http://www.eurekalert.org/pub_releases/2012-09/uoc-yro091612.php

Young researcher on the trail of herbal snakebite antidote

A PhD student at the University of Copenhagen has drawn on nature's own pharmacy to help improve the treatment of snakebites in Africa.

Marianne Molander from the University of Copenhagen's Faculty of Health and Medical Sciences has been working within a Danish team that has examined various plants native to the African continent in a bid to find locally available herbal antidotes.

"Snake venom antidotes are expensive, it's often a long way to the nearest doctor and it can be difficult to store the medicine properly in the warm climate. As a result many local people rely on natural resources for treating potentially fatal bites," says pharmacist and PhD student Marianne Molander.

The Danish researchers are now investigating African plants that have proven effective in treating snakebite. Armed with the results of their research they are set to provide guidance in the use of plants in remote areas where local people have limited access to Western medicine:

"We have particularly focused on the snake species Bitis arietans, which is widespread south of the Sahara. All snake venoms consist of a unique cocktail of enzymes, which results in rapid tissue death. Along with our African partners, we are currently testing plants that act as venom antidotes in remote regions of Africa. A hundred plants from Mali, 27 from South Africa and 13 from the Democratic Republic of Congo are now under the microscope," says Marianne Molander, PhD student in drug design and pharmacology at the University of Copenhagen.

Snake venom as medicine

100,000 people worldwide die each year from snakebites. Three times as many suffer permanent injuries, disability or amputations as a result of a bite to an arm or leg. The problem is greatest in tropical developing countries, where agricultural workers, women and children are the most likely victims. Although a million people in Africa are bitten by snakes each year - only half receive treatment.

But snake venom is not all bad. There are many instances where venom can be developed into drugs used, for example, in the treatment of hypertension, heart failure and diabetic kidney disease. The drug Aggrastat, which is used for chest pain, was developed using a peptide from an African viper.

Herbal healing in Africa

Historically plants have always been a major source of drugs. A quarter of all new medicinal products registered worldwide, come from plants or other natural resources. This impressive potential has its origins in the fact that plants have evolved to contain substances that prevent them being eaten or attacked by diseases. These biologically active defence compounds can sometimes be useful for developing new drugs. And Africa's poor use nature as their medicine cabinet.

"In Africa where much of the population can't afford medicine, there is a tradition of seeking out healers and alternative therapists, before turning to conventional medicine. Eighty percent visit the healer before they go to the hospital. Traditional herbal medicine is based on centuries of traditions and achievement, so the local shamans and medicine men are often a good place to start when you are looking for active substances with real pharmaceutical effects," says Marianne Molander.

http://www.eurekalert.org/pub_releases/2012-09/uoo-ctc091712.php

Challengers to Clovis-age impact theory missed key protocols, new study finds

University of Oregon psychologist was on the team, which confirmed the presence of magnetic particles

EUGENE, Ore. - An interdisciplinary team of scientists from seven U.S. institutions says a disregard of three critical protocols, including sorting samples by size, explains why a group challenging the theory of a North American meteor-impact event some 12,900 years ago failed to find iron- and silica-rich magnetic particles in the sites they investigated.

Not separating samples of the materials into like-sized groupings made for an avoidable layer of difficulty, said co-author Edward K. Vogel, a professor of psychology at the University of Oregon.

The new independent analysis -- published this week in the online Early Edition of the Proceedings of the National Academy of Sciences -- did, in fact, isolate large quantities of the "microspherules" at the involved sites where the challengers previously reported none. Lead author Malcolm A. LeCompte, an astrophysicist at Elizabeth City State University in North Carolina, said the findings support the climate-altering cosmic impact, but his team stopped short of declaring this as proof of the event.

The Clovis-age cosmic-impact theory was proposed in 2007 by a 26-member team led by Richard B. Firestone. That team included University of Oregon archaeologists Douglas J. Kennett and Jon M. Erlandson. While other

groups have found corroborating evidence of a potential cosmic event, other groups reported difficulties doing so. One group, led by Todd A Surovell of the University of Wyoming, did not find any microspherule evidence at five of seven sites they tested, including two previously studied locations where Firestone reported large numbers of microspherules.

"In investigating the two common sites and a third tested only by Surovell's team, we found spherules in equal or greater abundance than did the Firestone team, and the reported enhancement was in strata dated to about 13,000 years before the present," LeCompte said. "What we've done is provide evidence that is consistent with an impact, but we don't think it proves the impact. We think there's a mystery contained in the Younger Dryas strata, and that we've provided some validation to the original research by Firestone's group."

The particles in question, the team concluded, are terrestrial as was claimed by the Firestone group, and not of meteoric origin as claimed by other challengers including Surovell's group, and are similar to metamorphic material in Earth's crust. That determination was made using electron microscopy and spectroscopy.

"These spherules have evidence of very high-temperature melting and very rapid cooling, which is characteristic of debris ejected from an impact," LeCompte said. Speherules would have melted at temperatures approaching 2,000 degrees Celsius (more than 3,000 degrees Fahrenheit), he added. Cosmic materials, including the some microspherules, regularly fall to earth from space due to meteorite ablation, but the spherules found in soils dating to 13,000 years ago are much different, he added. Other researchers had suggested that these spherules were deposited by a cosmic rain or resulted through slow, terrestrial processes occurring under ambient conditions.

LeCompte and some key collaborators wondered why Surovell didn't find any spherules, and that led them to Vogel. Many of the spherules investigated were tiny, ranging in size from 20 to 50 micrometers (microns); about the diameter of a human hair. "The inherent difficulty in finding these small, relatively rare magnetic microspherules suggested there may be inherent limitations in human faculties that needed to be addressed, and that's how and why we sought out UO Professor Ed Vogel. His research into human cognitive capabilities proved so important in understanding both why the search was so difficult and why size-sorting was effective and important in making it easier," LeCompte said.

Vogel specializes in the ability of people to find specific items amid multiple distractions.

"A visual search is a very error-prone process," Vogel said. "This was a case of looking at millions of particles from which you are hoping to find something that might be present much less than 0.1 percent of the time." Size-sorting, he said, is vital because it is easier to find a target item with a characteristic shape and color when all of the many more-distracting objects are very similar. "It is a slow, tedious process to examine such quantities of materials with the human eyes when object sizes are extremely dissimilar."

"Science is only as good as the humans who conduct it, and this study shows how the minds of researchers can operate in some surprising ways," said Kimberly Andrews Espy, UO vice president for research and innovation, and dean of the graduate school. "Dr. Vogel's excellent work, which illustrates the importance of understanding how the human mind processes information and the consequences it can have beyond making everyday computations, reflects the University of Oregon's strengths in interdisciplinary research."

LeCompte described Surovell's study "as possibly the most damning of the reports that had challenged the original theory."

"Todd had worked very hard and couldn't find the spherules, but I think he made some fatal errors that need to be pointed out," LeCompte said. "It is instructive in that we initially made the same mistake and came to the same erroneous conclusion, but then we corrected our mistake. I would say this is a case of a missed opportunity due to their deviations from the protocol."

Two other critical protocol deviations not followed by the challengers involved the amounts of material examined and the use of microscopy techniques specified in Firestone's original research. Another two minor aspects of the protocol also were not repeated, reported LeCompte's team, which, in addition to Vogel, included an archaeologist, two materials scientists, a botanist, a periglacial geographer and an aerospace engineer.

LeCompte's team -- using the protocols of Firestone's group and electron microscopy -- additionally studied a quarry site in Topper, S.C., where Clovis-age people had made stone tools. After removing chert debris associated with tool making in soil at the depth of the Clovis occupation, LeCompte said, researchers observed virtually no spherules below it, while in soil just above the chert fragments they found a spike in the number of telltale spherules.

Further above that level, he noted, the soil layers were essentially "a dead zone" somewhat analogous to the K-T boundary, or "tombstone layer," from an extinction event that occurred 65 million years ago. At Topper, the dead zone showed almost no trace of human habitation for perhaps as long as 1,000 years duration.

"This suggests that something very dramatic happened," LeCompte said.
"The effects of such an impact would have been catastrophic on a global scale," said co-author Barrett Rock, a botanist at the University of New Hampshire. "On the order of 36 ice-age species became extinct, and the Clovis human culture eventually lost. All of this in response to dramatic changes in the vegetation at the base of the faunal food chain."
Co-authors on the PNAS paper with LeCompte, Vogel and Rock were Albert C. Goodyear of the South Carolina Institute of Archaeology and Anthropology at the University of South Carolina; Mark N. Demitroff of the Department of Geography at the University of Delaware; Dale Batchelor and Charles Mooney of the Analytical Instrumentation Facility at North Carolina State University; and Alfred W. Seidel of Seidel Research in North Carolina.

http://www.eurekalert.org/pub_releases/2012-09/nyph-rru091712.php

Researchers reveal underlying mechanism of powerful chemotherapy for prostate cancer treatment

Study suggests role of taxane-based chemotherapy drugs may be underestimated and should be re-examined to improve the drug's effectiveness

NEW YORK - The power of taxane-based chemotherapy drugs are misunderstood and potentially underestimated, according to researchers at Weill Cornell Medical College in the September 15 issue of the journal Cancer Research. Most physicians and investigators believe that taxane chemotherapy (paclitaxel, docetaxel and cabazitaxel) just does one thing -- stop a cancer cell from dividing -- but the team of Weill Cornell scientists have revealed it acts much more powerfully and broadly, especially against prostate cancer.
"Taxanes are one of the best class of chemotherapy drugs that we can use to treat our cancer patients, but while they are effective against a wide range of tumors, they don't work in all of them, and often patients become resistant," says the study's senior investigator, Dr. Paraskevi Giannakakou, an associate professor of pharmacology in medicine and pharmacology and director of laboratory research for the Division of Hematology and Medical Oncology at Weill Cornell. "However, our new understanding of the precise action of taxanes in a cancer cell may help us overcome drug insensitivity or acquired resistance to the drugs and design therapies that can be used in combination with them to improve cancer control."
In their study, the researchers stress that investigators must shift their attention away from taxane's function during cell division to the drugs' effects on halting the everyday movement of proteins and protein-to-protein communication within cancer cells -- and to understanding how and why a cancer cell can still survive. Researchers suggest that cancers that are insensitive to taxanes -- or those that have become resistant to them -- may, for example, switch to alternate forms of "transportation" to shuttle proteins within cells in a way that does not depend on the cell's skeletal structure which is the target of taxane therapy.
Researchers showed in the study that the androgen receptor (AR), which is a driving force in prostate cancer growth and metastasis, "moves" along microtubules to be transported to the nucleus. When a taxane binds microtubules, it stops AR from traveling, thus inhibiting its activity. Taxane chemotherapy drugs such as paclitaxel, docetaxel and cabazitaxel work by binding tubulin, a protein that makes up microtubules. Microtubules are the rope-like channels that provide both a skeletal structure to cells as well as provide "highways" along which molecules, such as proteins, RNA complexes and vesicles, can travel from one part of the cell to another and interact with each other.
"Microtubules are the highly dynamic network of wires within cells, and when taxanes are used, the network stops moving," says Dr. Giannakakou. This is best observed when cancer cells attempt to divide, she says. "It is easy to see in the laboratory, that prostate cancer cells double every 30-48 hours, and taxane stops them from doing that, which pushes these cells to die. This leads everyone to think that this is exclusively how taxanes work – they stop cells from dividing."
But Dr. Giannakakou and her research team point out in their new study that patients have significantly lower rates of cell division in their tumors than do cancer cells growing in the lab. In fact, cancer cells in prostate cancer patients only divide every 33-577 days, she says. "Thus, the therapeutic benefit of taxanes on microtubules depends on more than just stopping cell division."
The new insights provided by this study about the action of taxanes on AR trafficking helps explain the clinical activity of these drugs in the treatment of prostate cancer while at the same time can help researchers better understand why an individual patient might respond or not to taxane therapy. Such insights are critical for future chemotherapy customization, according to researchers.
The drug that was later named Taxol (paclitaxel) was isolated from the bark of a Pacific yew tree by federal researchers in 1967 and was later synthesized. In 1993 it was approved for use in ovarian cancer, and has since been used for lung, breast, head and neck and other cancers. Taxotere (docetaxel), synthesized from chemicals

extracted from the European yew tree, was developed as an alternative to Taxol, and is used for the treatment of many of the same cancer types. Cabazitaxel, the newest taxane, is a semi-synthetic paclitaxel analog and is used to treat patients with prostate cancer who have failed prior docetaxel chemotherapy.

"In the 20 years since Taxol was approved, hundreds of labs worldwide are trying to understand how taxanes work to stop cell division in cancer," Dr. Giannakakou says. "However, we think they need to now take a fresh approach and look at what these drugs do during the normal life cycle of a cancer cell and target the newly revealed underlying mechanisms and modes of movement with novel therapies, in combination with taxane therapy, to provide life-saving therapy for patients who don't benefit from taxanes."

Investigators working with Dr. Giannakakou on the study are the first author Maria Thadani-Mulero, who is a graduate student enrolled at Surrey University, UK performing her thesis work in Dr. Giannakakou's laboratory, and Dr. David M. Nanus, the Mark W. Pasmantier Professor of Hematology and Oncology in Medicine and chief of the Division of Hematology and Medical Oncology at Weill Cornell.

This study was funded by grants from the National Institutes of Health, the National Cancer Institute's Physical Sciences-Oncology Center at Cornell University, the Weill Cornell Clinical and Translational Science Center, a Creativity Award from the Prostate Cancer Foundation, and support from the Genitourinary Oncology Research Fund.

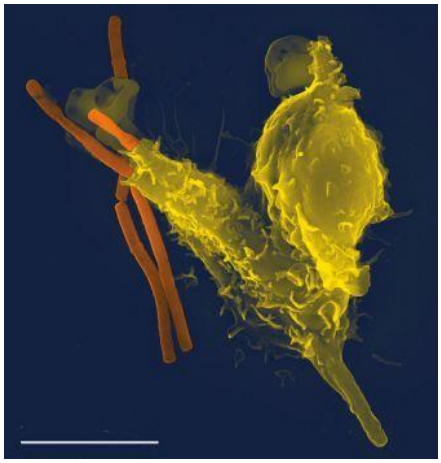
http://blogs.scientificamerican.com/guest-blog/2012/09/17/killer-skills-of-a-neutrophil/

Killer Skills of a Neutrophil

I'd like to tell you a secret. I am a superhero. I can devour my enemies whole, release my own chemical weapons and trap and kill my prey in nets spun from my own DNA. And I don't even need to wear my pants on the outside.

By Catherine Carver

I am a neutrophil, and several billion of me are made in your bone marrow every day.



Neutrophils are the most abundant white blood cell in the human body. They play a vital role in an ancient, rapid response called the innate immune system which is our first line of defense against disease-causing microbes. This system can mount a protective offense within minutes of the body being invaded, before the nature of the attack is known. This buys time for the body to produce a tailored response. The neutrophil is at the heart of the action, a killing machine that destroys unwanted intruders.

The neutrophil has many enemies. Perhaps you have a snot-filled toddler, a slobbery dog, or a propensity for paper cuts, but there will be something that exposes you to infection. Within minutes of infection invading your body the damaged tissue releases a chemical distress signal that attracts neutrophils out of the blood stream and activates them.

Image: Neutrophil engulfing anthrax bacteria, taken with a Leo 1550 scanning electron microscope. Scale bar is 5 micrometers. **From "Neutrophil engulfing Bacillus anthracis". PLoS Pathogens 1 (3): Cover page. DOI:10.1371. November 2005.**

Activated neutrophils employ three key killing strategies. First, they can engulf and devour microbes. This process, called phagocytosis, was first described over one hundred years ago by Mechnikov who won the Nobel Prize for Medicine in 1908. In his Nobel lecture he described "white corpuscles of the blood…which absorb the microbes and destroy them" [1]. The process of cell devouring is directed by molecular tags called opsonins which are produced by the body and stick to microbes. Imagine the microbe is a cookie: opsonins are like chocolate chips which make the cookie that much more appealing to the hungry neutrophil. Once consumed, the microbe is exposed to enzymes which kill and digest it.

