Lemurs lose weight with 'life-extending' supplement

The anti-obesity properties of resveratrol have been demonstrated for the first time in a primate. Researchers writing in the open access journal BMC Physiology studied the compound, generated naturally by plants to ward off pathogens, which has received much interest as a dietary supplement for its supposed life-extending effects.

Fabienne Aujard, from the Centre National de la Recherche Scientifique, Paris, France, worked with a team of researchers to investigate the effect of dietary supplementation with resveratrol on the weight, metabolism and energy intake of six mouse lemurs. She said, "The physiological benefits of resveratrol are currently under intensive investigation, with recent work suggesting that it could be a good candidate for the development of obesity therapies. We've found that lemurs eating a diet supplemented with the compound decreased their energy intake by 13% and increased their resting metabolic rate by 29%".

The researchers demonstrated that a four-week resveratrol supplementation was associated with a decrease in food intake and a reduction in seasonal body-mass gain. The response to resveratrol supplementation also involved significant changes in the animals' body temperatures. According to Dr Aujard, "These results provide novel information on the potential effects of resveratrol on energy metabolism and control of body mass in a primate".

Notes to Editors Resveratrol suppresses body mass gain in a seasonal non-human primate model of obesity
Alexandre Dal-Pan, Stephane Blanc and Fabienne Aujard BMC Physiology (in press)

Cancers of sweat glands, other skin-related structures may be increasing in United States

Cutaneous appendageal carcinomas - tumors of the skin appendages such as hair, nails, sweat glands and mammary glands - are rare but rates appear to be increasing in the United States, according to a report in the June issue of Archives of Dermatology, one of the JAMA/Archives journals.

"Cutaneous appendageal carcinomas are a rare and diverse group of complex neoplasms with diverse differentiation that frequently present a diagnostic challenge," the authors write as background information in the article. Because of their rarity, studies of these cancers have been limited.

Patrick W. Blake, B.S., of the National Cancer Institute, Bethesda, Md., and colleagues examined incidence rates, trends and survival rates of the disease using 16 cancer registries in the Surveillance, Epidemiology and End Results Program from 1978 to 2005. A total of 1,801 patients were identified for incidence analysis, 2,228 for trend analysis and 1,984 for survival analysis.

The age-adjusted incidence rates were 5.1 cases per 1 million people per year, with men more likely to develop one of the cancers than women. Hispanic whites, blacks and Asian/Pacific Islanders all had lower rates of incidence than non-Hispanic whites. The most common type was apocrine-eccrine carcinoma, or cancer of the sweat glands. Incidence rates increased with age, with a 100-fold difference between individuals age 20 to 29 years and those age 80 years and older.

Cutaneous appendageal carcinomas also became more common over time, with a 150-percent increase in incidence between 1978 to 1982 and 2002 to 2005. Rates of sweat gland cancers increased 170 percent and sebaceous carcinomas, cancers of glands in the eyelid, increased 217 percent. Overall, five-year survival rates were 99 percent for localized disease and 43 percent for disease that had spread to another part of the body. "Cutaneous appendageal carcinoma incidence rates are increasing in the United States, especially for sebaceous carcinoma, perhaps related to improved recognition and classification, but factors such as UV exposure and immunosuppression may also play a role," the authors write. "Further increases in cutaneous appendageal carcinomas over time should prompt new strategies for cancer screening and early intervention of this cancer."

(Arch Dermatol. 2010;146[6]:625-632. Available pre-embargo to the media at www.jamamedia.org.)

The Claim: A Craving for Ice Is a Sign of Anemia

By ANAHAD O'CONNOR

THE FACTS Fatigue and weakness are the familiar symptoms of the blood disorder anemia, which afflicts millions of Americans. But a fixation for ice?

Oddly enough, in recent years, cravings for ice have emerged in the medical literature as a puzzling and increasingly documented sign of anemia, especially its most common form, iron deficiency anemia. Scientists don't fully understand the link, but some suspect that compulsive consumption of ice - called pagophagia - relieves inflammation in the mouth brought on by iron deficiencies.

In extreme cases, people with undiagnosed anemia and pagophagia have been known to go through multiple bags or trays of ice in a single day; the problem usually clears up after treatment with iron supplements. (Another well-known anemia, sickle cell, cannot be treated with these supplements.)_

Studies at Northwestern have shown that ice cravings are a common side effect of a popular type of weight-loss surgery. The procedure, known as Roux-en-Y (pronounced ROO-on-why), involves bypassing the part of the intestine where iron and other minerals are most easily absorbed; about a third of patients develop a deficiency of iron or vitamin B12. One case was described in the Mayo Clinic Proceedings in 2008, involving a 33-year-old woman who had undergone bypass surgery.

"The patient's husband frequently observed her in the middle of the night with her head in the freezer eating the frost off the icemaker," the report stated. "This craving resolved after transfusion and iron administration."

THE BOTTOM LINE Abnormal cravings for ice can be a sign of anemia.

Seasonality of child abuse a myth

INDIANAPOLIS – A new study of homicides of 797 children younger than age five has found that these deaths occur uniformly throughout the year, dispelling the widely held anecdotal notion that the winter months, and especially winter holidays, are a time of increased child abuse.

"The seasonality of child abuse is clearly a myth," said Antoinette Laskey, M.D., M.P.H, associate professor of pediatrics at the Indiana University School of Medicine, who led the study.

