found in limestone slabs once destined for Italian homes.

Fossils of a new species of ancient crocodile cousin have been found in limestone once destined for Italian kitchen countertops, a new study says. The fossils were originally discovered in a limestone quarry in Ferrara, Italy, in 1955 after workers sliced a huge block into four slabs and found the bones trapped inside.

"When the owner noticed the bones, he decided to save" the slabs, said study co-author Federico Fanti, a geologist at the Museo Geologico Giovanni Capellini in Italy.

Scientists performed only a cursory examination of the fossils—enough to determine that they belonged to an ancient crocodile—before the slabs were transferred to two museums in Italy.

The fossils sat unstudied until 2009, when scientists decided to examine them again in more detail.

Analysis of the embedded bones revealed a skull and a few vertebrae that belonged to a previously unknown species of 165-million-year-old prehistoric reptile now named Neptunidraco ammoniticus.

The newfound creature turned out to be the oldest known member of Metriorhynchidae, a family of ancient marine crocodiles that roamed Earth's oceans for about 30 million years before dying out.

New Crocodile More Like a Dolphin

Scientists think Metriorhynchids split with the ancestors of modern crocodiles about 200 million years ago.

Unlike modern crocodiles, which have semi-aquatic lifestyles, scientists think N. ammoniticus was a fully marine predator that came on land rarely, if ever.

The 13-foot (4-meter) animal was comparable in size to modern crocodiles, but had a more streamlined skull, a more hydrodynamic body, and a vertical tail that more closely resembled those of fish or sharks.

A scientist shows the fossilized limestone next to a head model of the prehistoric crocodile. **Photograph courtesy Federico Borella**

Based on previous fossil finds of other Metriorhynchids species, the scientists also suspect N. ammoniticus had flippers. "It was so adapted to living in the sea that it was unable to survive outside water. In some general aspects, it was more like a dolphin than a croc," said study co-author Andrea Cau, a paleontologist at Italy's University of Bologna.

However, for all of their aquatic adaptations, N. ammoniticus and other marine crocodile species did not cut off ties with the surface world completely, Cau noted.

Like whales and dolphins, they had to swim to the ocean surface to breathe, and like sea turtles, they may have clambered up onto beaches once a year to lay their eggs. Though fearsome by modern standards, N. ammoniticus was also not an alpha predator among its ancient marine counterparts.

For instance, the crocodile cousin was dwarfed by top ocean predators such as the short-necked plesiosaur Liopleurodon, which could grow to more than 80 feet (25 meters).

Marine Crocodiles Successful—To a Point

Fossils of Metriorhynchids have been found all over the world, suggesting they roamed widely across ancient Earth's oceans. Based on the size and shape of their teeth, scientists think Metriorhynchids such as N. ammoniticus dined on fish and squid and perhaps other sea reptiles. But N. ammoniticus is the only crocodile cousin that is known to have lived in the ancient Tethys Ocean, which was located north of the supercontinent Gondwana and is now part of modern-day Italy.

Their presence in Tethys suggests Metriorhynchids were "even more successful" than previously thought, added study co-author Fanti, whose research appears in an upcoming issue of the journal Gondwana Research. Despite this, the group did not survive, Fanti noted. "They tried to colonize a marine world and survive with what the sea provided, but they failed," he said. "Their [terrestrial] cousins have fared much better."

The ancient reptile's dolphin-like body. **Illustration courtesy Davide Bonadonna. Ker Than for National Geographic News**

Crocodile Discovery "Exciting"

Mark Young, a paleontologist at the University of Edinburgh in the United Kingdom, said the discovery of N. ammoniticus offers "an exciting insight into the early evolution" of Metriorhynchids. For instance, the new species "tells us Metriorhynchids evolved and diversified far earlier than previously thought," said Young, who was not involved in the study. The fossils also support the idea that during the age of the dinosaurs, crocodile ancestors "were exceptionally diverse," Young added in an email.

Besides fully marine crocodiles such as Metriorhynchids, there were also terrestrial crocodiles with mammal-like teeth that later evolved into plant-eating reptiles. There were also crocodiles that ate both meat and plants, and huge semi-aquatic crocodiles that could take down dinosaurs.