The neutrophil's second strategy, called degranulation, kills microbes occupying the local area. The neutrophil releases packets of enzymes which attack the outside of the microbe. This is like pouring boiling oil on invaders; crude but effective. Unfortunately this can cause collateral damage to the very tissue the neutrophils are meant to protect. The damage is limited because the neutrophils are designed to die 24-48 hours after moving into the tissue. As the dead neutrophils accumulate we can see evidence of them in the form of pus.

Even in death the neutrophil works to bring down enemy forces through its third killer creation: Neutrophil Extracellular Traps (NETs). NETs are a relatively recent discovery, outlined in 2004 by Brinkmann and colleagues. NETs are created once the neutrophil's self-destruct programme has been engaged. DNA, proteins and hostile enzymes mingle within the cell which bursts open in a final kamikaze act that unleashes a web which can trap and kill bacteria. This works against an array of different bacteria, from Shigella, which causes dysentery, to Salmonella, which is responsible for typhoid fever.

Understanding this triad of killer skills is an important area of biomedical research. Neutrophils are designed to be part of a hard-and-fast response. If their assault is abnormally prolonged or excessive it can cause more harm than good. This process contributes to common autoimmune diseases including rheumatoid arthritis and emphysema. By understanding how neutrophils cause damage we hope to design new anti-inflammatory drugs to tone down the response and tackle these crippling conditions.

Yet we must not forget that we need neutrophils. Without their killer skills you couldn't go for a stroll in a park or kiss someone without risking death by infection. This is a reality for people on certain chemotherapy regimes which decimate neutrophil numbers. Doctors can try to protect patients by putting them in dedicated isolation rooms and using stringent hygiene controls. However these are short term measures and what patients really need are their neutrophils. We can stimulate recovery of neutrophil numbers using medications that promote their production and therefore give patients their freedom back.

We've all heard of the villains – superbugs, anthrax, flesh-eating bacteria. We've celebrated medicine's pharmacological victories like penicillin. It's time we recognise the remarkable feats happening inside each and everyone of us every day. To uncover these mysteries it is imperative that we keep funding research in this tough economic climate – it took almost 100 years between finding phagocytosis and NETs. There is so much more to be found, and to find it we have to keep looking. Forget space, forget the ocean floor, the human body is a veritable treasure trove for scientific explorers and the spoils – improved quality and quantity of life – can be enjoyed by all. So next time you see some pus, take a second to marvel at those millions of superheroes and the scientists helping us to understand them.

[1]. Ilya Mechnikov's Nobel Lecture (Accessed 23/4/12)

http://www.scientificamerican.com/article.cfm?id=drought-in-poland-reveals

Drought in Poland Reveals 400-Year-Old Sunken Treasures

A huge cargo of elaborate marble stonework that sank to the bottom of Poland's Vistula river four centuries ago has re-appeared after a drought and record-low water levels revealed the masonry lying in the mud on the river bed.

By Dagmara Leszkowicz

WARSAW (Reuters) - A huge cargo of elaborate marble stonework that sank to the bottom of Poland's Vistula river four centuries ago has re-appeared after a drought and record-low water levels revealed the masonry lying in the mud on the river bed. Archaeologists believe the stonework was part of a trove which 17th-century Swedish invaders looted from Poland's rulers and loaded onto barges to transport home, only for the booty to go to the bottom when the vessels sank.

Researchers knew about the artefacts, on the river bed where the Vistula passes through the Polish capital but, before the drought, retrieving them was a painstaking task because they were under several feet of water.

Now though, the masonry - large blocks of carved marble which were used in the columns, fountains, and staircases of Polish palaces - is lying exposed apart from a coating of foul-smelling yellow mud.

"The drought helped us a lot because what had been lying underneath is now at the surface," said Hubert Kowalski, Deputy director of the University of Warsaw Museum, leading the effort to retrieve the marble stonework.

Speaking at a building owned by the Warsaw river police, where some of the stonework is being temporarily stored, he said historians' knowledge about what happened four centuries ago had previously been sketchy.

"Now we have evidence, the best material evidence of the Swedish invasion so far."

JEWISH ARTEFACTS

Low rainfall over the past few months has brought the Vistula, Poland's longest river, to its lowest level since regular records began 200 years ago.

Navigation along the river has already been affected and officials say if water levels do not recover soon, power stations in Warsaw that use river water for cooling may be forced to close down.

The receding water has also revealed relics from Warsaw's bloody history during World War Two. During that period the city was occupied by Nazi Germany, the Jewish population was wiped out, the city rose up against the occupation, and then the Soviet Red Army arrived and imposed its own rule.

Unexploded World War Two ordnance was found on the river bed in one part of the city at the weekend.

Kowalski said on the stretch of river bed he had been studying, a few pieces of Jewish matzevah, or gravestones, had been discovered.

He said they would be handed over to the city's Jewish Historical Institute. Finds of Jewish artefacts are quite common in Warsaw, the legacy of successive Nazi and Soviet schemes to demolish traces of the city's Jewish community.

Historians believed that the Swedes who invaded Poland in the 17th century planned to move the looted cargo up the Vistula to Gdansk, where the river joins the Baltic Sea, and from there transport it home. There is still no firm explanation of why the boats sank on the way.
Kowalski said he and his team had so far located up to 10 tonnes of stonework, but this was only the beginning. "The boats had a capacity of 50-60 tonnes (each), so we think that we should find much more," he said.
Once it has been removed from the river bed and catalogued, the plan is to take the masonry to Warsaw's Royal Castle, one of the sites from which, historians believe, it was looted by the Swedish invaders.
For now though, the low water levels that revealed the artefacts are hampering efforts to retrieve them. Regular lifting equipment would sink into the mud, but the river is too low for the researchers to bring in floating cranes. "We need to wait until it gets higher," Kowalski said.
(Reporting by Dagmara Leszkowicz; Editing by Christian Lowe and Robin Pomeroy)

http://www.sciencedaily.com/releases/2012/09/120917085535.htm

Skilled Hunters 300,000 Years Ago

Finds from early stone age site in north-central Germany show that human ingenuity is nothing new -- and was probably shared by now-extinct species of humans.

ScienceDaily - Archeologists from the University of Tübingen have found eight extremely well-preserved spears -- an astonishing 300,000 years old, making them the oldest known weapons anywhere. The spears and other artifacts as well as animal remains found at the site demonstrate that their users were highly skilled craftsmen and hunters, well adapted to their environment -- with a capacity for abstract thought and complex planning comparable to our own. It is likely that they were members of the species Homo heidelbergensis, although no human remains have yet been found at the site.
The project is headed by Prof. Nicholas Conard and the excavations are supervised by Dr. Jordi Serangeli, both from the University of Tübingen's Institute of Prehistory, which has been supporting the local authority's excavation in an open-cast brown coal mine in Schöningen since 2008. They are applying skills from several disciplines at this uniquely well-preserved site find out more about how humans lived in the environment of 300,000 years ago.
The bones of large mammals -- elephants, rhinoceroses, horses and lions -- as well as the remains of amphibians, reptiles, shells and even beetles have been preserved in the brown coal. Pines, firs, and black alder trees are preserved complete with pine cones, as have the leaves, pollen and seeds of surrounding flora.
Until the mining started 30 years ago, these finds were below the water table. The archeologists say they are now carrying out "underwater archaeology without the water." Work continues almost all year round, and every day there is something new to document and recover.
Some of the most important finds of the past three years have been remains of a water buffalo in the context of human habitation, an almost completely preserved aurochs (one of the oldest in central Europe), and several concentrations of stone artifacts, bones and wood. They allow the scientists to examine an entire landscape instead of just one site. That makes Schöningen an exciting location and global reference point not just for archaeology, but also for quaternary ecology and climate research. A research center and museum, the "Paläon," is to be opened in 2013 to to provide information to the public about the work going on in Schöningen.

http://www.bbc.co.uk/news/science-environment-19623929

Neanderthals used feathers as 'personal ornaments'

Our evolutionary cousins the Neanderthals were harvesting feathers from birds in order to use them as personal ornaments, a study suggests.

By Paul Rincon Science editor, BBC News website

The authors say the result provides yet more evidence that Neanderthal thinking ability was similar to our own. The analysis even suggests they had a preference for dark feathers, which they selected from birds of prey and corvids - such as ravens and rooks. Details of the research appear in Plos One journal.
Numerous tribal peoples from history have also adorned themselves with feathers, and the authors stress that they are not suggesting we learned the practice from Neanderthals. Feather ornamentation could in fact go back even further, to a common ancestor of modern humans and Neanderthals.
Clive Finlayson and Kimberly Brown from the Gibraltar Museum, along with colleagues from Spain, Canada and Belgium, examined a database of 1,699 ancient sites across Eurasia, comparing data on birds at locations used by humans with those that were not. They found a clear association between raptor and corvid remains and sites that had been occupied by humans. They then looked more closely at bird bones found at Neanderthal sites in Gibraltar, including Gorham's and Vanguard cave, near the base of the rock: "The Neanderthals had cut

through and marked the bones. But what were they cutting? We realised a lot of it was wing bones, particularly those holding large primary feathers," Prof Finlayson told BBC News.
Co-author Jordi Rosell, from Rovira i Virgili University in Tarragona, Spain, said: "We saw the cut-marks on bird bones at one cave, and then started seeing them in others. I think it's a common aspect to the caves in this rock."
Juan Jose Negro, director of the Donana Biological Station in Seville, Spain, who is another co-author, said: "The wings make up less than 20% of the weight of the body of those birds," adding, "there is no meat in the wings - they were not consuming these animals. "The only explanation left is the use of those long feathers."
Not only this, but the ancient humans appeared to have a preference for birds with dark or black plumage. Species represented at the sites include ravens, crows, rooks, magpies, jackdaws, various types of eagle and vulture, red and black kites, kestrels and falcons.

Image correction

Speaking to me at this year's Calpe conference in Gibraltar, Prof Finlayson explained: "What all this suggests to us is that Neanderthals had the cognitive abilities to think in symbolic terms. The feathers were almost certainly being used for ornamental purposes, and this is a quite unbelievable thing to find."
For much of the last century, Neanderthals were portrayed as knuckle-dragging brutes, whose extinction some 30,000 years ago was the natural outcome of competing against a more intelligent, creative and resourceful human species - *Homo sapiens*.
In recent years, the Neanderthals - who lived across Europe, the Middle East and Central Asia in Pleistocene times - have come to be rehabilitated amid mounting evidence that their abilities had been underestimated.
"I think this is the tip of the iceberg," said Prof Finlayson: "It is showing that Neanderthals simply expressed themselves in media other than cave walls. The last bastion of defence in favour of our superiority was cognition."
Neanderthals, he said, may have been "different", but "their processes of thinking were obviously very similar".
Dr Negro cautioned that there was no way to tell how the feathers were put to use. But he observed: "Current uses of feathers typically involve the same species. If you think of the Plains Indians in North America, they put those feathers in headdresses and they are signalling. They are signalling power and status. Perhaps the Neanderthals were using feathers in the same way."
Asked how the ancient humans might have caught the birds, Clive Finlayson speculated: "It's possible that these birds were nesting near the caves. Some may have fallen, but there's too much of it to be a random collection of dead animals.
"It's possible the Neanderthals were climbing up the cliffs and collecting birds from nests. But a large proportion of these birds are scavengers. "An intelligent hominid, aware of this - and who may have used vultures as an indication of food sources - could easily have found ways of ambushing vultures and eagles when they came down to carcasses."
Other evidence of symbolic behaviour in Neanderthals includes the discovery of ochre - used to paint their bodies - at archaeological sites in Europe and the Levant. Earlier this year, another team published evidence of the possible symbolic use of eagle claws by Neanderthals, although they might also have been using the items as tools.

http://bit.ly/P8x3eC

Warm Currents: Graphite Powder Stirs Up Hints of Room-Temperature Superconductivity

Is a magnetic signal in water-treated graphite powder a sign of room-temperature superconductivity or a false alarm?

By Sophie Bushwick | Monday, September 17, 2012 | 21

A recent discovery in a study of room-temperature superconductivity, if borne out, could make the dream of super-efficient long-distance electricity transmission and levitating trains a little closer to reality.
Whereas physicists understand how standard superconductors can operate at nearly 275 degrees Celsius below water's freezing point, the mechanism behind high-temperature superconductors, which function at up to 140 degrees warmer than absolute zero, remains mysterious. Without knowing exactly how these warmer substances would manage to conduct electricity with zero resistance, researchers still don't know whether it's possible for anything to be superconductive at comparatively hot room-temperature conditions—which is what a new study claims.
According to a paper in Advanced Materials, cheap and easily obtainable graphite powder exhibits signs of superconductivity. And it doesn't need to be chilled with an expensive cryostat system—all it takes to make the powder superconductive is a simple water bath.

Pablo Esquinazi and other physicists from the University of Leipzig first discussed graphite as a potential superconductor in a 2012 paper published on arXiv, an electronic archive of preprint scientific papers. (The researchers have also made their new paper available there.) Certain parts of the material showed signs of the Josephson effect, when electrons tunnel between a barrier separating two superconductors. The effect indicated that the graphite samples contained superconducting areas.

"Due to this and the work we did the last three years, we were sure that superconducting patches could be possible," Esquinazi says. To test this notion the researchers treated graphite powder with water: They stirred it into the liquid for 23 hours, filtered it out and dried it at 100 degrees Celsius. Then they tested how the water-treated powder responded to a changing magnetic field.

Graphite, along with other materials, has held out the promise of room-temperature superconductivity before. For years there have been reports of weak, indirect superconducting signals coming from graphite treated with elements such as sulfur and oxygen. But nobody, not even these researchers, has been able to produce a definite room-temperature superconductor, a material that repeatedly meets the textbook definition of superconductivity—the conduction of electricity with zero resistance.

There are, however, other characteristics that mark a superconductor: A material typically becomes superconductive when it passes a temperature threshold and undergoes a distinct phase transition. The Josephson effect is another sign of superconductivity, and there is also the Meissner effect, also known as diamagnetism: When exposed to an external magnetic field, a superconductor pushes that field away so it doesn't penetrate the material. The magnetic field inside the superconductor will be less than the field outside. This effect makes it possible for superconductors to levitate, and it also creates detectable changes in the external magnetic field, providing a measurable sign of superconductivity.

The physicists tested their treated graphite powder for diamagnetism by measuring its magnetization as it was exposed to a changing magnetic field. And it responded as if a fraction of the sample was indeed superconducting—but only a tiny fraction of 0.01 percent.

This is hardly an impressive portion. "The amount is so teeny that it's extremely difficult to characterize," Esquinazi says. But the notion that anything can be superconductive at room temperature, especially a substance as cheap and easily fabricated as graphite and water, would be a major discovery.

"If you can make a material with zero resistance that's easy to manipulate and doesn't need [to be cooled with] liquid nitrogen, it can change the transmission of power, levitate trains, do many, many things," says physicist Ivan Schuller of the University of California, San Diego. Their speedy and efficient transmission of electricity could let superconductors improve power lines and even handheld electronic devices. But it's hard to imagine superconductors in the electric grid, the transportation system or your computer when they require continuous cooling with liquid nitrogen. If graphite powder, a simple and easily obtainable material, is really superconductive at room temperature, it could revolutionize current technology.

"Potentially, if it would be true, it's a major discovery," Schuller says. "The question is if it is true. And that's the part that has to be first scientifically determined." Schuller thinks that the finding needs more proof, especially because it is such an extraordinary claim. The researchers have not demonstrated that their sample has exhibited zero resistance, a transition temperature or even the Josephson effect. All that the graphite powder has is a slight diamagnetism.

Schuller says, "This must be reproduced in the same sample, then from sample to sample in their lab—and then in different labs. Scientists have to discuss and debate and argue and figure out if it's right or wrong. That's how science works. Then maybe one can come to some sort of conclusion."

Eminent physicist Theodore Geballe, an emeritus professor at Stanford University, agreed that when it comes to room-temperature superconductors, a lot of uncertainty—and a lot of work—remains. Although hints of room-temperature superconductivity in graphite are tantalizing, he said, "before they can be considered real, they must be identified. I hope it will be done in work following the present report, but am not at all optimistic."