"We looked at the statistics of fatalities related to child abuse in geographically disparate states to see whether or not there were any patterns and there were none. As we noted in our study, it is possible that the reason child abuse is believed to increase during the holidays is because an abused child seen on a memorable day like Christmas may be easier for a healthcare provider to recall because of the association with the holiday," said Dr. Laskey, who is a Riley Hospital for Children physician.

The study is the first of its size to use death certificate data to explore the question of seasonality of child homicide. It appears in the July 2010 issue of The Journal of Pediatrics and is now available online.

Data from Indiana, Ohio, Missouri, Oklahoma and Washington were analyzed for seasonal effect in the years 1999-2006. Children were found to be equally at risk of homicide death during any month of the year. Two-thirds of the deaths were in children younger than two years old.

"Since there is no reason to believe that child abuse deaths occur at differing rates throughout the year, it is important to keep in mind that prevention should be a year round effort. The fact is common stressors on caregivers, like crying, toileting accidents and normal childhood behavioral issues such as temper tantrums happen all year long. We need to teach caregivers how to respond better to these issues," said Dr. Laskey.

In addition to Dr. Laskey, who is a Regenstrief Institute affiliated scientist, co-authors of the study are Jonathan D. Thackeray, M.D., The Ohio State University College of Medicine; Sophia R. Grant, M.D., University of Oklahoma College of Medicine and Patricia G. Schnitzer, Ph.D., Sinclair School of Nursing, University of Missouri.

Humans have a mighty bite: study

By Bob Beale

The robust jaws and formidable teeth of some of our ancestors and ape cousins may suggest that humans are wimps when it comes to producing a powerful bite: but a new study has found the opposite is true, with major implications for our understanding of diet in ancestral humans.

The surprise findings suggest that early modern humans did not necessarily need to use tools and cooking to process high-nutrient hard foods, such as nuts - and perhaps less tough foods such as meat - but may have lost an ability to eat very tough items, such as tubers or leaves.

In the first comparison of its kind, Australian researchers have found that the lightly built human skull has a far more efficient bite than those of the chimp, gorilla and orang-utan, and of two prehistoric members of our family, Australopithecus africanus and Paranthropus boisei. They found that modern humans can achieve relatively high bite forces using less-powerful jaw muscles. In short, the human skull does not have to be as robust because, for any given bite force, the sum of forces acting on the human skull is much less.

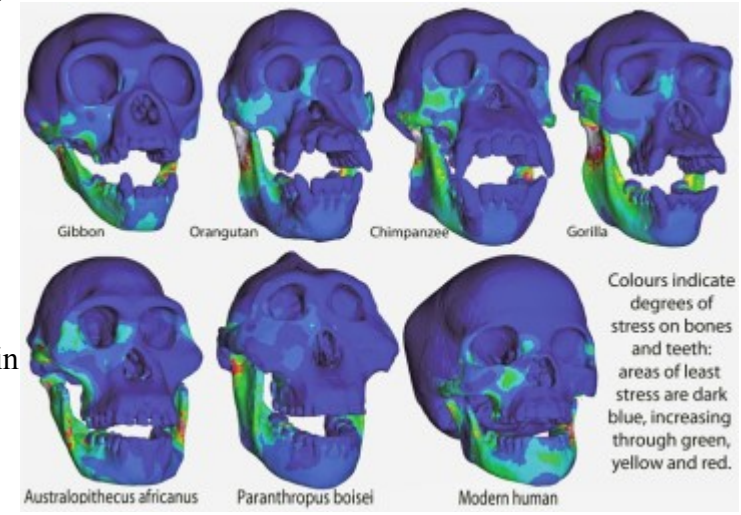
These results also explain the apparent inconsistency of very thick tooth enamel in modern humans - a feature typically associated with high bite forces in other species. Thick enamel and large human tooth roots are well adapted to take high loads when biting.

The study appears in a paper in the journal Proceedings of the Royal Society B by a team led by Dr Stephen Wroe, of the Computational Biomechanics Research Group in the UNSW's School of Biological, Earth and Environmental Sciences. They used sophisticated three-dimensional (3D) finite element analysis to compare digital models of actual skulls that had been CAT-scanned.

The technique, adapted from engineering, provides a highly detailed view of where stresses occur in materials under loads designed to mimic actual scenarios. Wroe's team has previously used this approach to study the jaw mechanics of living and extinct species as varied as the great white shark and the sabre-toothed tiger.

These result calls into question previous suggestions that the evolution of a less robust skull in modern humans involved a trade-off for a weaker bite or was necessarily a response to behavioural changes, such as switching to softer foods or more processing of foods with tools and cooking. It has also been suggested that human jaw muscles were reduced to make way for a larger brain.

"However plausible those ideas may seem they have been based on very little by way of comparative data: for example, there are no actual records of bite force collected from living members of any other ape species, " says Dr Wroe. "It turns out that we don't have a wimpish bite at all - it is very efficient and powerful.



"When we're biting down in vertical plane, at the back of the jaw our bite is about 40-50% more efficient than it is for all great apes. It's even more efficient when biting at the front of the jaw.

"We've only looked at two extinct hominins in this study, but, for our size, we humans are comparable in terms of maximum bite force to these fossil species, which include 'nutcracker man', renowned for its particularly massive skull and jaw muscles. Size matters, but efficiency matters more - and humans are very efficient biters.

"Importantly though, our study focuses on the generation of peak bite forces over short time spans. The jaws of other species may be better adapted to maintain chewing over long periods. This means that although humans are up there with great apes in their ability to quickly crack open a hard item, such as a large nut, or process less tough foods, such as meat, they may be less well adapted to process tough material, such as leaves or bamboo, which requires sustained chewing over a long period".