Study co-author Fanti added there may be more fossil gems like N. ammoniticus hidden in museums across Europe. "This is one specimen in our museum, and we have one million specimens," Fanti said. "So the potential [for new discoveries] is huge."

http://www.pasthorizons.com/index.php/archives/12/2010/neanderthal-face-is-not-cold-adapted

Neanderthal face is not cold adapted

Researchers have reported in the Journal of Human Evolution that the long held belief that the Neanderthal nose was a result of adaptations to extreme cold may not be all it seems.

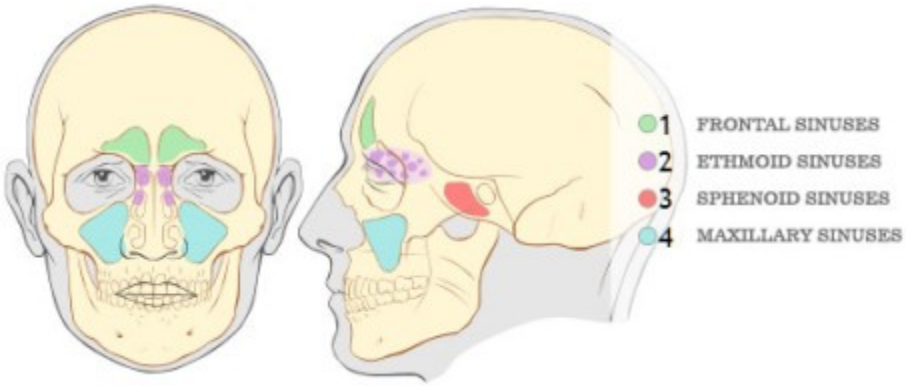
Many of the morphological features of Homo neanderthalensis, including the reputed large size of its paranasal sinuses, have been interpreted as adaptations to extreme cold, as some Neanderthals lived in Europe during glacial periods.

This interpretation of sinus evolution rested on two assumptions: that increased formation of air cells or cavities in the face, were an adaptation to lower ambient temperatures, and that Neanderthals have large sinuses relative to the modern human. However, the researchers from Roehampton University, Universität Greifswald and The Natural History Museum, London have conducted detailed analysis of humans, primates and rodents suggesting a very different picture

The new report shows the first assumption is at best suspect; with the maxillary sinus undergoing a significant reduction in volume in extreme cold, in both wild and laboratory conditions.

The second assumption – that Neanderthal sinuses are large, extensive, or even over developed has been accepted since the first specimen was described in the 19th century. This has been interpreted as the explanation for some of the distinctive aspects of Neanderthal facial form, but has never been evaluated with respect to scaling these cavities to other hominid forms.

To test the second assumption, the researchers tested previously published measurements from two-dimensional X-rays and new three-dimensional data from computed tomography of Neanderthals and temperate-climate European Homo sapiens and then scaled the results against cranial size to determine the relative size of their sinuses.



Location of sinus cavities **(wikimedia commons)**

The 2D data reveals Neanderthals sinus size is comparable in scale with that seen in temperate climate H. sapiens. The 3D analysis of CT data from a smaller sample also supported this conclusion.

These results suggest that the distinctive Neanderthal face cannot be interpreted as a direct result of increased sinus size as an adaptation to resist cold stress; and so an alternative explanation is required.

In 1997 Jeffrey Laitman, an anatomist at Mount Sinai Medical Centre in New York , asked the question if the Neanderthals' highly specialised noses could have been a drawback once Europe's climate warmed. In warm weather, a cavernous, sticky sinus might have been fertile ground for infection and with absolutely huge sinus systems how would this have affected the European Neanderthal.

More information *The Neanderthal face is not cold adapted, Todd C. Rae, Thomas Koppe and Chris B. Stringer – Journal of Human Evolution, December 2010*

http://www.livescience.com/animals/fish-possibly-swam-across-sahara-101228.html

Fish Swam the Sahara, Bolstering Out of Africa Theory

By Charles Q. Choi, LiveScience Contributor

Fish may have once swum across the Sahara, a finding that could shed light on how humanity made its way out of Africa, researchers said.