And in fact, the researchers themselves agree that more proof is necessary before a graphite room-temperature superconductor can be proclaimed. "Other people have to do similar experiments and prove it's really superconductivity," Esquinazi says. "This is a very tricky experiment and the signal is very small." After that his team would need to increase the proportion of superconductive material in their sample, and then to study its properties.

"Then if the properties of a superconductor are good enough and stable enough at room temperature," he says, "this will be a revolution. We are really at the very beginning."

http://www.eurekalert.org/pub_releases/2012-09/bmj-a2p091712.php

Average 25% pay gap between men and women doctors largely 'inexplicable'

Is there equal pay in healthcare? Not if you are a doctor

According to the latest survey of UK hourly pay by the Office of National Statistics (ONS) female doctors' pay lags behind their male colleagues by 28.6%. This "eye opener" pay gap, which trends suggest has stood at around 25% on average since 2000, remains largely inexplicable, says John Appleby, Chief Economist at the King's Fund, in an article published on bmj.com today.

He explores possible reasons for this persistent gender divide in medicine and suggests that doctors have some way to catch up with other health care jobs.

For example, nursing auxiliaries and assistants show the smallest bias in pay towards men, writes Appleby, with women's median hourly pay being 0.1% less than men's. For nurses the pay gap widens to 1.9%.

Female paramedics' and health service managers pay also lags behind their male colleagues by 4.9% and 5.8% respectively, while at 16%, the pay gap for pharmacists is nearly treble this. Interestingly, female medical radiographers appear to earn 5.3% more than their male counterparts on average, adds Appleby.

But what explains the big gap in medical practitioners' pay between men and women?

A 2009 study for the BMA suggested that some of the difference may be legitimate' and explained by factors such as experience, grade and administrative duties "although why men end up with more experience or on higher grades - and hence more pay - begs some questions," he writes.

Nevertheless, a significant part of the pay gap appeared to be 'unexplained' by such factors. The analysis suggested that female doctors were disadvantaged due to caring roles, a 'hostile culture' and geographical limitations which reduced their ability to change jobs (a key way to increase pay).

"These are of course problems faced by women in other occupations too. But it may be that these factors are more acute for female medical practitioners, suggests Appleby. "Maybe there are lessons to be learned from some other health care professions, where gender pay differences are closer to zero," he concludes.

http://www.eurekalert.org/pub_releases/2012-09/uoc-dco091812.php

Dictionary completed on language used everyday in ancient Egypt

Completion of 37-year project benefits global scholars of ancient Middle East

A dictionary of thousands of words chronicling the everyday lives of people in ancient Egypt — including what taxes they paid, what they expected in a marriage and how much work they had to do for the government — has been completed by scholars at the University of Chicago.

The ancient language is Demotic Egyptian, a name given by the Greeks to denote it was the tongue of the demos, or common people. It was written as a flowing script and was used in Egypt from about 500 B.C. to 500 A.D., when the land was occupied and usually dominated by foreigners, including Persians, Greeks and Romans.

The language lives on today in words such as adobe, which came from the Egyptian word for brick. The word moved through Demotic, onto Arabic and eventually to Spain during the time of Islamic domination there, explained Janet Johnson, editor of the Chicago Demotic Dictionary.

Ebony, the dark wood that was traded down the Nile from Nubia (present-day Sudan), also comes from Demotic roots. The name Susan is indirectly related to the Demotic word for water lily.

"Demotic was used for business and legal documents, private letters and administrative inscriptions, and literary texts, such as narratives and pieces of wisdom literature," said Johnson, the Morton D. Hull Distinguished Service Professor at the Oriental Institute. "It was also used for religious and magical texts as well as scientific texts dealing with topics such as astronomy, mathematics and medicine. It is an indispensible tool for reconstructing the social, political and cultural life of ancient Egypt during a fascinating period of its history," she continued.

"The University of Chicago is pretty much Demotic central," said James Allen, PhD'81, the Wilbour Professor of Egyptology and chair of the Department of Egyptology and Ancient Western Asian Studies at Brown

University. "Besides the Demotic dictionary, the University also has some of the world's top experts on Demotic on its faculty. "This dictionary will be very useful, as there are more unpublished documents in Demotic than any other phase of ancient Egyptian," he said.
The Demotic language was one of the three texts on the Rosetta stone, which was also written in Egyptian hieroglyphs and Greek. In addition to being used on stone carvings, the script was left behind on papyrus and broken bits of pottery.
"The last four decades have seen a real explosion of Demotic studies, with more scholars focusing on this material, and great leaps in our understanding of this late version of the Egyptian language," said Gil Stein, director of the Oriental Institute. "The Chicago Demotic Dictionary is reaching completion at the perfect time to have an enormous impact on our understanding of Egyptian civilization in the final few centuries, when it still flourished as a vibrant and unique culture.
"The Chicago Demotic Dictionary provides the key to understanding the vast body of Demotic contracts, letters, tax records and other documents; this allows us to hear the voices of the people who made up the vast majority of Egyptian society during the period when they were under first Greek and then Roman rule," Stein said.

http://www.eurekalert.org/pub_releases/2012-09/ru-tmu091812.php

Theory: Music underlies language acquisition

Theorists advocate that music underlies the ability to acquire language

HOUSTON - Contrary to the prevailing theories that music and language are cognitively separate or that music is a byproduct of language, theorists at Rice University's Shepherd School of Music and the University of Maryland, College Park (UMCP) advocate that music underlies the ability to acquire language.
"Spoken language is a special type of music," said Anthony Brandt, co-author of a theory paper published online this month in the journal Frontiers in Cognitive Auditory Neuroscience. "Language is typically viewed as fundamental to human intelligence, and music is often treated as being dependent on or derived from language. But from a developmental perspective, we argue that music comes first and language arises from music."
Brandt, associate professor of composition and theory at the Shepherd School, co-authored the paper with Shepherd School graduate student Molly Gebrian and L. Robert Slevc, UMCP assistant professor of psychology and director of the Language and Music Cognition Lab.
"Infants listen first to sounds of language and only later to its meaning," Brandt said. He noted that newborns' extensive abilities in different aspects of speech perception depend on the discrimination of the sounds of language – "the most musical aspects of speech."
The paper cites various studies that show what the newborn brain is capable of, such as the ability to distinguish the phonemes, or basic distinctive units of speech sound, and such attributes as pitch, rhythm and timbre.
The authors define music as "creative play with sound." They said the term "music" implies an attention to the acoustic features of sound irrespective of any referential function. As adults, people focus primarily on the meaning of speech. But babies begin by hearing language as "an intentional and often repetitive vocal performance," Brandt said. "They listen to it not only for its emotional content but also for its rhythmic and phonemic patterns and consistencies. The meaning of words comes later." Brandt and his co-authors challenge the prevailing view that music cognition matures more slowly than language cognition and is more difficult.
"We show that music and language develop along similar time lines," he said.
Infants initially don't distinguish well between their native language and all the languages of the world, Brandt said. Throughout the first year of life, they gradually hone in on their native language. Similarly, infants initially don't distinguish well between their native musical traditions and those of other cultures; they start to hone in on their own musical culture at the same time that they hone in on their native language, he said.
The paper explores many connections between listening to speech and music. For example, recognizing the sound of different consonants requires rapid processing in the temporal lobe of the brain. Similarly, recognizing the timbre of different instruments requires temporal processing at the same speed -- a feature of musical hearing that has often been overlooked, Brandt said.
"You can't distinguish between a piano and a trumpet if you can't process what you're hearing at the same speed that you listen for the difference between 'ba' and 'da,'" he said. "In this and many other ways, listening to music and speech overlap." The authors argue that from a musical perspective, speech is a concert of phonemes and syllables.
"While music and language may be cognitively and neurally distinct in adults, we suggest that language is simply a subset of music from a child's view," Brandt said. "We conclude that music merits a central place in our understanding of human development."

Brandt said more research on this topic might lead to a better understanding of why music therapy is helpful for people with reading and speech disorders. People with dyslexia often have problems with the performance of musical rhythm. "A lot of people with language deficits also have musical deficits," Brandt said.
More research could also shed light on rehabilitation for people who have suffered a stroke. "Music helps them reacquire language, because that may be how they acquired language in the first place," Brandt said.
The research was supported by Rice's Office of the Vice Provost for Interdisciplinary Initiatives, the Ken Kennedy Institute for Information Technology and the Shepherd School of Music. For the full text of the theory paper, visit http://www.frontiersin.org/Auditory_Cognitive_Neuroscience/10.3389/fpsyg.2012.00327/abstract.

http://www.eurekalert.org/pub_releases/2012-09/bu-obm091812.php

Oral bacteria may signal pancreatic cancer risk

Research suggests a strong link, possibly predictive, between pancreatic cancer and levels of antibodies to certain oral bacteria.

PROVIDENCE, R.I. [Brown University] — A new study finds significant associations between antibodies for multiple oral bacteria and the risk of pancreatic cancer, adding support for the emerging idea that the ostensibly distant medical conditions are related.
The study of blood samples from more than 800 European adults, published online Sept. 18 in the journal Gut, found that high antibody levels for one of the more infectious periodontal bacterium strains of Porphyromonas gingivalis were associated with a two-fold risk for pancreatic cancer. Meanwhile, study subjects with high levels of antibodies for some kinds of harmless "commensal" oral bacteria were associated with a 45-percent lower risk of pancreatic cancer.
"The relative increase in risk from smoking is not much bigger than two," said Brown University epidemiologist Dominique Michaud, the paper's corresponding author. "If this is a real effect size of two, then potential impact of this finding is really significant."
Pancreatic cancer, which is difficult to detect and kills most patients within six months of diagnosis, is responsible for 40,000 deaths a year in the United States.
Several researchers, including Michaud, have found previous links between periodontal disease and pancreatic cancer. The Gut paper is the first study to test whether antibodies for oral bacteria are indicators of pancreatic cancer risk and the first study to associate the immune response to commensal bacteria with pancreatic cancer risk. The physiological mechanism linking oral bacteria and pancreatic cancer remains unknown, but the study strengthens the suggestion that there is one.
"This is not an established risk factor," said Michaud, who is also co-lead author with Jacques Izard, of the Forsyth Institute and Harvard University. "But I feel more confident that there is something going on. It's something we need to understand better."
Izard, a microbiologist, said the importance of bacteria in cancer is growing. "The impact of immune defense against both commensals and pathogenic bacteria undeniably plays a role," he said. "We need to further investigate the importance of bacteria in pancreatic cancer beyond the associated risk."

Prospective, controlled study

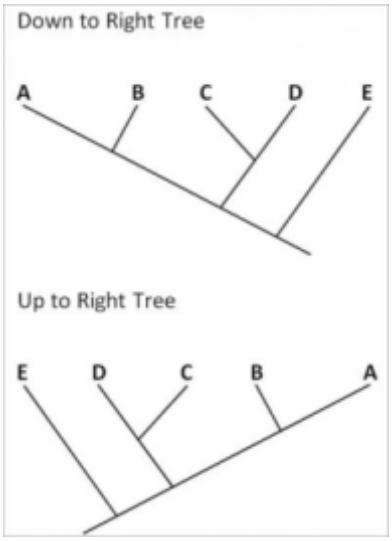
To conduct their research, Michaud and Izard drew on medical records and preserved blood samples collected by the Imperial College-led European Prospective Investigation into Cancer and Nutrition Study, a massive dataset of more than 500,000 adults in 10 countries. Detailed health histories and blood samples are available from more than 380,000 of the participants.
From that population, the researchers found 405 people who developed pancreatic cancer, but no other cancer, and who had blood samples available. The researchers also selected 416 demographically similar people who did not develop pancreatic cancer for comparison.
The researchers blinded themselves to which samples came from cancer patients and which didn't during their analysis of the blood, which consisted of measuring antibody concentrations for 25 pathogenic and commensal oral bacteria. In their study design and analysis they controlled for smoking, diabetes, body mass index, and other risk factors.
An important element of the study design was that date of the blood samples preceded the diagnosis of pancreatic cancer by as much as a decade, meaning that the significant difference in antibody levels were likely not a result of cancer.
Instead, the underlying mechanisms that link Porphyromonas gingivalis to pancreatic cancer could be causal, Michaud said, although much more research is needed to understand this association.
Meanwhile, the researchers speculate, the association of high levels of antibodies for commensal bacteria and pancreatic cancer, may indicate an innate, highly active immune response that is protective against cancer.

"Genetic determinants of immune surveillance clearly play a critical role in pancreatic cancer development," the authors wrote. "Consequently, it is plausible that elevated levels of antibodies to oral bacteria in individuals serve as a marker for a genetically stronger immune response, providing protection against carcinogenesis." Michaud, who studies cancer risk factors generally, continues to investigate the association between oral bacteria and pancreatic cancer in collaboration with Izard.

http://www.eurekalert.org/pub_releases/2012-09/uoc--up091812.php

UCSB psychologist studies the effects of diagram orientation on comprehension

Orientation of a diagram may seem inconsequential, but it can have a significant impact on a reader's ability to comprehend the information



(Santa Barbara, Calif.) — The orientation of a diagram on the page of a textbook may seem inconsequential, but it can have a significant impact on a reader's ability to comprehend the information as presented, according to a team of researchers at UC Santa Barbara, Vanderbilt University, and West Carolina University. Their findings appear in a recent issue of the journal Bioscience. Focusing on variously formatted cladograms — also known as phylogenetic trees — the researchers found that two diagrams may contain the same information, but they aren't necessarily equivalent in terms of how the information is interpreted. "In Western culture, we read from left to right, so we naturally come to a diagram with that behavior," said Andrew T. Stull, a researcher in the Department of Psychological & Brain Sciences at UCSB and an author of the paper. "The important point in this research, however, is that how efficiently a student comprehends the information presented in the phylogenetic tree depends on how the tree is angled."

Although images in textbooks generally represent phylogenetic trees with trunks angling up and to the right, research shows that students have better comprehension when the trunks angle down to the right. **UCSB**

As it turns out, when a diagonal tree extends from tips on the left to the root on the right, and the trunk angles downward to the right-hand side, the information is more easily accessible. "The way we interrogate the tree is first culturally based — left to right — and the strong diagonal line tends to make us flow one way or another," said Stull. "But that combined effect influences the accuracy, or how we're able to use the tree effectively." However, most textbooks depict the diagonal cladogram in the upward orientation, Stull noted. "Many artists draw the diagram in an inefficient and potentially confusing way," he said. "Artists have a tendency to draw it at the upward angle, not realizing they'd communicate the information better if they angled it downward."

The researchers used a phylogenetic tree for their research because it is very important for a process called tree thinking. "It's the idea that from an evolutionary perspective, there is a distinctive relationship between taxa," said Stull. "It's not just that things line up together on a tree, but you can infer certain biological, physiological, and pharmaceutical commonalities that might be relevant. There are a lot of things you can do in knowing how all of life is organized, and each organism's relation to everything else."

Drawing them in tree form, Stull continued, should help teach students the relationships between organisms, and to anticipate the valuable information those relationships can provide.

The researchers used eye-tracking technology to carry out their research. They showed test subjects one tree, and then another, and asked them to determine whether or not they were the same. "In order to answer the question, they had to interpret the two images," Stull explained. "Then we took all the eye positions. What we found is that when people studied the tree with the upward diagonal trunk, they were less accurate than when the tree followed the downward diagonal."

Why the directional angle makes a difference may have to do with how organisms represented by the individual branches relate to their closest common ancestor and to those with a more distant common ancestor. "With upward angled trunks, it may be because they [students] are thinking of it from the root up," Stull said. "But it's more efficient to think of it from the branches down. So, from an artistic perspective, it makes more sense to build it that way. With that orientation, the user doesn't have to deconstruct it in order to access the information."

Stull's co-authors include Laura R. Novick, associate professor of psychology and human development at Vanderbilt University; and Kefyn M. Catley, a professor of evolutionary biology at Western Carolina University.

http://www.sciencedaily.com/releases/2012/09/120918162220.htm

How Life Arose On Earth: Researchers Brew Up Organics On Ice

Researchers are brewing up icy, organic concoctions in the lab to mimic materials at the edge of our solar system and beyond.