The study team included UNSW colleagues Toni Ferrara, Darren Curnoe and Uphar Chamoli, along with Colin R. McHenry of the University of Newcastle, and was supported by the Australian Research Council.

Coffee may protect against head and neck cancers

PHILADELPHIA - Data on the effects of coffee on cancer risk have been mixed. However, results of a recent study add to the brewing evidence that drinking coffee protects against cancer, this time against head and neck cancer. Full study results are published online first in Cancer Epidemiology, Biomarkers & Prevention, a journal of the American Association for Cancer Research.

Using information from a pooled-analysis of nine studies collected by the International Head and Neck Cancer Epidemiology (INHANCE) consortium, participants who were regular coffee drinkers, that is, those who drank an estimated four or more cups a day, compared with those who were non-drinkers, had a 39 percent decreased risk of oral cavity and pharynx cancers combined.

Data on decaffeinated coffee was too sparse for detailed analysis, but indicated no increased risk. Tea intake was not associated with head and neck cancer risk. The association is more reliable among those who are frequent, regular coffee drinkers, consuming more than four cups of coffee a day.

"Since coffee is so widely used and there is a relatively high incidence and low survival rate of these forms of cancers, our results have important public health implications that need to be further addressed," said lead researcher Mia Hashibe, Ph.D., assistant professor in the department of family and preventive medicine at the University of Utah, Salt Lake City, and a Huntsman Cancer Institute investigator.

"What makes our results so unique is that we had a very large sample size, and since we combined data across many studies, we had more statistical power to detect associations between cancer and coffee," she said.

At the AACR Frontiers in Cancer Prevention Research Conference last December, researchers from Harvard presented data that showed a strong inverse association between coffee consumption and the risk of lethal and advanced prostate cancers - men who drank the most coffee had a 60 percent lower risk of aggressive prostate cancer than men who did not drink any coffee.

More recently, results of another study published in the January issue of Cancer Epidemiology, Biomarkers & Prevention showed a decreased risk of gliomas, or brain tumors, associated with coffee. This association was found among those who drank five or more cups of coffee or tea a day, according the researchers from the Imperial College, London.

Cancer Epidemiology, Biomarkers & Prevention editorial board member Johanna W. Lampe, Ph.D., R.D., believes this current analysis by Hashibe and colleagues provides strong, additional evidence for an association between caffeinated coffee drinking and cancer risk.

"The fact that this was seen for oral and pharyngeal cancers, but not laryngeal cancers, provides some evidence as to a possible specificity of effect," said Lampe, who is a full member and associate division director in the division of public health sciences at Fred Hutchinson Cancer Research Center, Seattle., Wash.

"These findings provide further impetus to pursue research to understand the role of coffee in head and neck cancer prevention," she added. Lampe is not associated with this study.

Additional research is warranted to characterize the importance of timing and duration of exposure and possible mechanisms of action, according to Hashibe.

Seeking to Illuminate the Mysterious Placebo Effect

By ERIK VANCE

The phrase “mind-body connection” has many connotations. For some, it’s shorthand for New Age quackery. For others, it’s a source of hope and a way to reconcile their spiritual life with modern science.

For Tor D. Wager, it’s just another day at the office.

Dr. Wager (pronounced WAY-gur) is a professor of psychology at the University of Colorado. His specialty is neuroscience and brain imaging, but his passion is the placebo effect - a phenomenon that has undergone a resurgence in recent years and is now being studied by researchers in many corners of science.

Much of this attention is a result of the kind of brain imaging Dr. Wager does, and he is a leading figure in the new generation of placebo researchers.

Which may make his background seem unlikely. Dr. Wager, 35, was raised in Christian Science, a religion mostly known for its aversion to medical treatment. His family was not strict about it, however; he recalls an incident from his Colorado childhood that could have served as a harbinger for his career.

As a baby, he says, he came down with a rash, and after much prayer his mother took him to a doctor, fearing scarlet fever. “The doctor said, ‘Here’s a cream, rub it on there,’ and it went away,” Dr. Wager said.

So did his mother’s distress. Her pulse probably slowed, he says now, and her breathing relaxed - just the effect a placebo may have on a terrified patient.

Increasingly, placebo effects are being viewed as real and tangible, if mysterious. In various surveys, 45 percent to 85 percent of American and European practitioners say they have used placebos in clinical practice, and 96 percent of academic physicians in the United States say they think placebos have therapeutic effects.

Even so, many scientists mistrust them.

“When I started grad school I felt like it was kind of taboo to study the placebo,” Dr. Wager said. The research at the time was spotty at best, “and then there were whole sections of society that were ready to jump on that and say, ‘Oh, look how powerful the mind is!’ ”

But placebo research has gained respectability in recent years, thanks largely to the work of Dr. Fabrizio Benedetti, an Italian neuroscientist widely seen as the patriarch of the field. Dr. Benedetti argues that there is not a single placebo effect, but many.

One common effect involves the assumption that a particular pill is responsible for easing pain or discomfort that is actually subsiding naturally. Another is classic Pavlovian conditioning, in which a patient is so accustomed to feeling better after a shot that it works no matter what is in it. Another is the relief a patient like Dr. Wager’s mother feels when a doctor offers a concrete solution.

As a graduate student at the University of Michigan, Dr. Wager used imaging to watch emotions in the brain. It was fascinating work, he says, but emotions are hard to define with precision and he wanted to do something that could help patients.

So he decided to look at placebos in a clinical setting. In 2001 he joined forces with Dr. Robert M. Rose, a University of Texas scientist who had done pioneering studies of stress in Vietnam War veterans, and a group of respected researchers called the Network on Mind-Body Interactions.