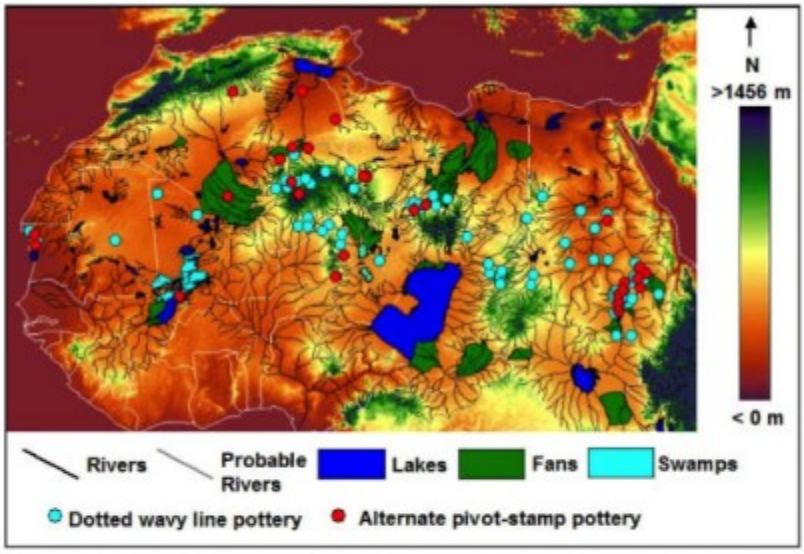
The cradle of humanity lies south of the Sahara, which begs the question as to how our species made its way past it. The Sahara is the largest hot desert in the world, and would seem a major barrier for any humans striving to migrate off the continent.

Scientists have often focused on the Nile Valley as the corridor by which humans left Africa. However, considerable research efforts have failed to uncover evidence for its consistent use by people leaving the continent, and precisely how watery it has been over time is controversial.

Now it turns out the Sahara might not have been quite as impassable as once thought — not only for humanity, but for fish as well.

"Fish appeared to have swam across the Sahara during its last wet phase sometime between 10,000 and 6,000 years ago," researcher Nick Drake, a geographer at King's College London, told LiveScience. "The Sahara is not a barrier to the migrations of animals and people. Thus it is possible — likely? — that early modern humans did so, and this could explain how we got out of Africa."

Using satellite imagery and digital maps of the landscape, the researchers found the Sahara was once covered by a dense network of rivers, lakes and inland deltas. This large waterway channeled water and animals into and across the Sahara during wet, "green" times.



Supporting Fig. 14. Late Pleistocene and Early Holocene palaeo-hydrology of the Sahara (~11-8 ka) with the spatial distribution of dotted wavy line and alternate pivot-stamp pottery plotted (from Ref. 70).

A map of what the Sahara was like 8,000 to 11,000 years ago, revealing rivers, lakes, swamps and fan-shaped deposits where rivers emptied out. The dots indicate where various kinds of pottery were found. **Credit: Nick Drake.**

In their analysis, Drake and his colleagues found evidence that many creatures, including aquatic ones, dispersed across the Sahara recently. For example, 25 North African animal species have populations both north and south of the Sahara with small refuges within the desert, including catfish (Clarias gariepinus), tilapia (Tilapia zillii), jewel cichlid fish (Hemichromis letourneuxi) and freshwater snails such as the red-rimmed melania (Melanoides tuberculata). Indeed, more animals may have once crossed over the Sahara than over the Nile corridor, the researchers said — only nine animal species that occupy the Nile corridor today are also found both north and south of the Sahara.

If fish could have crossed the Sahara, it is hard to imagine that humans didn't. Analysis of African languages and artifacts suggest that ancient waterways recently affected how humans occupied the Sahara. For instance, speakers of Nilo-Saharan languages once lived across central and southern Sahara, and may have once hunted aquatic creatures with barbed bone points and fish hooks. In addition, ancient lake sediments suggest the Sahara was green roughly 125,000 years ago, back when anatomically modern humans might have begun migrating out of Africa.

Future work could focus on when species got across the Sahara — genetic analysis of fish could help pinpoint such times in fish, Drake said. However, further research into the past of the Sahara could prove difficult and even dangerous, he noted. Some of the Saharan countries the researchers would like to visit in order to analyze the genetics of fish populations or date the ages of ancient shorelines "are deemed to be too dangerous to visit due to terrorist activity or civil war," Drake said.

The scientists detailed their findings online Dec. 27 in the journal Proceedings of the National Academy of Sciences.