ScienceDaily - Would you like icy organics with that? Maybe not in your coffee, but researchers at NASA's Jet Propulsion Laboratory in Pasadena, Calif., are creating concoctions of organics, or carbon-bearing molecules, on ice in the lab, then zapping them with lasers. Their goal: to better understand how life arose on Earth.

In a new study published in the Astrophysical Journal Letters, the research team provides the first direct look at the organic chemistry that takes place on icy particles in the frigid reaches of our solar system, and in the even chillier places between stars. Scientists think that the basic ingredients of life, including water and organics, began their journey to Earth on these lonesome ice particles. The ice and organics would have found their way into comets and asteroids, which then fell to Earth, delivering "prebiotic" ingredients that could have jump-started life.

The various steps needed to go from icy organics to slime molds are not clear, but the new findings help explain how the process works. The lab experiments show that organic material can begin the processing it needs to become prebiotic -- while still frozen in ice. "The very basic steps needed for the evolution of life may have started in the coldest regions of our universe," said Murthy Gudipati, lead author of the new study at JPL. "We were surprised to see organic chemistry brewing up on ice, at these very cold temperatures in our lab."

The organics looked at in the study are called polycyclic aromatic hydrocarbons, or PAHs for short. These carbon-rich molecules can be found on Earth as combustion products: for example, in barbecue pits, candle soot and even streaming out of the tail pipe of your car. They have also been spotted throughout space in comets, asteroids and more distant objects. NASA's Spitzer Space Telescope has detected PAHs in the swirling planet-forming disks around stars, in the spaces between stars and in remote galaxies.

Murthy and his colleague Rui Yang of JPL used their lab setup to mimic the environment of icy PAH molecules in the quiet cold of space, at temperatures as low as 5 Kelvin (minus 450 degrees Fahrenheit, or minus 268 degrees Celsius). First, they bombarded the particles with ultraviolet radiation similar to that from stars. Then, to determine the products of the chemical reaction, they used a type of laser system known as MALDI (for Matrix Assisted Laser Desorption and Ionization), which involves zapping the ice with both infrared and ultraviolet lasers.

The results revealed that the PAHs had transformed: they had incorporated hydrogen atoms into their structure and lost their circular, aromatic bonds, becoming more complex organics. According to Gudipati, this is the type of change that would need to occur if the material were to eventually become amino acids and nucleotides -- bits and pieces of protein and DNA, respectively. "PAHs are strong, stubborn molecules, so we were surprised to see them undergoing these chemical changes at such freezing-cold temperatures," said Gudipati.

Another bonus for the research is that it might explain the mystery of why PAHs have not yet been identified on ice grains in space. While the hardy organics are pervasive in the cosmos as gases and hot dust, researchers have remained puzzled that their signatures do not show up on ice. The new findings show that PAHs, once they stick to the ice surface, are chemically transformed into other complex organics, explaining why they might not be seen.

While the new results teach us that life's journey could have already begun in the very cold regions of the universe, another question remains: Did it arise elsewhere beyond our sun, too? Researchers don't know, but studies like this one help the ongoing search for life beyond Earth.

Murthy S. Gudipati, Rui Yang. In-Situ Probing of Radiation-Induced Processing of Organics in Astrophysical Ice Analogs—novel Laser Desorption Laser Ionization Time-Of-Flight Mass Spectroscopic Studies. The Astrophysical Journal, 2012; 756 (1): L24 DOI: 10.1088/2041-8205/756/1/L24

http://www.sciencedaily.com/releases/2012/09/120918184756.htm

Compound Found in Purple Corn May Aid in Developing Future Treatments for Type 2 Diabetes, Kidney Disease

Purple corn grown in Peru and Chile is rich in anthocyanins, which are reported to have anti-diabetic properties

ScienceDaily - Diabetic nephropathy is one of the most serious complications related to diabetes, often leading to end-stage kidney disease. Purple corn grown in Peru and Chile is a relative of blue corn, which is readily available in the U.S. The maize is rich in anthocyanins (also known as flavonoids), which are reported to have anti-diabetic properties. Scientists from the Department of Food and Nutrition and Department of Biochemistry at Hallym University in Korea investigated the cellular and molecular activity of purple corn anthocyanins

(PCA) to determine whether and how it affects the development of diabetic nephropathy (DN). Their findings suggest that PCA inhibits multiple pathways involved in the development of DN, which may help in developing therapies aimed at type 2 diabetes and kidney disease.
The study is entitled "Purple corn anthocyanins inhibit diabetes-associated glomerular monocyte activation and macrophage infiltration." It appears in the online edition of the American Journal of Physiology -- Renal Physiology, published by the American Physiological Society.

Methodology

Researcher Min-Kyung Kang and colleagues performed a two-part study, an in vitro experiment investigating the effects of PCA on human endothelial cells cultured under hyperglycemic kidney conditions and an in vivo study that investigated the effects of PCA on kidney tissue in diabetic mice. In the in vitro experiment, cultured cells were exposed to 1-20 µg/ml of PCA for six hours (control cells were not exposed), then assessed for level of monocyte-endothelial cell adhesion, a major factor in the development of diabetic glomerulosclerosis. In the in vivo experiment, diabetic and control mice were dosed with PCA for eight weeks, then changes in kidney tissue were assessed and immunohistological analyses were performed. Kidney tissue was further analyzed for levels of inflammatory chemokines, which are key components in DN.

A compound found in purple corn, a relative of the widely known blue corn, may help in developing therapies aimed at Type 2 diabetes and kidney disease. **(Credit: © kamonrat / Fotolia)**

Results

Researchers found that in human endothelial cells cultured in hyperglycemic kidney conditions, induction of endothelial cell adhesion molecules decreased in a dose-dependent manner with PCA exposure, meaning that the PCA likely interfered with cell-cell adhesion in glomeruli. PCA also appeared to interfere with leukocyte recruitment and adhesion to glomerular endothelial cells. In diabetic mice, PCA exposure slowed mesangial expansion and interrupted the cellular signaling pathway that may instigate glomerular adhesion and infiltration of inflammatory cells responsible for diabetic glomerulosclerosis. Finally, PCA inhibited levels of macrophage inflammatory protein-2 and monocyte chemotactic protein-1 in kidney tissue, demonstrating that it may inhibit macrophage infiltration, which is closely related to renal inflammation.

Importance of the Findings

The research suggests that anthocyanins may be the main biofunctional compound in purple corn and could protect against mesangial activation of monocytes and infiltration of macrophages in glomeruli -- the two major contributors to DN. The research further suggests that renoprotection by PCA against mesangial activation may be specific therapies targeting diabetes-associated diabetic glomerulosclerosis and renal inflammation. Finally, PCA supplementation may be an important strategy in preventing renal vascular disease in type 2 diabetes. "PCA may be a potential renoprotective agent treating diabetes-associated glomerulosclerosis," wrote the researchers.

Research Team

In addition to Min-Kyung Kang, the study team included Jing Li, Ju-Hyun Gong, Su-Nam Kwak, Jung Han Yoon Park, Soon Sung Lim and Young-Hee Kang, all also of the Department of Food and Nutrition at Hallym University in Korea, and Jae-Yong Lee, of the Department of Biochemistry at Hallym University.

M.-K. Kang, J. Li, J.-L. Kim, J.-H. Gong, S.-N. Kwak, J. H. Y. Park, J.-Y. Lee, S. S. Lim, Y.-H. Kang. Purple corn anthocyanins inhibit diabetes-associated glomerular monocyte activation and macrophage infiltration. AJP: Renal Physiology, 2012; DOI: 10.1152/ajprenal.00106.2012

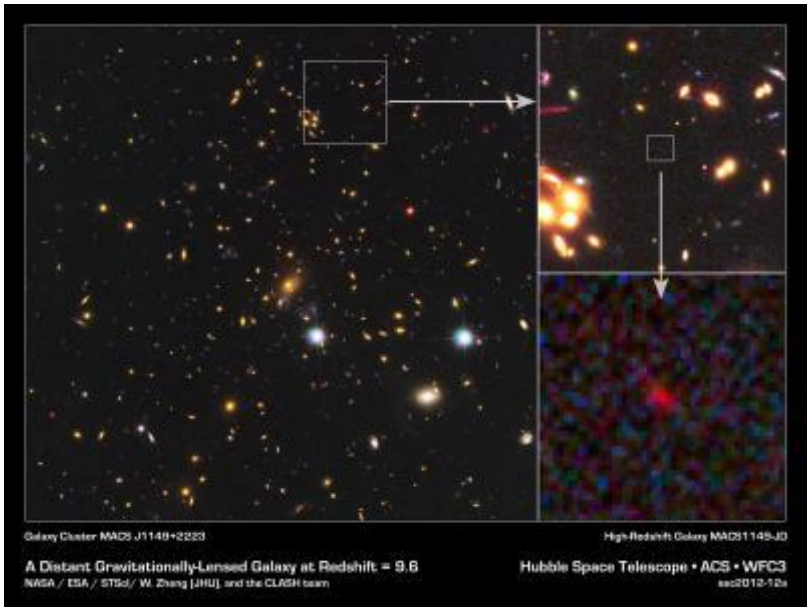
http://www.eurekalert.org/pub_releases/2012-09/jhu-jha091912.php

Johns Hopkins astrophysicist spies ultra-distant galaxy amidst cosmic 'dark ages'

A team of astronomers has spotted what could be the most distant galaxy ever detected

With the combined power of NASA's Spitzer and Hubble space telescopes as well as a cosmic magnification effect, a team of astronomers led by Wei Zheng of The Johns Hopkins University has spotted what could be the most distant galaxy ever detected.
Light from the young galaxy captured by the orbiting observatories shone forth when the 13.7-billion-year-old universe was just 500 million years old.
The far-off galaxy existed within an important era when the universe began to transit from the so-called "Dark Ages." During this period, the universe went from a dark, starless expanse to a recognizable cosmos full of galaxies. The discovery of the faint, small galaxy accordingly opens up a window into the deepest, remotest epochs of cosmic history.

"This galaxy is the most distant object we have ever observed with high confidence," said Zheng, a principal research scientist in The Henry A. Rowland Department of Physics and Astronomy at Johns Hopkins' Krieger School of Arts and Sciences and lead author of a paper appearing in Nature on Sept. 20. "Future work involving this galaxy -- as well as others like it that we hope to find -- will allow us to study the universe's earliest objects and how the Dark Ages ended."



Light from the primordial galaxy traveled approximately 13.2 billion light-years before reaching NASA's telescopes. In other words, the starlight snagged by Spitzer and Hubble left the galaxy when the universe was just 3.6 percent of its present age. Technically speaking, the galaxy has a redshift, or "z," of 9.6. The term "redshift" refers to how much an object's light has shifted into longer wavelengths as a result of the expansion of the universe. Astronomers use "redshift" to describe cosmic distances.

In the big image at left, the many galaxies of a massive cluster called MACS J1149+2223 dominate the scene. Gravitational lensing by the giant cluster brightened the light from the newfound galaxy, known as MACS 1149-JD, some 15 times. At upper right, a partial zoom-in shows MACS 1149-JD in more detail, and a deeper zoom appears to the lower right. **NASA/ESA/STScI/JHU**

Unlike previous detections of galaxy candidates in this age range, which were only glimpsed in a single color, or waveband, this newfound galaxy has been seen in five different wavebands. As part of the Cluster Lensing and Supernova Survey with Hubble program (CLASH), the Hubble Space Telescope registered the newly described far-flung galaxy in four wavelength bands. Spitzer located it in a fifth band with its Infrared Array Camera (IRAC), placing the discovery on firmer ground.

Objects at these extreme distances are mostly beyond the detection sensitivity of today's largest telescopes. To catch sight of these early, distant galaxies, astronomers rely on "gravitational lensing." In this phenomenon -- predicted by Albert Einstein a century ago -- the gravity of foreground objects warps and magnifies the light from background objects. A massive galaxy cluster situated between our galaxy and the early galaxy magnified the latter's light, brightening the remote object some 15 times and bringing it into view.

Based on the Spitzer and Hubble observations, astronomers think the distant galaxy was spied at a time when it was less than 200 million years old. It also is small and compact, containing only about 1 percent of the Milky Way's mass. According to leading cosmological theories, the first galaxies should indeed have started out tiny. They then progressively merged, eventually accumulating into the sizable galaxies of the more modern universe. These first galaxies likely played the dominant role in the epoch of reionization, the event that signaled the demise of the universe's Dark Ages. About 400,000 years after the Big Bang, neutral hydrogen gas formed from cooling particles. The first luminous stars and their host galaxies, however, did not emerge until a few hundred million years later. The energy released by these earliest galaxies is thought to have caused the neutral hydrogen strewn throughout the universe to ionize, or lose an electron, the state in which the gas has remained since that time.

"In essence, during the epoch of reionization, the lights came on in the universe," said paper co-author Leonidas Moustakas, a research scientist at NASA's Jet Propulsion Laboratory, a division of the California Institute of Technology in Pasadena, Calif.

Astronomers plan to study the rise of the first stars and galaxies and the epoch of reionization with the successor to both Spitzer and Hubble -- NASA's James Webb Telescope, slated for launch in 2018. The newly described distant galaxy will likely be a prime target.

Holland Ford, one of Zheng's colleagues and a co-author on the paper, commented on the findings.

"Science is very exciting when we explore the frontiers of knowledge," said Ford, a physics and astronomy professor at Johns Hopkins. "One of these frontiers is the first few hundred million years after the birth of our universe. Dr. Zheng's many years of searching for quasars and galaxies in the dawn of the universe has paid off with his discovery of a galaxy that we see as it was when the universe was less than 500 million years old.

"With his discovery, we are seeing a galaxy when it was not even a toddler," Ford said. "But this infant galaxy will in its future grow to be a galaxy like our own, hopefully hosting planetary systems with astronomers who will look back in time and see our galaxy in its infancy."

http://www.eurekalert.org/pub_releases/2012-09/wfbm-gmm091912.php

Genetic mutation may have allowed early humans to migrate throughout Africa, research says

A mutation thousands of years ago might answer how early humans moved across Africa in the "Great Expansion"

WINSTON-SALEM, N.C. - A genetic mutation that occurred thousands of years ago might be the answer to how early humans were able to move from central Africa and across the continent in what has been called "the great expansion," according to new research from Wake Forest Baptist Medical Center.

By analyzing genetic sequence variation patterns in different populations around the world, three teams of scientists from Wake Forest Baptist, Johns Hopkins University School of Medicine and the University of Washington School of Medicine, Seattle, demonstrated that a critical genetic variant arose in a key gene cluster on chromosome 11, known as the fatty acid desaturase cluster or FADS, more than 85,000 years ago. This variation would have allowed early humans to convert plant-based polyunsaturated fatty acids (PUFAs) to brain PUFAs necessary for increased brain size, complexity and function. The FADS cluster plays a critical role in determining how effectively medium-chain PUFAs found in plants are converted to the long-chain PUFAs found in the brain.

This research is published online today in PLOS One.

Archeological and genetic studies suggest that homo sapiens appeared approximately 180,000 years ago, but stayed in one location around bodies of water in central Africa for almost 100,000 years. Senior author Floyd H. "Ski" Chilton, Ph.D., professor of physiology and pharmacology and director of the Center for Botanical Lipids and Inflammatory Disease Prevention at Wake Forest Baptist, and others have hypothesized that this location was critical, in part, because early humans needed large amounts of the long-chain PUFA docosahexaenoic acid (DHA), which is found in shellfish and fish, to support complex brain function.

"This may have kept early humans tethered to the water in central Africa where there was a constant food source of DHA," Chilton said. "There has been considerable debate on how early humans were able to obtain sufficient DHA necessary to maintain brain size and complexity. It's amazing to think we may have uncovered the region of genetic variation that arose about the time that early humans moved out of this central region in what has been called the 'great expansion.'"

Once this trait arose, the study shows that it was under intense selective pressure and thus rapidly spread throughout the population of the entire African continent. "The power of genetics continually impresses me, and I find it remarkable that we can make inferences about things that happened tens of thousands of years ago by studying patterns of genetic variation that exist in contemporary populations," said Joshua M. Akey, Ph.D., lead scientist at the University of Washington.

This conversion meant that early humans didn't have to rely on just one food source, fish, for brain growth and development. This may have been particularly important because the genetic variant arose before organized hunting and fishing could have provided more reliable sources of long-chain PUFAs, Akey said.