Within a few years, Dr. Wager’s name was at the top of a groundbreaking study in the journal Science that used functional magnetic resonance imaging - a specialized scan that measures changes in blood flow - to link specific brain activation to people experiencing a placebo effect (in this case rubbing unmedicated cream on a burn). Since then, he has written roughly a dozen scientific papers on placebo effects, including a 2007 study linking pain-related effects to parts of the brain that process opium or heroin (which may help explain why many placebos are temporary). “Tor is a person who has to convince himself of something,” Dr. Rose said. “He doesn’t buy it because someone else does it. He is a skeptic. But once he buys it, boy, is he dogged.”

When Dr. Wager isn’t writing about placebos, he is defending the tools he uses to study them. Many critics are skeptical of functional M.R.I., and Dr. Wager says that at first he was, too.

To deal with that skepticism, he said, one can either "a) say, 'Ah, this is all sort of bogus, let's do something else,' or b) try to work and develop things that make it a lot more believable."

At the recent conference of the Organization for Human Brain Mapping, Dr. Wager gave a presentation about placebos to a full house of scientists. But his laboratory at the University of Colorado also shared arcane new statistics for reading brain scans. Such attention to detail, he said, is the only way to convince skeptics.

Until recently, the government and the drug industry have been hesitant to finance studies of placebo effects.

"Companies who are developing new treatments like to think that actually their new treatment works well enough to do better than just the power of positive thinking," said Dr. Helen S. Mayberg, a neurologist at Emory University known for her work with functional M.R.I. in patients with depression. (She quickly added that placebo effects were very different from positive thinking.)

Drug trials sometimes start with everyone getting a placebo; those who recover are then weeded out. While perhaps strengthening the results, this does not help researchers understand why people in the first group got better.

That persistent question - why some people are more responsive to placebos than others - has long frustrated scientists. "There's decades of research that has more or less failed," Dr. Wager said. "New methods are going to let us get a lot more out of it."

Solving the mystery would potentially unlock whole new areas for therapy. Dr. Wager recently attended a meeting sponsored by the National Institutes of Health about enlisting multiple institutions in an effort to understand placebos. Several drug companies were present; some have begun their own research into the mystery.

Dr. Wager (who receives financing from the N.I.H., the National Science Foundation and the Michael J. Fox Foundation) says drug companies were cautious about bringing too much attention to placebos, but recognized a potential for better therapies.

But for him it is a deeper question, tied to his childhood religion and the way he sees the world. "What is the placebo effect?" he asked. "It's not some weird magical thing that just kind of happened out of the blue.

"I think it's connected to systems that generate emotional responses," he continued. "It's a window into ways in which psychological factors can affect brain and body factors that are related to health."

Incidence and reproduction numbers of pertussis

Press release from PLoS Medicine

Analyses of serological and social contact data from five European countries by Mirjam Kretzschmar and colleagues show that childhood vaccination against Bordetella pertussis (whooping cough) has shifted the burden of infection from children to adolescents and adults. Adolescents and adults rarely develop severe pertussis

Two new statistical methods were used to estimate the incidence and basic reproduction number of pertussis. The authors used cross-sectional data on the seroprevalance of antibodies to pertussis toxin and cross-sectional data on social contact patterns from 5 countries. The results of this study suggest that in countries with high childhood vaccine coverage, adolescents and young adults are reservoirs for asymptomatic pertussis infection.

The researchers suggest pertussis could be eliminated if a vaccine or vaccine schedule could be developed that provided life-long protection against pertussis.

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No link between early child cancers and living near mobile phone masts

Research: Mobile phone base stations and early childhood cancers: case-control study

There is no association between risk of early childhood cancers and a mother's exposure to a mobile phone base station during pregnancy, concludes a new study published on bmj.com today.

This is the first study to look at phone masts in Britain as a whole and is the largest of its kind.

Use of mobile (cellular) phones has increased markedly in recent years and questions have been raised about possible health effects, including brain and other cancers, especially after prolonged use. Surveys also indicate high levels of public concern about the potential risks of living near mobile phone masts.

Previous reports of apparent cancer clusters near mobile phone base stations are difficult to interpret due to small numbers and possible biases that could have affected the results. Also, any radiobiological explanation for such cancer excesses is lacking.

So researchers at Imperial College London set out to investigate the risk of early childhood cancers, such as brain tumours and leukaemia, and proximity to a mobile phone base station during pregnancy.

They identified 1,397 British children aged 0-4 years registered with leukaemia or a tumour in the brain or central nervous system between 1999 and 2001. Each case was matched to four controls from the national birth register. Data on all mobile phone base station antennas across Britain from 1996-2001 were also obtained.

Birth address was then used to estimate distance (in metres) from the nearest mobile phone base station, total power output for base stations within 700m of birth address and power density for base stations within 1400m of birth address. The researchers found no association between cancer risk in young children and mobile phone base station exposures during pregnancy.

The authors acknowledge that their focus was early childhood cancers and therefore did not include longer term or other potential health effects that have been associated with mobile phone use. However, they conclude: "The results of our study should help to place any future reports of cancer clusters near mobile phone base stations in a wider public health context."

In an accompanying editorial, John Bithell from the Childhood Cancer Research Group at the University of Oxford, says that clinicians should reassure patients not to worry about proximity to mobile phone masts. "Moving away from a mast, with all its stresses and costs, cannot be justified on health grounds in the light of current evidence," he writes.