To investigate the evolutionary forces shaping patterns of variation in the FADS gene cluster in geographically diverse populations, the researchers analyzed 1,092 individuals representing 15 different human populations that were sequenced as part of the 1000 Genome Project and 1,043 individuals from 52 populations from the Human Genome Diversity Panel database. They focused on the FADS cluster because they knew those genes code for the enzymatic steps in long-chain PUFA synthesis that are the least efficient.

Chilton said the findings were possible because of the collaboration of internationally recognized scientists from three distinct and diverse disciplines – fatty acid biochemistry (Wake Forest Baptist), statistical genetics (Johns Hopkins) and population genetics (University of Washington). This new information builds on Chilton's 2011 research findings published in BMC Genetics that showed how people of African descent have a much higher frequency of the gene variants that convert plant-based medium-chain omega-6 PUFAs found in cooking oils and processed foods to long-chain PUFAs that cause inflammation. Compared to Caucasians, African Americans in the United States have much higher rates of hypertension, type 2 diabetes, stroke, coronary heart disease and certain types of cancer. "The current observation provides another important clue as to why diverse racial and ethnic populations likely respond differently to the modern western diet," Chilton said.

This research was supported by National Institutes of Health grants, P50 AT002782 and a Clinical and Translational Science Award grant to The Johns Hopkins Medical Institutions. Additional support was received from the Wake Forest Health

Sciences Center for Public Health Genomics. Additional support came from the Mary Beryl Patch Turnbull Scholar Program and the MOSAIC initiative of Johns Hopkins University.
Chilton has a financial interest in and is a consultant for Gene Smart Health. His potential conflict of interest is being institutionally managed by Wake Forest Baptist and outside sponsors, as appropriate. No other authors have a conflict of interest.
First author is Rasika Mathias, Sc.D, assistant professor of medicine and epidemiology, Johns Hopkins; contributing authors include Hannah C. Ainsworth and Susan Sergeant, both of Wake Forest Baptist; Wenqing Fu, U of W; Dara G. Torgerson, University of California San Francisco; and Ingo Ruczinski and Kathleen C. Barnes of Johns Hopkins.

http://www.eurekalert.org/pub_releases/2012-09/uotw-kpa091412.php

Khoe-San peoples are unique, special -- largest genomic study finds

Some 220 individuals from different regions in southern Africa participated in the research that led to the analysis of around 2.3 million DNA variants per individual – the biggest ever

Genetically, culturally and ethically the Khoe-San have something special to add to this world. The importance of this study is to put the Khoe and San heritage in the right place in history and this research will provide a genetic backdrop for future studies - Mattias Jakobsson.

The largest genomic study ever conducted among Khoe and San groups reveals that these groups from southern Africa are descendants of the earliest diversification event in the history of all humans - some 100 000 years ago, well before the 'out-of-Africa' migration of modern humans.

Some 220 individuals from different regions in southern Africa participated in the research that led to the analysis of around 2.3 million DNA variants per individual – the biggest ever.

The research was conducted by a group of international scientists, including Professor Himla Soodyall from the Human Genomic Diversity and Disease Research Unit in the Health Faculty at the University of the Witwatersrand in Johannesburg.

Entitled ***Genomic variation in seven Khoe-San groups reveals adaptation and complex African history***, the study has been selected for early online publishing in the renowned scientific journal, Science, on Thursday, 20 September 2012 at 20:00 SATS (14:00 U.S. EST).

"The deepest divergence of all living people occurred some 100 000 years ago, well before modern humans migrated out of Africa and about twice as old as the divergences of central African Pygmies and East African hunter-gatherers and from other African groups," says lead author Dr Carina Schlebusch, a Wits University PhD-graduate now conducting post-doctoral research at Uppsala University in Sweden.

Soodyall, from National Health Laboratory Services in South Africa, has a long standing relationship with Khoe and San communities and said that the findings are a "phenomenal tribute to the indigenous Khoe and San people of southern Africa, and through this magnificent collaboration, we have given the peoples of Africa an opportunity to reclaim their place in the history of the world".

Besides the publication of the study, the authors will also be visiting the San groups in the Kalahari, in the Askam area in South Africa on the 24th of September 2012 for the country's Heritage Day celebrations. "We are excited that together with some of our colleagues from Uppsala University, we will be able to join in the celebrations with the San groups in the Kalahari who participated in our research and to acknowledge their contribution in making our research possible".

The researchers are now making the genome-wide data freely available: "Genetic information is getting more and more important for medical purposes. In addition to illuminating their history, we hope that this study is a step towards Khoe and San groups also being a part of that revolution," says Schlebusch. Another author, Professor Mike de Jongh from University of South Africa adds, "It is important for us to communicate with the participants prior to the genetic studies, to inform individuals about the nature of our research, and to also go back to not only to share the results with them, but also to explain the significance of the data for recapturing their heritage, to them."

ABOUT THE RESEARCH:

According to Assistant-Professor Mattias Jakobsson from Uppsala University, these deep divergences among African populations have important implications and consequences when the history of all humankind is deciphered.

The deep structure and patterns of genetic variation suggest a complex population history of the peoples of Africa. "The human population has been structured for a long time," says Jakobsson, "and it is possible that modern humans emerged from a non-homogeneous group."

The study also found surprising stratification among Khoe-San groups. For example, the researchers estimate that the San populations from northern Namibia and Angola separated from the Khoe and San populations living in South Africa as early as 25,000 – 40,000 years ago.
"There is astonishing ethnic diversity among the Khoe-San group, and we were able to see many aspects of the colorful history that gave rise to this diversity in their DNA", said Schlebusch.
The study further indicates how pastoralism first spread to southern Africa in combination with the Khoe culture. From archaeological and ethnographic studies it has been suggested that pastoralism was introduced to the Khoe in southern Africa before the arrival of Bantu-speaking farmers, but it has been unclear if this event had any genetic impact.
The Nama, a pastoralist Khoe group from Namibia showed great similarity to 'southern' San groups. "However, we found a small but very distinct genetic component that is shared with East Africans in this group, which may be the result of shared ancestry associated with pastoral communities from East Africa," says Schlebusch.
With the genetic data the researchers could see that the Khoe pastoralists originate from a Southern San group that adopted pastoralism with genetic contributions from an East African group – a group that would have been the first to bring pastoralist practices to southern Africa.
The study also revealed evidence of local adaptation in different Khoe and San groups. For example, the researchers found that there was evidence for selection in genes involved in muscle function, immune response, and UV-light protection in local Khoe and San groups. These could be traits linked with adaptations to the challenging environments in which the ancestors of present-day San and Khoe were exposed to that have been retained in the gene pool of local groups.
The researchers also looked for signals across the genome of ancient adaptations that happened before the historical separation of the Khoe-San lineage from other humans. "Although all humans today carry similar variants in these genes, the early divergence between Khoe-San and other human groups allowed us to zoom-in on genes that have been fast-evolving in the ancestors of all of us living on the planet today," said Pontus Skoglund from Uppsala University.
Among the strongest candidates were genes involved in skeletal development that may have been crucial in determining the characteristics of anatomically modern humans.

http://www.eurekalert.org/pub_releases/2012-09/plos-atm091712.php

Ancient tooth may provide evidence of early human dentistry

Evidence of ancient dentistry in a 6,500-year-old human jaw bone with a tooth showing traces of beeswax filling

Researchers may have uncovered new evidence of ancient dentistry in the form of a 6,500-year-old human jaw bone with a tooth showing traces of beeswax filling, as reported Sep. 19 in the open access journal PLOS ONE.
The researchers, led by Federico Bernardini and Claudio Tuniz of the Abdus Salam International Centre for Theoretical Physics in Italy in cooperation with Sincrotrone Trieste and other institutions, write that the beeswax was applied around the time of the individual's death, but cannot confirm whether it was shortly before or after. If it was before death, however, they write that it was likely intended to reduce pain and sensitivity from a vertical crack in the enamel and dentin layers of the tooth.

This is a microphotograph of the tooth crown in occlusal view with indication of the surface covered by beeswax (within the yellow dotted line). **Bernardini F, Tuniz C, Coppa A, Mancini L, Dreossi D, et al. (2012) Beeswax as Dental Filling on a Neolithic Human Tooth. PLoS ONE 7(9): e44904. doi:10.1371/journal.pone.0044904**

According to Tuniz, the severe wear of the tooth "is probably also due to its use in non-alimentary activities, possibly such as weaving, generally performed by Neolithic females."
Evidence of prehistoric dentistry is sparse, so this new specimen, found in Slovenia near Trieste, may help provide insight into early dental practices.
"This finding is perhaps the most ancient evidence of pre-historic dentistry in Europe and the earliest known direct example of therapeutic-palliative dental filling so far", says Bernardini.
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Competing Interest Statement: The authors have declared that no competing interests exist.
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http://www.eurekalert.org/pub_releases/2012-09/uoc-bin091812.php

Birth is no reason to go to hospital

A new Cochrane Review concludes that all countries should consider establishing proper home birth services.

They should also provide low-risk pregnant women with information enabling them to make an informed choice. The review has been prepared by senior researcher, statistician Ole Olsen, the Research Unit for General Practice, University of Copenhagen, and midwifery lecturer PhD Jette Aaroe Clausen.

In many countries it is believed that the safest option for all women is to give birth in hospital. However, observational studies of increasingly better quality and in different settings suggest that planned home birth in many places can be as safe as planned hospital birth and with less intervention and fewer complications.

"If home birth is going be an attractive and safe option for most pregnant women, it has to be an integrated part of the health care system," Ole Olsen says and adds, "In several Danish regions the home birth service has been very well organised for several years. This is not the case everywhere in the world."

The updated Cochrane Review concludes that there is no strong evidence from experimental studies (randomised trials) to favour either planned hospital birth or planned home birth for low-risk pregnant women. At least not as long as the planned home birth is assisted by an experienced midwife with collaborative medical back up in case transfer should be necessary.

Fewer interventions in home birth

Routines and easy access to medical interventions may increase the risk of unnecessary interventions in birth explaining why women who give birth at home have a higher likelihood for a spontaneous labour. There are 20-60 per cent fewer interventions, for example fewer cesarean sections, epidurals and augmentation among those women who plan a homebirth; and 10-30 per cent fewer complications, for example post partum bleeding and severe perineal tears.

"Patience is important if women want to avoid interference and give birth spontaneously," says Jette Aaroe Clausen. "At home the temptation to make unnecessary interventions is reduced. The woman avoids for example routine electronic monitoring that may easily lead to further interventions in birth."

Jette Aaroe Clausen adds that interventions in childbirth are common in many countries, but also that there is a growing concern internationally because interventions may lead to iatrogenic effects; iatrogenic effects meaning unintended consequences of the intervention. Routine electronic monitoring may for example lead to more women having artificial rupture of membranes which in turn can lead to more interventions.

Evidence and human rights

While the scientific evidence from observational studies has been growing, the European Court of Human Rights in Strasbourg in the case Ternovszky versus Hungary has handed down a judgment stating that "the right to respect for private life includes the right to choose the circumstances of birth". This is quoted in the review. Thus the conclusions of the review are based on human rights and ethics as well as on results from the best available scientific studies.

Ref.: Olsen O, Clausen JA. Planned hospital birth versus planned home birth. The Cochrane Library, Issue 9, 2012. The full review may be available here (depends on country): http://onlinelibrary.wiley.com/doi/10.1002/14651858.CD000352.pub2/abstract

http://www.sciencedaily.com/releases/2012/09/120919124900.htm

Clenching Left Hand Could Help Athletes Avoid Choking Under Pressure

Some athletes may improve their performance under pressure by squeezing a ball or clenching their left hand before competition to activate parts of the brain

ScienceDaily - Some athletes may improve their performance under pressure simply by squeezing a ball or clenching their left hand before competition to activate certain parts of the brain, according to new research published by the American Psychological Association.

In three experiments with experienced soccer players, judo experts and badminton players, researchers in Germany tested the athletes' skills during practice and then in stressful competitions before a large crowd or video camera. Right-handed athletes who squeezed a ball in their left hand before competing were less likely to choke under pressure than right-handed players who squeezed a ball in their right hand. The study was published online in the Journal of Experimental Psychology: General.

For skilled athletes, many movements, such as kicking a soccer ball or completing a judo kick, become automatic with little conscious thought. When athletes under pressure don't perform well, they may be focusing too much on their own movements rather than relying on their motor skills developed through years of practice,

said lead researcher Juergen Beckmann, PhD, chair of sport psychology at the Technical University of Munich in Germany.

"Rumination can interfere with concentration and performance of motor tasks. Athletes usually perform better when they trust their bodies rather than thinking too much about their own actions or what their coaches told them during practice," Beckmann said. "While it may seem counterintuitive, consciously trying to keep one's balance is likely to produce imbalance, as was seen in some sub-par performances by gymnasts during the Olympics in London."

Previous research has shown that rumination is associated with the brain's left hemisphere, while the right hemisphere is associated with superior performance in automated behaviors, such as those used by some athletes, the study notes. The right hemisphere controls movements of the left side of the body, and the left hemisphere controls the right side. The researchers theorized that squeezing a ball or clenching the left hand would activate the right hemisphere of the brain and reduce the likelihood of the athlete's choking under pressure. The study focused exclusively on right-handed athletes because some relationships between different parts of the brain aren't as well understood for left-handed people, according to the authors.

The research could have important implications outside athletics. Elderly people who are afraid of falling often focus too much on their movements, so right-handed elderly people may be able to improve their balance by clenching their left hand before walking or climbing stairs, Beckmann said.

"Many movements of the body can be impaired by attempts at consciously controlling them," he said. "This technique can be helpful for many situations and tasks."

In the first experiment, 30 semi-professional male soccer players took six penalty shots during a practice session. The next day, they attempted to make the same penalty shots in an auditorium packed with more than 300 university students waiting to see a televised soccer match between Germany and Austria. The players who squeezed a ball with their left hand performed as well under pressure as during practice, while players who squeezed a ball in their right hand missed more shots in the crowded auditorium.

Twenty judo experts (14 men and six women) took part in the second experiment. First, they performed a series of judo kicks into a sandbag during practice. During a second session, they were told that their kicks would be videotaped and evaluated by their coaches. The judo athletes who squeezed a ball with their left hand not only didn't choke under pressure, they performed better overall during the stressful competition than during practice, while those in the control group choked under pressure, the study found.

The final experiment featured 18 experienced badminton players (12 men and six women) who completed a series of practice serves. Then, they were divided into teams and competed against each other while being videotaped for evaluation by their coaches. Athletes who squeezed a ball in their left hand didn't choke under pressure, unlike the control group players who squeezed a ball in their right hand. A final phase of the experiment had the athletes just clench their left or right hand without a ball before competition, and players who clenched their left hand performed better than players who squeezed their right hand.

The ball-squeezing technique probably wouldn't help athletes whose performance is based on strength or stamina, such as weightlifters or marathon runners, the authors noted. The effects apply to athletes whose performance is based on accuracy and complex body movements, such as soccer players or golfers, they said.

Jürgen Beckmann, Peter Gröpel, Felix Ehrlenspiel. Preventing Motor Skill Failure Through Hemisphere-Specific Priming: Cases From Choking Under Pressure.. Journal of Experimental Psychology: General, 2012; DOI: 10.1037/a0029852

http://www.sciencedaily.com/releases/2012/09/120919135318.htm

Human Brains Share a Consistent Genetic Blueprint and Possess Enormous Biochemical Complexity

The human brains share a consistent genetic blueprint and possess enormous biochemical complexity

ScienceDaily - Scientists at the Allen Institute for Brain Science reported in the latest issue of the journal Nature that human brains share a consistent genetic blueprint and possess enormous biochemical complexity. The findings stem from the first deep and large-scale analysis of the vast data set publicly available in the Allen Human Brain Atlas.

The results of this study are based on extensive analysis of the Allen Human Brain Atlas, specifically the detailed all-genes, all-structures survey of genes at work throughout the human brain. This dataset profiles 400 to 500 distinct brain areas per hemisphere using microarray technology and comprises more than 100 million gene expression measurements covering three individual human brains to date. Among other findings, these data show that 84% of all genes are expressed somewhere in the human brain and in patterns that are substantially similar from one brain to the next.