Chimps, Too, Wage War and Annex Rival Territory

By NICHOLAS WADE

Every day, John Mitani or a colleague is up at sunrise to check on the action among the chimpanzees at Ngogo, in Uganda's Kibale National Park. Most days the male chimps behave a lot like frat boys, making a lot of noise or beating each other up. But once every 10 to 14 days, they do something more adult and cooperative: they wage war.

A band of males, up to 20 or so, will assemble in single file and move to the edge of their territory. They fall into unusual silence as they penetrate deep into the area controlled by the neighboring group. They tensely scan the treetops and startle at every noise. "It's quite clear that they are looking for individuals of the other community," Dr. Mitani says.

When the enemy is encountered, the patrol's reaction depends on its assessment of the opposing force. If they seem to be outnumbered, members of the patrol will break file and bolt back to home territory. But if a single chimp has wandered into their path, they will attack. Enemy males will be held down, then bitten and battered to death. Females are usually let go, but their babies will be eaten.

These killings have a purpose, but one that did not emerge until after Ngogo chimps' patrols had been tracked and cataloged for 10 years. The Ngogo group has about 150 chimps and is particularly large, about three times the usual size. And its size makes it unusually aggressive. Its males directed most of their patrols against a chimp group that lived in a region to the northeast of their territory. Last year, the Ngogo chimps stopped patrolling the region and annexed it outright, increasing their home territory by 22 percent, Dr. Mitani said in a report being published Tuesday in Current Biology with his colleagues David P. Watts of Yale University and Sylvia J. Amsler of the University of Arkansas at Little Rock. Dr. Mitani is at the University of Michigan.

The objective of the 10-year campaign was clearly to capture territory, the researchers concluded. The Ngogo males could control more fruit trees, their females would have more to eat and so would reproduce faster, and the group would grow larger, stronger and more likely to survive. The chimps' waging of war is thus "adaptive," Dr. Mitani and his colleagues concluded, meaning that natural selection has wired the behavior into the chimps' neural circuitry because it promotes their survival.

Chimpanzee warfare is of particular interest because of the possibility that both humans and chimps inherited an instinct for aggressive territoriality from their joint ancestor who lived some five million years ago. Only two previous cases of chimp warfare have been recorded, neither as clear-cut as the Ngogo case.

In one, a chimp community first observed by Jane Goodall in Tanzania's Gombe National Park split into two and one group then wiped out the other. But the chimps had been fed bananas, to enable them to be observed, and some primatologists blamed the war on this human intervention. In a second case, in the Mahale Mountains National Park of Tanzania, Toshisada Nishida of Kyoto University noticed that a chimp group had disappeared, presumably killed by its neighbors, but he was not able to witness the killings or find the bodies.

Dr. Mitani's team has now put a full picture together by following chimps on their patrols, witnessing 18 fatal attacks over 10 years and establishing that the warfare led to annexation of a neighbor's territory.

The benefits of chimp warfare are clear enough, at least from the perspective of human observers. Through decades of careful work, primatologists have documented the links in a long causal chain, proving for instance that females with access to more fruit trees will bear children faster.

But can the chimps themselves foresee the outcome of their behavior? Do they calculate that if they pick off their neighbors one by one, they will eventually be able to annex their territory, which will raise their females' fertility and the power of their group? "I find that a difficult argument to sustain because the logical chain seems too deep," says Richard Wrangham, a chimp expert at Harvard.

A simpler explanation is that the chimps are just innately aggressive toward their neighbors, and that natural selection has shaped them this way because of the survival advantage that will accrue to the winner.

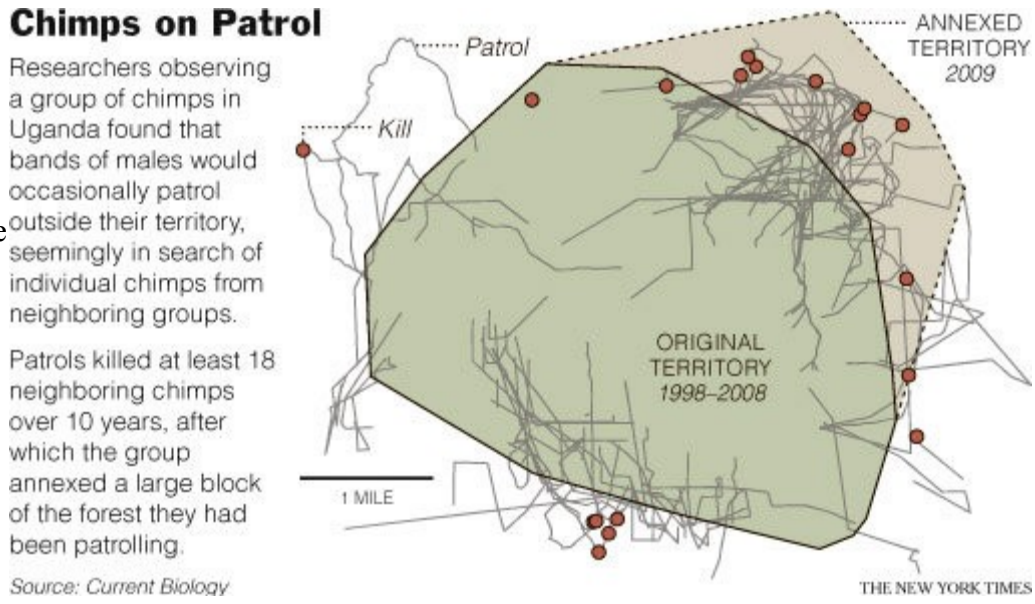
Warfare among human groups that still live by hunting and gathering resembles chimp warfare in several ways. Foragers emphasize raids and ambushes in which few people are killed, yet casualties can mount up with incessant skirmishes. Dr. Wrangham argues that chimps and humans have both inherited a propensity for aggressive territoriality from a chimplike ancestor. Others argue the chimps' peaceful cousin, the bonobo, is just as plausible a model for the joint ancestor.