"This study demonstrates the value of a global analysis of gene expression throughout the entire brain and has implications for understanding brain function, development, evolution and disease," said Ed Lein, Ph.D., Associate Investigator at the Allen Institute for Brain Science and co-lead author on the paper. "These results only scratch the surface of what can be learned from this immense data set. We look forward to seeing what others will discover."

Key Findings

The results of this study show that, despite the myriad personalities and cognitive talents seen across the human population, our brains are more similar to one another than different. Individual human brains share the same basic molecular blueprint, and deeper analysis of this shared architecture reveals several further findings:

Neighboring regions of the brain's cortex -- the wrinkly outer rind -- are more biochemically similar to one another than to more distant brain regions, which has implications for understanding the development of the human brain, both during the lifespan and throughout evolution.

The right and left hemispheres show no significant differences in molecular architecture. This suggests that functions such as language, which are generally handled by one side of the brain, likely result from more subtle differences between hemispheres or structural variation in size or circuitry, but not from a deeper molecular basis.

Despite controlling a diversity of functions, ranging from visual perception to planning and problem-solving, the cortex is highly homogeneous relative to other brain regions. This suggests that the same basic functional elements are used throughout the cortex and that understanding how one area works in detail will uncover fundamentals that apply to the other areas, as well.

In addition to such global findings, the study provides new insights into the detailed inner workings of the brain at the molecular level -- the level at which diseases unfold and therapeutic drugs take action.

84% of all genes are expressed, or turned on, somewhere in the human brain.

Many previously uncharacterized genes are turned on in specific brain regions and localize with known functional groups of genes, suggesting they play roles in particular brain functions.

Synapse-associated genes -- those related to cell-to-cell communication machinery in the brain -- are deployed in complex combinations throughout the brain, revealing a great diversity of synapse types and remarkable regional variation that likely underlies functional distinctions between brain regions.

"The tremendous variety of synapses we see in the human brain is quite striking," said Seth Grant, FRSE, Professor of Molecular Neuroscience at the University of Edinburgh and collaborating author on the study. "Mutations in synaptic genes are associated with numerous brain-related disorders, and thus understanding synapse diversity and organization in the brain is a key step toward understanding these diseases and developing specific and effective therapeutics to treat them."

Michael J. Hawrylycz, Ed S. Lein, Angela L. Guillozet-Bongaarts, Elaine H. Shen, Lydia Ng, Jeremy A. Miller, Louie N. van de Lagemaat, Kimberly A. Smith, Amanda Ebbert, Zackery L. Riley, Chris Abajian, Christian F. Beckmann, Amy Bernard, Darren Bertagnolli, Andrew F. Boe, Preston M. Cartagena, M. Mallar Chakravarty, Mike Chapin, Jimmy Chong, Rachel A. Dalley, Barry David Daly, Chinh Dang, Suvro Datta, Nick Dee, Tim A. Dolbeare, Vance Faber, David Feng, David R. Fowler, Jeff Goldy, Benjamin W. Gregor, Zeb Haradon, David R. Haynor, John G. Hohmann, Steve Horvath, Robert E. Howard, Andreas Jeromin, Jayson M. Jochim, Marty Kinnunen, Christopher Lau, Evan T. Lazarz, Changkyu Lee, Tracy A. Lemon, Ling Li, Yang Li, John A. Morris, Caroline C. Overly, Patrick D. Parker, Sheana E. Parry, Melissa Reding, Joshua J. Royall, Jay Schulkin, Pedro Adolfo Sequeira, Clifford R. Slaughterbeck, Simon C. Smith, Andy J. Sodt, Susan M. Sunkin, Beryl E. Swanson, Marquis P. Vawter, Derric Williams, Paul Wohnoutka, H. Ronald Zielke, Daniel H. Geschwind, Patrick R. Hof, Stephen M. Smith, Christof Koch, Seth G. N. Grant, Allan R. Jones. An anatomically comprehensive atlas of the adult human brain transcriptome. Nature, 2012; 489 (7416): 391 DOI: 10.1038/nature11405

http://www.sciencenews.org/view/generic/id/345237/title/Oral_MS_drug_passes_tests

Oral MS drug passes tests

BG-12 suppresses relapses

By Nathan Seppa

People with multiple sclerosis might soon have a new option for controlling their disease with pills instead of shots. Two studies in the Sept. 20 New England Journal of Medicine demonstrate that a variation on a drug used against psoriasis for years in Germany holds off MS relapses and has minimal side effects.

“These data look good. Both studies show a reduction in relapses with really pretty robust effects,” says Clyde Markowitz, a neurologist at the University of Pennsylvania who wasn’t involved with the trials.

The drug, called BG-12, has been submitted to the U.S. Food and Drug Administration for approval by the biotech company Biogen Idec. Markowitz expects it to get approved. “It would be a clear benefit to the MS

population to have another option," he says. If approved, BG-12 would be the third oral drug available to treat MS.

The disease results when the immune system attacks the fatty myelin sheaths coating nerves in the central nervous system, leading to impaired muscle control, balance, vision and speech. BG-12, or dimethyl fumarate, has anti-inflammatory, cell-protective and antioxidant effects, which earlier work suggested could suppress the aberrant immune reactions in MS patients.

Scientists in both studies recruited MS patients and randomly assigned some in each group to BG-12 or placebo tablets. In one of the studies, an additional group was randomly assigned to get an injectable MS drug called glatiramer acetate (Copaxone). In other respects the studies were nearly identical, each enrolling more than 1,000 MS patients, ages 18 to 55, in 28 countries apiece, for two years of treatment. Both trials included a mix of North American and European researchers.

On average, patients getting BG-12 went from 72 weeks to more than 90 weeks before experiencing a relapse, compared with 30 and 38 weeks among those assigned a placebo in the two studies. Magnetic resonance imaging also revealed strikingly fewer lesions in the brains of patients after two years of BG-12 than in those on placebos.

The results come at a heady time in MS research, with several drugs in testing and some newly approved in the past decade. The most recent was the oral drug teriflunomide (Aubagio), which the FDA cleared on September 12. It joins another oral drug, fingolimod (Gilenya), which was approved in 2010. Two injectable cancer drugs have also shown promise against MS (SN: 2/23/08, p. 125; SN: 11/22/08, p.9), and these or similar versions of them are awaiting FDA approval as MS drugs. For years, the standard treatment has been injectable anti-inflammatory interferon beta.

The oral drugs are more convenient to use than interferon and the other injectables, boosting patient compliance, says Robert Fox, a neurologist at the Cleveland Clinic who coauthored one of the studies. The oral drugs also seem more effective at preventing relapses than the injectables, with the exception of a potent injectable called natalizumab (Tysabri), which was first approved in 2004. But natalizumab stumbled on early reports of side effects and was pulled off shelves temporarily. It's been back on the market for six years, with label warnings (SN: 3/4/06, p. 131).

It may take years before any of the oral drugs proves better overall than the others. "It is not clear at the moment how to advise patients about the new oral drugs, but the overall benefits-to-risk assessment, as of this month, may favor fumarate," meaning BG-12, says physician Allan Ropper of Brigham and Women's Hospital in Boston, writing in the same New England Journal of Medicine issue. "The two-decade safety record of fumarate in psoriasis lessens concern about long-term risk," he says.

Markowitz says that advances in understanding the immune system are driving the progress against MS. "If you can modulate immune functions, you can control disease activity," he says.

While the spate of new drugs has given patients and doctors more options, it also has made it more difficult to test drugs. "With those other therapies [available], it's a lot harder to keep patients — from an ethical point of view — on a placebo for two years," Fox says.

http://www.eurekalert.org/pub_releases/2012-09/uop-wtt092012.php

Walking to the beat could help patients with Parkinson's disease

Pitt study examines effects of visual, auditory, and tactile cues on human gait

Walking to a beat could be useful for patients needing rehabilitation, according to a University of Pittsburgh study. The findings, highlighted in the August issue of PLOS One, demonstrate that researchers should further investigate the potential of auditory, visual, and tactile cues in the rehabilitation of patients suffering from illnesses like Parkinson's Disease—a brain disorder leading to shaking (tremors) and difficulty walking.

Together with a team of collaborators from abroad, Ervin Sejdic, an assistant professor of engineering in Pitt's Swanson School of Engineering, studied the effects of various metronomic stimuli (a mechanically produced beat) on fifteen healthy adults, ages 18 to 30. Walkers participated in two sessions consisting of five 15-minute trials in which the participants walked with different cues.

In the first, participants walked at their preferred walking speed. Then, in subsequent trials, participants were asked to walk to a metronomic beat, produced by way of visuals, sound, or touch. Finally, participants were asked to walk with all three cues simultaneously, the pace of which was set to that of the first trial.

"We found that the auditory cue had the greatest influence on human gait, while the visual cues had no significant effect whatsoever," said Sejdic. "This finding could be particularly helpful for patients with Parkinson's Disease, for example, as auditory cues work very well in their rehabilitation."

Sejdic said that with illnesses like Parkinson's Disease, a big question is whether researchers can better understand the changes that come with this deterioration. Through their study, the Pitt team feels that visual cues could be considered as an alternative modality in rehabilitation and should be further explored in the laboratory.

"Oftentimes, a patient with Parkinson's Disease comes in for an exam, completes a gait assessment in the laboratory, and everything is great," said Sejdic. "But then, the person leaves and falls down. Why? Because a laboratory is a strictly controlled environment. It's flat, has few obstacles, and there aren't any cues (like sound) around us. When we're walking around our neighborhoods, however, there are sidewalks, as well as streetlights and people honking car horns: you have to process all of this information together. We are trying to create that real-life space in the laboratory."

In the future, Sejdic and his team would like to conduct similar walking trials with patients with Parkinson's Disease, to observe whether their gait is more or less stable.

"Can we see the same trends that we observed in healthy people?" he said. "And, if we observe the same trends, then that would have direct connotations to rehabilitation processes."

Additionally, his team plans to explore the impact of music on runners and walkers.

Funding for this project was provided, in part, by the University of Pittsburgh, the University of Toronto, and Holland Bloorview Kids Rehabilitation Hospital.

http://www.eurekalert.org/pub_releases/2012-09/icl-fbp091912.php

Free bus passes have health benefit, say researchers

Free bus passes for over-60s may be encouraging older people to be more physically active, say the authors of a study published today in the American Journal of Public Health.

Researchers from Imperial College London reached their conclusion by analysing four years of data from the UK National Travel Survey. They found that people with a bus pass are more likely to walk frequently and take more journeys by "active travel" - defined as walking, cycling or using public transport. These associations cut across socio-economic groups, suggesting that wealthier and poorer people are benefitting from the scheme equally.

Keeping physically active helps to maintain mental wellbeing, mobility and muscle strength in older people and reduces their risk of cardiovascular disease, falls and fractures. Previous research has shown that 15 minutes of moderate daily exercise is associated with a 12 per cent lower risk of death is people over 60.

Another study found that 19 per cent of adults in Britain get their recommended amount of physical activity through active travel alone. Public health organisations increasingly believe that "incidental" exercise, such as walking to and from bus stops, may have a key role to play in helping people keep fit.

Free bus passes for people aged 60 and over were introduced in England in 2006, entitling holders to free local bus travel after 9:30am on weekdays and all day on weekends and public holidays. Pressure on public spending has led to proposals for the scheme, which costs £1.1 billion a year, to be scrapped, or for bus passes to be means-tested.

The scheme's proponents claim that it reduces social exclusion among older people and ensures access to travel for those on limited incomes. The authors of the new study believe that possible benefits for public health should also be taken into consideration.

"Given the need to encourage older people to be physically active, it's good news that the provision of free bus passes seems to be having a positive impact," said Sophie Coronini-Cronberg, from the School of Public Health at Imperial College London, who led the study.

"Before the government looks at reforming the scheme, they should make sure we understand its value to society. We would welcome more research in this area, such as a detailed cost analysis to establish whether the scheme represents good value for money."

The researchers examined data from the National Travel Survey from 2005, the year before free bus basses were implemented, until 2008. They included results from respondents aged 60 or over in England, giving a total of 16,911 people. The percentage of respondents with a free pass rose from 56.8 per cent in 2005 to 74.7 per cent in 2008.

The findings show that the biggest factor associated with not using active travel or walking is having access to a car. People in large urban areas are more likely to use active transport, and people in rural areas or small towns are more likely to report walking frequently.

1. Reference: S Coronini-Cronberg et al (2012) The impact of free older persons' bus pass on active travel and regular walking in England. Am J Public Health. Published online ahead of print September 20 2012: e1–e8. doi:10.2105/AJPH.2012.300946

http://www.eurekalert.org/pub_releases/2012-09/s-ha092012.php

'Psychopaths' have an impaired sense of smell

Study suggests that a poor sense of smell may be a marker for psychopathic traits

People with psychopathic tendencies have an impaired sense of smell, which points to inefficient processing in the front part of the brain. These findings by Mehmet Mahmut and Richard Stevenson, from Macquarie University in Australia, are published online in Springer's journal Chemosensory Perception.

Psychopathy is a broad term that covers a severe personality disorder characterized by callousness, manipulation, sensation-seeking and antisocial behaviors, traits which may also be found in otherwise healthy and functional people. Studies have shown that people with psychopathic traits have impaired functioning in the front part of the brain - the area largely responsible for functions such as planning, impulse control and acting in accordance with social norms. In addition, a dysfunction in these areas in the front part of the brain is linked to an impaired sense of smell.

Mahmut and Stevenson looked at whether a poor sense of smell was linked to higher levels of psychopathic tendencies, among 79 non-criminal adults living in the community. First they assessed the participants' olfactory ability as well as the sensitivity of their olfactory system. They also measured subjects' levels of psychopathy, looking at four measures: manipulation; callousness; erratic lifestyles; and criminal tendencies. They also noted how much or how little they emphasized with other people's feelings.

The researchers found that those individuals who scored highly on psychopathic traits were more likely to struggle to both identify smells and tell the difference between smells, even though they knew they were smelling something. These results show that brain areas controlling olfactory processes are less efficient in individuals with psychopathic tendencies.

The authors conclude: " Our findings provide support for the premise that deficits in the front part of the brain may be a characteristic of non-criminal psychopaths. Olfactory measures represent a potentially interesting marker for psychopathic traits, because performance expectancies are unclear in odor tests and may therefore be less susceptible to attempts to fake good or bad responses."

M. K. Mahmut, R. J. Stevenson (2012). Olfactory abilities and psychopathy: higher psychopathy scores are associated with poorer odor discrimination and odor identification; Chemosensory Perception; DOI: 10.1007/s12078-012-9135-7

http://phys.org/news/2012-09-short-billion-dollar-drugs.html

A short cut to billion dollar drugs

Scientists have found a highly efficient method of making hormone-based drugs which could generate billions of sales for the pharmaceutical industry.

Phys.org - Organic chemists from the University of Bristol, whose work was recently published in Nature, have perfected a quicker way of making prostaglandins which would mean many more people could be treated for a range of illnesses for the same cost.

Prostaglandins are some of the most important molecules in biology and medicine as they regulate a wide range of activities in the body including blood circulation, digestion and reproduction.

Some synthetic analogues of prostaglandin are 'billion dollar' drugs. The prostaglandin analogue latanoprost, for example, which is used to treat glaucoma and ocular hypertension, generates approximately $1.6 billion in sales each year.

Prostaglandins have been popular targets in synthesis for the last forty years because of their breadth of biological activity and their challenging molecular architecture. However, since these molecules cannot be isolated from natural sources in sufficient quantities, they have to be synthesised, but process is lengthy. For example, the current synthesis of latanoprost requires twenty steps. Until now, despite huge synthetic effort in industry and academia, advances in the synthesis of prostaglandins have been limited.

Professor Varinder Aggarwal, who led the research funded jointly by the Engineering and Physical Sciences Research Council and the European Research Council, now reports a concise synthesis of prostaglandin PGF2a, which relies on the use of an organocatalyst, a small organic molecule, to catalyse a key step in the process. The new process has enabled them to complete the synthesis in just seven steps.

In a follow-up patent, the authors have described the application of this technology to a simple synthesis of prostaglandin-based drugs, e.g. latanoprost and bimataprost. The methodology should now make it easier to discover new biologically active prostaglandin analogues. It is a major advance and represents a step change in the synthesis of this important class of compounds.

Professor Aggarwal, from the University's School of Chemistry, said: "Despite the long syntheses and the resulting huge effort that is required for the preparation of these molecules, they are still used in the clinic, because of their important biological activity.

"Being able to make complex pharmaceuticals in a shorter number of steps and therefore more effectively, would mean that many more people could be treated for the same cost."
More information: doi:10.1038/nature11411

http://www.eurekalert.org/pub_releases/2012-09/lhri-ssa092112.php

Study shows anaesthetic-related deaths reduced dramatically

London-led research looks at data collected worldwide over past 50 years

LONDON, ON – A team of researchers led by London's Dr. Daniel Bainbridge have compiled data from 87 studies worldwide that shows post-anaesthetic deaths have declined as much as 90 percent since before the 1970s. During the same period, the risk of dying from any cause within 48 hours of surgery has decreased by 88 percent. The study covered outcomes in both developed and developing countries, with the findings published in the current issue of the high-profile journal The Lancet.

The study calls for use of evidence-based interventions to reduce the disparities between outcomes in higher and lower income countries. It also makes the point that although significant progress has been made, there is more that can be done. "Although anaesthetic mortality remains low compared with traffic fatalities or suicide, it still remains high compared with death caused by air travel, which is a commonly used yardstick to measure risk," says Dr. Bainbridge.

Dr. Bainbridge is a scientist with the Lawson Health Research Institute, and Anesthetist at London Health Sciences Centre, and an Associate Professor at Schulich School of Medicine & Dentistry at Western University.

http://www.eurekalert.org/pub_releases/2012-09/fhcr-soc092112.php

Simple ovarian cancer symptom survey that checks for 6 warning signs may improve early detection

First evaluation of such a screening tool in a primary care clinic

SEATTLE – A simple three-question paper-and-pencil survey, given to women in the doctor's office in less than two minutes, can effectively identify those who are experiencing symptoms that may indicate ovarian cancer, according to a study by researchers at Fred Hutchinson Cancer Research Center. The study represents the first evaluation of an ovarian cancer symptom-screening tool in a primary care setting among normal-risk women as part of their routine medical-history assessment. The results are published online in the Open Journal of Obstetrics and Gynecology.

Early detection of ovarian cancer is key to survival. Cure rates for those diagnosed when the disease is confined to the ovary are approximately 70 percent to 90 percent. However, more than 70 percent of women with ovarian cancer are diagnosed with advanced-stage disease, when the survival rate is only 20 percent to 30 percent.

The researchers evaluated the effectiveness and feasibility of several different symptom screening surveys. After a few tweaks to formatting and content, the version that proved most effective contained three questions that asked whether a woman was currently experiencing one or more of the following symptoms, all of which have been identified previously as potentially indicative of ovarian cancer:

- ***Abdominal and/or pelvic pain***
- ***Feeling full quickly and/or unable to eat normally***
- ***Abdominal bloating and/or increased abdomen size***

The survey also asked about the frequency and duration of these symptoms: how many days a month and for how long?

"Symptoms such as pelvic pain and abdominal bloating may be a sign of ovarian cancer but they also can be caused by other conditions. What's important is to determine whether they are current, of recent onset and occur frequently," said lead author M. Robyn Andersen, Ph.D., a member of the Hutchinson Center's Public Health Sciences Division. Previous research by Andersen and colleagues has found that about 60 percent of women with early-stage ovarian cancer and 80 percent of women with advanced disease report symptoms that follow this distinctive pattern at the time of diagnosis.

"Women with symptoms that are frequent, continual and new to them in the past year should talk to their doctor, as they may be candidates for further evaluation with ultrasound and blood tests that measure markers of ovarian cancer such as CA-125," she said. "Recent research indicates that approximately one in 140 women with symptoms may have ovarian cancer. Aggressive follow-up of these symptoms can lead to diagnosis when ovarian cancer can be caught earlier and more effectively treated."

The study involved 1,200 women, age 40 to 87, who were seen in a Seattle women's health clinic. More than half of the study participants reported being postmenopausal and approximately 90 percent were white. About half of the clinic visits were for a current health concern or for follow-up of a health problem reported at an earlier visit. The other half were for routine appointments such as mammography screening.

Of those surveyed, 5 percent had a positive symptom score that indicated the need for further testing. Of this group of about 60 women, one was diagnosed with ovarian cancer shortly thereafter. Of the 95 percent of women who tested negative on the symptom survey, none developed ovarian cancer during a 12-month follow-up period, which attests to the accuracy of the screening tool.

Those who reported current symptoms on the questionnaire or reported other medical concerns scored higher than those who did not. Non-white women were also about twice as likely to receive a positive symptom score as compared to white women. "If ovarian cancer screening using symptoms is widely adopted, maximizing the specificity of screening programs will be important," the authors wrote. "Until better biomarkers are identified and tested, collecting information about symptoms appears to have promise."

The bottom line, Andersen said, is that the screening tool can be used easily in a primary-care setting, is acceptable to patients and providers, and identifies women with symptoms that are worthy of concern with minimal false-positive results.

The study questionnaire that was tested in the clinic was based on a symptom-screening index developed in 2006 by Andersen and co-author Barbara Goff, M.D., professor and director of Gynecologic Oncology at the University of Washington School of Medicine. *The National Institute of Nursing Research funded the study.*

http://www.eurekalert.org/pub_releases/2012-09/ncsu-mkf092112.php

Money key factor in driving med students from primary care careers

Many students are choosing to pass up a career in primary care because those physicians make substantially less money than specialists

Primary care physicians are at the heart of health care in the United States, and are often the first to diagnose patients and ensure those patients receive the care they need. But researchers from North Carolina State University, East Carolina University (ECU) and the Albert Einstein College of Medicine of Yeshiva University in New York have found that many students are choosing to pass up a career in primary care because those physicians make substantially less money than specialists, such as dermatologists or radiologists.

"We found that students who placed a premium on high income and students who anticipated having a lot of student debt were significantly more likely to pursue a high-paying medical specialty rather than become primary care physicians," says Dr. Lori Foster Thompson, a professor of psychology at N.C. State and co-author of a paper describing the research. "This held true even for students who entered medical school with the goal of becoming primary care physicians – they often switched to high-paying specialties before graduating."

The study, published online this week in Medical Education, surveyed more than 2,500 medical students attending New York Medical College and the Brody School of Medicine at ECU between 1993 and 2012. Students were surveyed at the beginning of their first year of medical school and just before graduation four years later. The survey asked the students what sort of medical career they planned to pursue, to estimate their final student loans and to rate the value they place on income.

The researchers then looked at those students planning to pursue a career in primary care, as well as those students planning to pursue any of the 12 specialties with a median income of more than $300,000 per year, based on 2010 salary data. By comparison, primary care physicians had a median income of just under $200,000 per year. Primary care consists of internal medicine, family medicine and pediatrics.

The study found that anticipated debt was a significant factor in the students' career decisions. Graduating students who pursued high-paying specialties were facing average student loans of approximately $104,000, whereas those who chose primary care faced an average debt of less than $94,000. Students facing higher debt were also more likely to switch to high-paying specialties – including more than 30 percent of students who had expected to become primary care physicians when they entered medical school.

First-year and graduating students who chose to pursue one of the high-paying specialties also rated income as being significantly more important than students who chose to pursue primary care. In addition, those graduating students who felt income was more important than they had as first-years were more likely to have switched to a high-paying specialty.

Other factors that guide student decisions about what specialty to pursue include parental or peer pressure, lifestyle desires and the exposure to more specialties once students reach medical school, though this study did not look at those issues specifically. "The other major factor in choosing a primary care career is a service commitment – wanting to help others," adds Dr. Dale Newton, a professor of pediatrics at ECU. "Measuring such a commitment in a research setting is very difficult, however."

The study suggests that measures should be explored to encourage primary care careers such as incentive pay, debt forgiveness, additional scholarships and higher reimbursement for primary care services in order to meet the growing need.

In addition, Newton says, "If the current efforts at health care reform continue, the incomes of primary care physicians should improve over the next few years. Primary care has to play a major role in the new health care paradigm."
The study's findings come as the Association of American Medical Colleges projects a shortage of 63,000 physicians by 2015, the vast majority of those in primary care.
The paper, "Payback Time: The Association of Debt and Income with Medical Student Career Choice," was published online Sept. 19 in the journal Medical Education and was co-authored by Dr. Martha Grayson of Albert Einstein College of Medicine. Grayson was at New York Medical College at the time of the study.

http://blogs.discovermagazine.com/cosmicvariance/2012/09/19/scientists-your-gender-bias-is-showing/

Scientists, Your Gender Bias Is Showing

Academic scientists are, on average, biased against women

by Sean Carroll

Nobody who is familiar with the literature on this will be surprised, but it's good to accumulate new evidence and also to keep the issue in the public eye: academic scientists are, on average, biased against women. I know it's fun to change the subject and talk about bell curves and intrinsic ability, but hopefully we can all agree that people with the same ability should be treated equally. And they are not.
That's the conclusion of a new study in PNAS by Corinne Moss-Racusin and collaborators at Yale. (Hat tip Dan Vergano.) To test scientist's reactions to men and women with precisely equal qualifications, the researchers did a randomized double-blind study in which academic scientists were given application materials from a student applying for a lab manager position. The substance of the applications were all identical, but sometimes a male name was attached, and sometimes a female name.

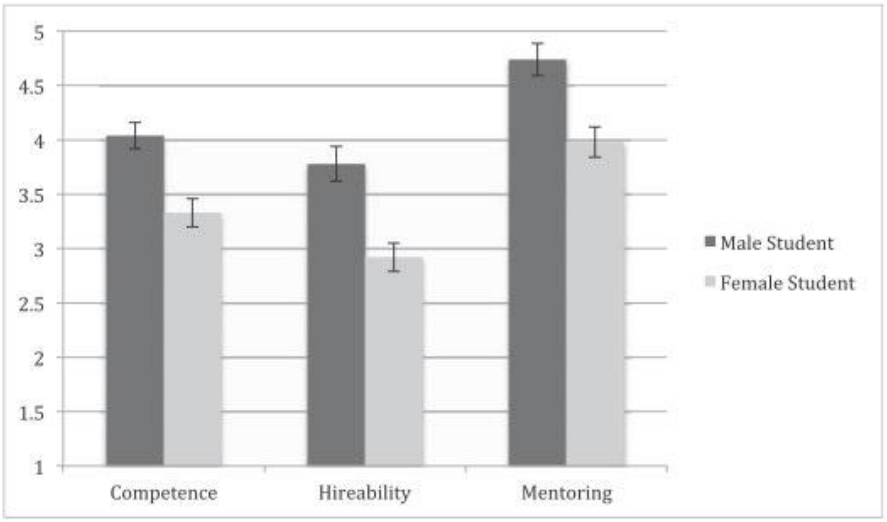

Fig. 1. Competence, hireability, and mentoring by student gender condition (collapsed across faculty gender). All student gender differences are significant ($P < 0.001$). Scales range from 1 to 7, with higher numbers reflecting a greater extent of each variable. Error bars represent SEs. $n_{\text{male student condition}} = 63$, $n_{\text{female student condition}} = 64$.

Results: female applicants were rated lower than men on the measured scales of competence, hireability, and mentoring (whether the scientist would be willing to mentor this student). Both male and female scientists rated the female applicants lower.
This lurking bias has clear real-world implications. When asked what kind of starting salaries they might be willing to offer the applicants, the ones offered to women were lower.
I have no reason to think that scientists are more sexist than people in other professions in the US, but this is my profession, and I'd like to see it do better. Admitting that the problem exists is a good start.

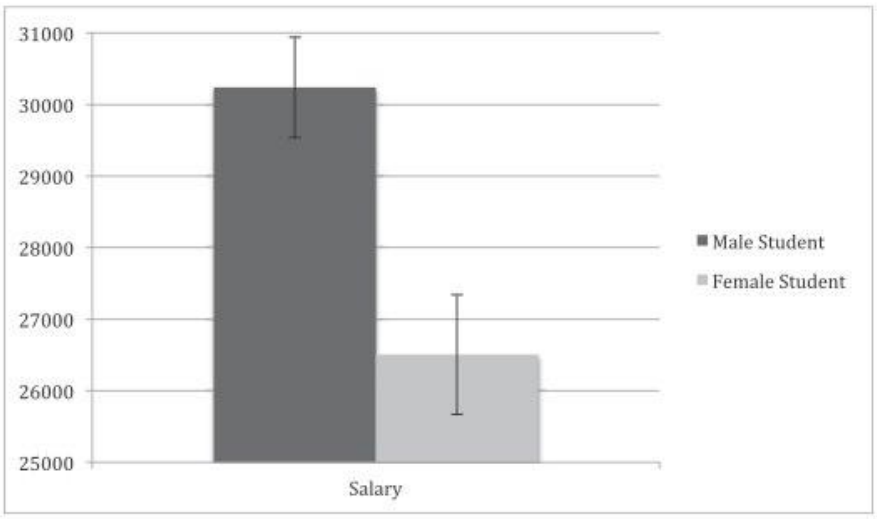

Fig. 2. Salary conferral by student gender condition (collapsed across faculty gender). The student gender difference is significant ($P < 0.01$). The scale ranges from $15,000 to $50,000. Error bars represent SEs. $n_{\text{male student condition}} = 63$, $n_{\text{female student condition}} = 64$.

http://phys.org/news/2012-09-bacteria-effect-weathering.html

New data suggest bacteria have a direct effect on rock weathering

Bacteria may directly kick off a cascade of reactions that reduce rocks to soil

Mössbauer spectroscopy helped researchers gain new knowledge about how lithotrophic bacteria behave in the environment, for example, in the subsurface and in the rhizosphere where soil, bacteria, and plant roots interact. New research shows that in a bid to derive energy from iron, bacteria may be directly responsible for kicking off a cascade of reactions that reduce rocks to soil and free biologically important minerals.

These findings from a team of EMSL staff and users are based on a model microbial community called the Straub culture. The Straub culture is lithotrophic, or literally an "eater of rock," meaning that it can turn non-carbon sources, such as iron, into energy. This energy is produced via a biochemical pathway driven by a series of electron exchanges, which in the case of the Straub culture is initiated by taking an electron from, or oxidizing, iron.

To gain insight into how lithotrophs behave in the environment, the research team incubated the Straub culture with media containing fine particles of an iron-rich mica called biotite. After two weeks, Mössbauer spectroscopy at EMSL was used to compare a biotite control to biotite incubated with the Straub culture. Mössbauer spectroscopy is used to quantify how much iron exists in what oxidation states in a sample.

In the biotite, Mössbauer confirmed that the microbes did oxidize iron from Fe(II) to Fe(III). Moreover, transmission electron microscopy revealed that this oxidation affected the biotite structure, leading to changes that resemble those observed in nature. This work offers new insight into the roles of microbes in soil production and in the biogeochemical cycling of minerals and suggests that microbes have a direct effect on rock weathering—that bacteria oxidize iron, leading to mineral transformations then rock decomposition.

Shelobolina ES, H Xu, H Konishi, RK Kukkadapu, T Wu, M Blothe, and EE Roden. 2012. "Microbial Lithotrophic Oxidation of Structural Fe(II) in Biotite." Applied and Environmental Microbiology 78(16):5746–5752. DOI 10.1128/AEM.01034-12.

http://www.sciencedaily.com/releases/2012/09/120921123959.htm

Suicide Leading Cause of Injury Mortality in U. S.

Suicide has now passed motor vehicle traffic crashes as the leading cause of injury deaths in the United States

ScienceDaily - A published study by researchers from the West Virginia University School of Public Health and Injury Control Research Center found that suicide has now passed motor vehicle traffic crashes as the leading cause of injury deaths in the United States. Additionally, the disease rate has been declining while the injury rate has been rising.

The research team, led by WVU and including scientists from nine other institutions, examined changes in injury mortality and its five leading causes from 2000 through 2009. The mortality data for 2009 were released for public use by the National Center for Health Statistics in January 2012.