Dr. Wrangham's view is that since gorillas and chimps are so similar, their joint ancestor, which lived some seven million years ago, would have been chimplike and therefore so would the joint ancestor of chimps and humans when they parted ways two million years later. "So I think it's very reasonable to think this behavior goes back a long way," he said, referring to the propensity to wage war against one's own species.

Dr. Mitani, however, is reluctant to infer any genetic link between human and chimp warfare, despite the similarity of purpose, cost and tactics. "It's just not at all clear to me that these lethal raids are similar sorts of phenomena," he said. More interesting than warfare, in his view, is the cooperative behavior that makes war possible.

Why do chimps incur the risk and time costs of patrolling into enemy territory when the advantage accrues most evidently to the group? Dr. Mitani invokes the idea of group-level selection - the idea that natural selection can work on groups and favor behaviors, like altruism and cooperation, that benefit the group at the expense of the individual. Selection usually depends only on whether an individual, not a group, leaves more surviving children.

Many biologists are skeptical of group-level selection, saying it could be effective only in cases where there is intense warfare between groups, a reduced rate of selection on individuals, and little interchange of genes between groups. Chimp warfare may be constant and ferocious, fulfilling the first condition, but young females emigrate to neighboring groups to avoid inbreeding. This constant flow of genes would severely weaken any group selective process, Dr. Wrangham said.



Samuel Bowles, an economist at the Santa Fe Institute who has worked out theoretical models of group selection, said the case for it "is pretty strong for humans" but remains an open question in chimpanzees.

Chimp watching is an arduous task since researchers must first get the chimpanzees used to their presence, but without inducements like bananas, which could interfere with their natural behavior. Chimpanzees are immensely powerful, and since they can tear each other apart, they could also make short work of any researcher who incurred their animosity.

"Luckily for us, they haven't figured out that they are stronger than us," Dr. Mitani said, explaining that there was no danger in tagging along behind a file of chimps on the warpath. "What's curious is that after we do gain their trust, we sort of blend into the background and they pretty much ignore us."

Chemical element 114: A first at GSI

One of the heaviest elements

At GSI Helmholtzzentrum für Schwerionenforschung, an international team of scientists succeeded in the observation of the chemical element 114, one of the heaviest elements created until now. The production of element 114 is very difficult and requires dedicated particle accelerators. So far, this feat was achieved at only two other research centers, in the USA and Russia. In the experiment at GSI, scientists employed the innovative

new setup TASCA (TransActinide Separator and Chemistry Apparatus), which was developed in the past few years. The aim of future experiments with this new setup is to advance to yet heavier elements and possibly to discover new elements beyond element 118.

With the new TASCA setup, the research team led by Christoph Düllman observed 13 atoms of element 114 during the course of their four week long experiment. Despite being a small number of atoms, it corresponds to the highest ever measured production rate for element 114. This paves the way for future in-depth chemical, atomic, and nuclear physics studies. Based on the radiation emitted during the element's decay, the scientists were able to identify two different isotopes of element 114 with the mass numbers 288 and 289. The measured half-lives are of the order of one second.

"TASCA is currently the world's most efficient system for detecting superheavy elements produced with particle accelerators. This high efficiency is the key to future experiments, where we will also conduct chemical analyses of superheavy elements in the vicinity of element 114, to determine their correct position in the periodic table of the elements", says Christoph Düllmann from GSI, head of the collaboration. Düllmann also works at the newly founded Helmholtz Institute Mainz, based at Johannes Gutenberg University Mainz.

Using the 120-meter long GSI particle accelerator, the scientists fired charged calcium atoms (called calcium ions) onto a plutonium-coated foil. In the course of the experiments, a calcium and a plutonium nucleus undergo fusion to form a nucleus of the new element. The element's atomic number (the number of protons in the atomic nucleus) is 114, hence its preliminary name "element 114". Its atomic number corresponds to the sum of those of the reacting elements: calcium with 20 and plutonium with 94 protons.

The gas-filled separator TASCA separated the atoms produced by the accelerator with high selectivity from other reaction products. The atoms of element 114 then implanted into a special semiconductor detector, where they were subsequently identified based on the radiation emitted during their decay.

Initial reports on the observation of element 114 were published about 10 years ago from the research center in Dubna, Russia. However, the commission of the International Union of Pure and Applied Chemistry (IUPAC) in charge has not yet officially recognized the discovery claim. Almost simultaneously to the GSI experiment, two atoms of element 114 were observed at a research center in Berkeley, USA. The results from GSI, Darmstadt, and Berkeley, USA now essentially confirm the results from Dubna.

Recently, IUPAC officially recognized element 112, discovered at GSI, as the heaviest element thus far. Russian reports on the creation of elements up to atomic number 118 are yet unconfirmed.

The TASCA experiment on the production of element 114 at GSI was led by scientists from GSI, the Johannes Gutenberg University Mainz and the Technische Universität München. The collaboration also includes researchers from Berkeley (USA), Jyväskylä (Finland), Kolkata (India), Liverpool (UK), Lund (Sweden), Oslo (Norway) und Warsaw (Poland).

Weakened flu virus proves ideal vaccine

* 22 June 2010 **by Ewen Callaway**

A "rewritten" flu virus prompts an identical immune response in mice to a natural infection - meaning it could make a more effective vaccine than traditional options.

The new vaccine virus contains exactly the same proteins as the flu strain it targets, with one major difference: its genome has been rewritten to produce a virus that replicates too slowly to cause any trouble.

"It's unlike anything nature ever evolved," says Steffen Mueller, a virologist at Stony Brook University in New York, whose team tested the vaccine in mice.

The team exploited a quirk in the genetic code to weaken the virus without changing the proteins it contains. Three-letter DNA sequences called codons determine which amino acids get assembled into a protein. Yet with more three-letter combinations than there are amino acids, more than one codon can produce the same amino acid. Organisms have their favourites - preferring some codons over others because they translate into proteins more efficiently, says Mueller.

His team took advantage of this quirk to engineer a flu virus that contains thousands of genetic alterations that result in unfavourable combinations of codons. "We call this death by one thousand cuts," says Mueller. Each alteration is virtually inconsequential by itself, but together they create a weakened virus that does not replicate well. Mice that were given the vaccine stayed healthy. After four weeks, they were infected with a dose of flu that would ordinarily kill them. Three days later, 80 per cent of the mice had no detectable flu virus in their system (Nature Biotechnology, DOI: 10.1038/nbt.1636).

The rewritten virus should elicit a stronger immune response than traditional vaccines because it would expose the immune system to proteins identical to the ones seen in seasonal or pandemic flu strains, says Mueller.

"It's an interesting approach to flu vaccination and is certainly likely to be safe," says Sarah Gilbert of the University of Oxford.

Ancient Mesoamerica's Rubber Industry

By SINDYA N. BHANOO

The Mesoamericans were robust users of rubber, according to historical and archaeological records. With it they made sandals, rubber bands and also balls, which they used to play a ceremonial game in stone-walled courts. Each of these items need different qualities in the rubber of which they are made. A ball requires elasticity for bounciness, a rubber band requires strength, and a sandal requires wear and resistance.

A new study reports that the Mesoamericans, which include the Aztec and the Maya, knew how to make different kinds of rubber, mixing latex from rubber trees with juice squeezed from morning glory vines in different proportions.

"It's a pretty safe bet that they were engineering materials to suit their needs," said Michael Tarkanian, the study's lead researcher and a materials scientist at M.I.T. "It wasn't just a haphazard concoction."

Mr. Tarkanian and his co-author, Dorothy Hosler, also an M.I.T. researcher, experimented with samples of latex and morning glory vine juice from Mexico and achieved three kinds of rubber with different mixtures.

Bounciness is maximized when 50 percent of the mixture is juice, while longevity and wear are maximized when 25 percent of the mixture is juice. And strength, required for a rubber band, is maximized when no juice is added.

The earliest records indicate that Mesoamericans were using rubber by 1600 B.C. Thousands of years later, in 1839, Charles Goodyear discovered vulcanization, the chemical process used to produce rubber today.

The research will be published in an upcoming issue of Latin American Antiquity.

Research from Rensselaer Polytechnic Institute professor offers clues to Alzheimer's disease

Compound found in red wine neutralizes toxicity of proteins related to Alzheimer's

Troy, N.Y. An organic compound found in red wine – resveratrol – has the ability to neutralize the toxic effects of proteins linked to Alzheimer's disease, according to research led by Rensselaer Professor Peter M. Tessier. The findings, published in the May 28 edition of the Journal of Biological Chemistry, are a step toward understanding the large-scale death of brain cells seen in certain neurodegenerative diseases.

"We've shown how resveratrol has very interesting selectivity to target and neutralize a select set of toxic peptide isoforms," Tessier said. "Because resveratrol picks out the clumps of peptides that are bad and leaves alone the ones that are benign, it helps us to think about the structural differences between the peptide isoforms."

Isoforms are different packing arrangements of a particular peptide. Deformations of a particular peptide - the Aβ1-42 peptide - have been linked to Alzheimer's disease. Improperly folded peptides have been shown to collect in accumulations called "plaques" within the brain. Those plaques are often found near areas of cell death in diseased brains.

It is not clear that resveratrol is able to cross the blood-brain barrier, Tessier said. However, the molecule has garnered interest in recent years for its potential impact on cancer and aging.

In their research, Tessier and his co-authors generated A□ peptides packed together in five unique isoforms, or "arrangements" (monomer, soluble oligomer, non-toxic oligomer, fibrillar intermediates and amyloid fibrils). In their experiments, three of these arrangements were toxic to human cells, two were not.

Next, the researchers introduced resveratrol. The resveratrol reacted with the toxic arrangements of the Aβ1-42 peptide, neutralizing their toxicity. It did not affect the non-toxic arrangements. "The surprise is that this molecule can target some of these packing arrangements that are toxic and rearrange them into packing arrangements that are not toxic. For those forms that are non-toxic, it doesn't change them," Tessier said.

Intriguingly, Tessier said, one of the toxic arrangements (the soluble oligomer) and one of the non-toxic arrangements (the non-toxic oligomer) were indistinguishable by various methods. And yet the resveratrol only affected the toxic arrangement.

The point, Tessier concludes, is that the seemingly identical non-toxic and toxic arrangements must have some distinguishing feature yet to be discovered, raising questions for future study. "We have two things that look very similar, but one is toxic and the other isn't," Tessier said. "What is it that makes the bad one bad and the good one good?"

The research produced several other findings, Tessier said, including reliable methods of generating the arrangements Tessier's team produced, and formation of one arrangement which had previously been unknown.