Ian Rockett, Ph.D., M.P.H., professor in the WVU School of Public Health Department of Epidemiology and lead author of the study, published in the American Journal of Public Health, said many significant findings emerged from the study. "Suicide is now the leading cause of unintentional and violence-related injury mortality as a whole," Dr. Rockett said. "Suicide only surpassed motor vehicle traffic crashes in the final year available for the study, 2009. The suicide mortality rate was 15 percent higher in 2009 than 2000."

In addition, the unintentional poisoning mortality rate increased by 128 percent between 2000 and 2009. "Unintentional poisoning has risen to third among the leading causes of injury mortality, a change that appears mainly driven by the enormous increase in the rate of fatal overdoses from prescription painkillers," Rockett said. While motor vehicle traffic crashes still rank second as a cause of injury death, the rate decreased by 25 percent between 2000 and 2009 and is a universal success story, according to Rockett.

"Much time, attention and resources have been devoted to traffic safety," he said. "Similar efforts will be needed for success in other spheres of injury prevention." The fall mortality rate rose by 71 percent between 2000 and 2009. Falls now rank fourth as a cause of injury deaths and homicide fifth.

The research team also reported important findings related to gender, race/ethnicity and age. The male injury mortality rate is more than twice as high as the female injury mortality rate. However, the female rate increase was more than double that for males. The injury mortality rate for whites was 20 percent higher in 2009 than in 2000. By contrast, this rate was 11 percent lower for both African-Americans and Hispanics.

"Whites now have a higher rate than these two largest minority groups," Rockett said. "Traditionally at excess risk for injury mortality, the 15-24 year age group did not stand out from the 25-74 age group. But, the 0-14 age group showed a 78 percent lower risk for injury death than the 15-24 age group, and the 75-years-and-older age group, an almost three-fold higher risk."

The article reporting this research, "Leading Causes of Unintentional and Intentional Injury Mortality: United States, 2000-2009," was published in the Sept. 20 issue of the American Journal of Public Health.
Co-authors on the study include Michael Regier, Ph.D., and Jeffrey Coben, M.D.

http://www.sciencedaily.com/releases/2012/09/120922085847.htm

New Ways to Protect Female Fertility

New research offers hope to women whose fertility has been compromised by the side-effects of cancer therapy or by premature menopause.

ScienceDaily - In a study published in Molecular Cell, researchers from the Walter and Eliza Hall Institute (WEHI), Monash University and Prince Henry's Institute of Medical Research found that two proteins, PUMA and NOXA, cause the death of egg cells in the ovaries. Blocking the activity of the proteins may lead to new strategies to protect women's fertility.
The team, including Associate Professor Jeffrey Kerr from Monash, Associate Professor Clare Scott, Dr Ewa Michalak and Professor Andreas Strasser from WEHI and Dr Karla Hutt and Professor Jock Findlay from PHI, focused their studies on egg cells called primordial follicle oocytes, which provide each woman's lifetime supply of eggs. Low numbers of these egg cells can also cause early menopause.
Associate Professor Clare Scott, an oncologist at The Royal Melbourne and Royal Women's hospitals, said the research showed that when the DNA of egg cells is damaged following exposure to radiation or chemotherapy, PUMA and NOXA trigger the death of the damaged eggs, leading to infertility in many female cancer patients.
"PUMA and NOXA can trigger cell death, and have been found to be necessary for the death of many different cell types in response to DNA damage," Associate Professor Scott said.
"This removal of damaged cells is a natural process that is essential to maintaining health but, for women undergoing cancer treatment, can be devastating when it leads to infertility."
Associate Professor Kerr said that when these egg-producing cells were missing the PUMA protein they did not die after being exposed to radiation therapy.
"This might ordinarily be cause for concern because you want damaged egg cells to die so as not to produce abnormal offspring," he said.
"To our great surprise we found that not only did the cells survive being irradiated, they were able to repair the DNA damage they had sustained and could be ovulated and fertilised, producing healthy offspring. When the cells were also missing the NOXA protein, there was even better protection against radiation."
Future treatments could block the function of PUMA, preventing egg cell death in patients undergoing chemotherapy or radiation.
Professor Jock Findlay, head of the Female Reproductive Biology Group at PHI, said the study could also have implications for delaying menopause.
"We know that the timing of menopause is influenced by how many egg cells a female has," he said.
"Interventions that slow the loss of egg cells from the ovaries could delay premature menopause, prolonging female fertility, such a treatment could have the potential to reduce menopause-associated health conditions, such as osteoporosis and heart disease."
The research was supported by National Health and Medical Research Council, Cancer Council Victoria, the Victorian Cancer Agency, the US Leukemia and Lymphoma Society, the US National Cancer Institute, the American Cancer Society, and the Victorian Government.
Jeffrey B. Kerr, Karla J. Hutt, Ewa M. Michalak, Michele Cook, Cassandra J. Vandenberg, Seng H. Liew, Philippe Bouillet, Alea Mills, Clare L. Scott, Jock K. Findlay, Andreas Strasser. DNA Damage-Induced Primordial Follicle Oocyte Apoptosis and Loss of Fertility Require TAp63-Mediated Induction of Puma and Noxa. Molecular Cell, 2012; DOI: 10.1016/j.molcel.2012.08.017

http://boingboing.net/2012/09/22/pharmaceutical-companies-delib.html

Pharmaceutical companies deliberately mislead doctors into prescribing useless and even harmful meds

Thanks to aggressive manipulation from the pharmaceutical companies and passivity from regulators, doctors often don't know that the drugs were ineffective (or harmful) in a majority of their clinical trials

By Cory Doctorow at 5:02 pm Saturday, Sep 22

Writing in the Guardian, Ben Goldacre reveals the shocking truth about the drugs that doctors prescribe: thanks to aggressive manipulation from the pharmaceutical companies and passivity from regulators, doctors often don't know that the drugs were ineffective (or harmful) in a majority of their clinical trials. That's because pharma companies set up their trials so that they the right to terminate ones that look unpromising (or stop them

early if they look promising and report on the result partway through as though it reflected the whole trial), and to simply suppress the results of negative trials.

As a result, doctors -- even doctors who do their homework and pay close attention to the published trials, examining their methodology carefully -- end up prescribing useless (or harmful) medicines. And according to Goldacre, this is true of all doctors in every country, because every country's regulators allow pharmaceutical companies to cynically manipulate research outcomes to increase their profits. As Goldacre points out, a 2010 Harvard/Toronto study showed that "85% of the industry-funded studies were positive, but only 50% of the government-funded trials were" -- and in another analysis, industry-funded trials of statins "were 20 times more likely to give results favouring the test drug."

What's more, when scientists blow the whistle on this life-threatening criminality, they're smeared and hounded by the pharma companies, as happened when Danish scientists published a study critical of industry-funded trials in the Journal of the American Medical Association. After the study was published, Lif, the Danish pharmaceutical industry association, called for professional misconduct investigations into the researchers, though they couldn't provide any evidence of the alleged misconduct. Though the researchers were cleared of all wrongdoing, their employers were given copies of the accusations of scientific dishonesty, as did "the Danish medical association, the ministry of health, the ministry of science and so on."

This long piece is an excerpt from Goldacre's forthcoming book, Bad Pharma: How drug companies mislead doctors and harm patients.

Sometimes trials are flawed by design. You can compare your new drug with something you know to be rubbish – an existing drug at an inadequate dose, perhaps, or a placebo sugar pill that does almost nothing. You can choose your patients very carefully, so they are more likely to get better on your treatment. You can peek at the results halfway through, and stop your trial early if they look good. But after all these methodological quirks comes one very simple insult to the integrity of the data. Sometimes, drug companies conduct lots of trials, and when they see that the results are unflattering, they simply fail to publish them.

Because researchers are free to bury any result they please, patients are exposed to harm on a staggering scale throughout the whole of medicine. Doctors can have no idea about the true effects of the treatments they give. Does this drug really work best, or have I simply been deprived of half the data? No one can tell. Is this expensive drug worth the money, or has the data simply been massaged? No one can tell. Will this drug kill patients? Is there any evidence that it's dangerous? No one can tell. This is a bizarre situation to arise in medicine, a discipline in which everything is supposed to be based on evidence.

And this data is withheld from everyone in medicine, from top to bottom. Nice, for example, is the National Institute for Health and Clinical Excellence, created by the British government to conduct careful, unbiased summaries of all the evidence on new treatments. It is unable either to identify or to access data on a drug's effectiveness that's been withheld by researchers or companies: Nice has no more legal right to that data than you or I do, even though it is making decisions about effectiveness, and cost-effectiveness, on behalf of the NHS, for millions of people.

In any sensible world, when researchers are conducting trials on a new tablet for a drug company, for example, we'd expect universal contracts, making it clear that all researchers are obliged to publish their results, and that industry sponsors – which have a huge interest in positive results – must have no control over the data. But, despite everything we know about industry-funded research being systematically biased, this does not happen. In fact, the opposite is true: it is entirely normal for researchers and academics conducting industry-funded trials to sign contracts subjecting them to gagging clauses that forbid them to publish, discuss or analyse data from their trials without the permission of the funder.

Just read it. There's so much more. Paroxetine, a drug that was known to be ineffective for treating children, which had a risk of suicide as a side-effect, widely prescribed to children, because GlaxoSmithKline declined to publish its research data after an internal memo stated "It would be commercially unacceptable to include a statement that efficacy had not been demonstrated, as this would undermine the profile of paroxetine."

Source: ***The drugs don't work: a modern medical scandal***

http://www.eurekalert.org/pub_releases/2012-09/uonc-uls091912.php

UNC Lineberger scientists lead cancer genome analysis of breast cancer

Team identifies genetic causes and similarity to ovarian cancer

A team of scientists with The Cancer Genome Atlas program reports their genetic characterization of 800 breast tumors, including finding some of the genetic causes of the most common forms of breast cancer, providing clues for new therapeutic targets, and identifying a molecular similarity between one sub-type of breast cancer and ovarian cancer.

Their findings, which offer a more comprehensive understanding of the mechanisms behind each sub-type of breast cancer, are reported in the September 23, 2012 online edition of the journal Nature.

The researchers, including a large group from the University of North Carolina at Chapel Hill, analyzed tumors using two basic approaches: first, using an unbiased and genome-wide approach, and second, within the context of four previously known molecular sub-types of breast cancer: HER2-enriched, Luminal A, Luminal B and Basal-like. Both approaches arrived at the same conclusions, which suggest that even when given the tremendous genetic diversity of breast cancers, four main subtypes were observed. This study is also the first to integrate information from six analytic technologies, thus providing new insights into these previously defined disease subtypes.

Charles Perou, PhD, corresponding author of the paper, says, "Through the use of multiple different technologies, we were able to collect the most complete picture of breast cancer diversity ever. These studies have important implications for all breast cancer patients and confirm a large number of our previous findings. In particular, we now have a much better picture of the genetic causes of the most common form of breast cancer, namely Estrogen-Receptor positive/Luminal A disease. We also found a stunning similarity between Basal-like breast cancers and ovarian cancers."

"This study has now provided a near complete framework for the genetic causes of breast cancer, which will significantly impact clinical medicine in the coming years as these genetic markers are evaluated as possible markers of therapeutic responsiveness." Dr. Perou is the May Goldman Shaw Distinguished Professor of Molecular Oncology and a member of UNC Lineberger Comprehensive Cancer Center.

Among the many discoveries include findings of some of the likely genetic causes of the most common form of breast cancer, which is the Estrogen-Receptor positive Luminal A subtype. Luminal A tumors are the number one cause of breast cancer deaths in the USA accounting for approximately 40 percent, and thus, finding the genetic drivers of this subtype is of paramount importance. The TCGA team found that the mutation diversity within this group was the greatest, and that even specific types of mutations within individual genes, were associated with the Luminal A subtype. Some of these mutations may be directly targetable by a drug(s) that is in clinical development, thus possibly offering new options for many patients.

In addition, the team compared basal-like breast tumors (also known as triple-negative breast cancers) with high-grade serous ovarian tumors and found many similarities at the molecular level, suggesting a related origin and similar therapeutic opportunities. These data also suggest that basal-like breast cancer should be considered a different disease than ER-positive/Luminal breast cancer, and in fact, both basal-like breast cancer and ovarian cancer were more similar to each other than either was to ER-positive/Luminal breast cancer.

Dr. Perou adds, "Cancer is, of course, a complex disease that includes many types of alterations, and thus, no one technology can identify all of these alteration; however, by using such a diverse and powerful set of technologies in a coordinated fashion, we were able to identify the vast majority of these alterations."

Katherine Hoadley, PhD, study co-author, explains, "Our ability to compare and integrate data from RNA, microRNA, mutations, protein, DNA methylation, and DNA copy number gave us a multitude of insights about breast cancer. In particular, highlighting how distinct basal-like breast cancers are from all other breast cancers on all data types. These findings suggest that basal-like breast cancer, while arising in the same anatomical location, is potentially a completely different disease."

Dr. Perou describes UNC's role on the TCGA Breast cancer project as "extensive, including generating the RNA expression data, performing integrated data analyses, and playing a major role in the writing of the paper and crafting of the new hypotheses coming from this work."

TCGA is a groundbreaking effort to genetically characterize the entire genome of 20 different cancer types, involving scientists from around the world. UNC Lineberger was one of the original consortium members and will receive over $20 million in grants to fund this research. TCGA is funded jointly by the National Cancer Institute and the National Human Genome Research Institute, both part of the National Institutes of Health.

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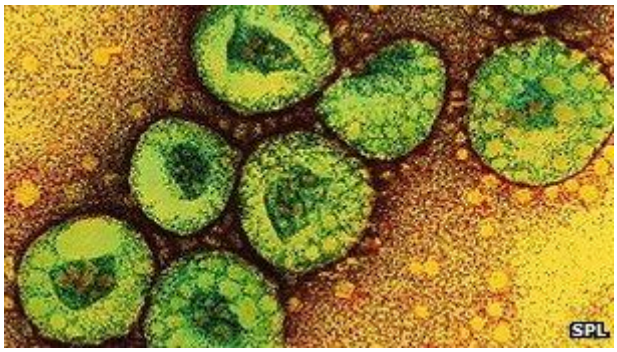
http://www.bbc.co.uk/news/health-19698335

New 'Sars-like' coronavirus identified in the UK

A new respiratory illness similar to the Sars virus that spread globally in 2002 and killed hundreds of people has been identified in a man who is being treated in Britain.

By Michelle Roberts Health editor, BBC News online



The 49-year-old man, who was transferred to a London hospital by air ambulance from Qatar, is the second person confirmed with the coronavirus.

The first case was a patient in Saudi Arabia who has since died.

Officials are still determining what threat the new virus may pose.

The World Health Organization has not recommended any travel restrictions.

Prof John Watson, head of the respiratory diseases department at the UK's Health Protection Agency, said: "In the light of the severity of the illness that has been identified in the two confirmed cases, immediate steps have been taken to ensure that people who have been in contact with the UK case have not been infected, and there is no evidence to suggest that they have.

"Further information about these cases is being developed for healthcare workers in the UK, as well as advice to help maintain increased vigilance for this virus."

He said there was no specific evidence of the virus spreading from person to person and he had no advice for the public or returning travellers.

Peter Openshaw, director of the Centre for Respiratory Infection at Imperial College London, told Reuters that at this stage the novel virus looked unlikely to prove a concern, and may well only have been identified due to sophisticated testing techniques.

Coronaviruses are a large family of viruses which includes ones that cause the common cold and Sars (severe acute respiratory syndrome).

This new virus is different from any coronaviruses that have previously been identified in humans.

There have been a small number of other cases of serious respiratory illness in the Middle East in the past three months, one of whom was treated in the UK but has since died.

This person's illness is also being investigated, although there is no evidence as yet to suggest that it is caused by the same virus or linked to the current case. No other confirmed cases have been identified to date in the UK.

Sars is a serious respiratory infection that caused a global outbreak in 2002, spreading from Hong Kong to more than 30 different countries around the world and killing around 800 people. Although it has not been eradicated its spread was fully contained in 2003. Like other coronaviruses, it is spread through droplets of body fluids - produced by sneezing and coughing.