Last week, Tessier was named as a 2010 Pew Scholar in the Biomedical Sciences by the Pew Charitable Trusts.The distinction includes an award of $240,000 over four years and inclusion into a select community of scientists that includes three Nobel Prize winners, three MacArthur Fellows, and two recipients of the Albert Lasker Medical Research Award, according to the Pew Charitable Trusts.

Tessier was also recently awarded a five-year, $411,872 Faculty Early Career Development Award (CAREER) from the National Science Foundation (NSF) for research in the related field of protein thermodynamics and aggregation.

The CAREER Award is given to faculty members at the beginning of their academic careers and is one of NSF's most competitive awards, placing emphasis on high-quality research and novel education initiatives.

Tessier joined the Rensselaer faculty in 2007 following a postdoctoral fellowship at the Massachusetts Institute of Technology's Whitehead Institute for Biomedical Research. He received his bachelor's degree in chemical engineering from the University of Maine, and went on to earn his doctoral degree in chemical engineering from the University of Delaware.

The fruit fly formerly known as Drosophila

*** 22 June 2010 by Kim van der Linde and Amir Yassin**

My name is...? **(Image: janeff/iStock)**

Kim van der Linde

Common names of plants and animals often differ dramatically from country to country. In the past, this caused endless confusion and misunderstanding among scientists. To resolve this difficulty, 16th-century naturalists developed a standardised naming scheme that was later perfected by Carl Linnaeus. Under this scheme, each species has a two-part name. The first is the genus name, which is shared by several closely related species. The second is the species name.

To promote stability, there are rules governing the naming of species. Even so, names sometimes change, and species can be moved from one genus to another on the basis of new insights.

Most name changes go unnoticed by non-specialists and the general public. The imminent renaming of the fruit fly Drosophila melanogaster is an exception. This species is one of the most widely used in biology. It is often referred to simply as drosophila - a name that can be found in virtually every biology textbook and more than 50,000 scholarly articles.

The move to rename Drosophila melanogaster has arisen because the genus Drosophila as currently defined is a chaotic hodgepodge of species that are related to widely varying degrees. Cleaning up this royal mess to create a biologically consistent scheme will entail a name change: Drosophila melanogaster will have to become Sophophora melanogaster.

Though this problem has been recognised for decades, the implications of a name change have deterred any such move. No longer. Together with several colleagues I petitioned the International Commission on Zoological Nomenclature to conserve the name. In March, after three years of deliberation, they rejected the request.

I think it is a bad decision. Changing a name as important as Drosophila melanogaster is asking for trouble.

For one thing, it flies in the face of name stability. What's more, many researchers have an emotional bond with the old name and will refuse to use the new one. Several years ago the name of another laboratory workhorse, the mosquito Aedes aegypti, was changed to Stegomyia aegypti. Yet apart from mosquito taxonomists, everybody still uses the old name. The reassignment of a group of Hawaiian flies from Drosophila to the genus Idiomyia was similarly ignored.

Changing the name of Drosophila melanogaster will be met with even more resistance. Most likely drosophila will stick. There really is no point changing the name.

Amir Yassin

The great geneticist Theodosius Dobzhansky famously said: "Nothing in biology makes sense except in the light of evolution." By this criterion, the genus Drosophila makes no sense. Most of its members belong to one of two subgenera, Sophophora and (confusingly) Drosophila, which are not actually very closely related. In fact, the subgenus Drosophila is more closely related to 20 other genera of small flies than it is to Sophophora.

Under normal circumstances this would not be a problem. We would simply reorganise the whole scheme to reflect biological reality, but that is easier said than done. Why? Because the famous laboratory fruit fly Drosophila melanogaster actually belongs in the subgenus Sophophora.

Taxonomically speaking, the most satisfactory solution is to split the genus Drosophila into several new genera. That would mean upgrading Sophophora from a subgenus to a genus - and hence changing the name Drosophila melanogaster to Sophophora melanogaster. This is not popular with geneticists.

The alternative is to lump all the groups together in a single genus, Drosophila. But while that would allow Drosophila melanogaster to keep its name, it would also result in a large number of taxonomic anomalies. For example, four species would all end up with the name Drosophila serrata. Four more would be called Drosophila carinata. This is a serious problem because species names reflect biological reality more than genus names.

What to do? I think we must favour the first solution.

There are very good taxonomic reasons for doing so. First, there is lots of evidence that Sophophora species are closely related, while the relationships between the other groups remain unclear. Secondly, only 332 species names will be affected, while the alternative will affect at least 1500 and possibly as many as 2000.

There is also no rational reason for geneticists to reject the change. They already use drosophila as a colloquial name for all the species in the family Drosophilidae - nearly 70 genera. Nothing need stop them continuing to call Sophophora melanogaster plain old drosophila. As for emotional attachment, that didn't prevent astronomers from downgrading Pluto's status as a planet.

The subgenus Sophophora was created in 1939 by Alfred Sturtevant, one of the founding fathers of drosophila genetics. His overriding purpose was to create a "scheme of classification indicating degree of genetic relationship". It is clear that the existing scheme no longer serves that purpose. Renaming Drosophila melanogaster is the right thing to do.

Florida State University, Tallahassee American Museum of Natural History, New York

Cold, Dark and Teeming With Life

By WILLIAM J. BROAD

The deep seabed was once considered a biological desert. Life, the logic went, was synonymous with light and photosynthesis. The sun powered the planet's food chains, and only a few scavengers could ply the preternaturally dark abyss.

Then, in 1977, oceanographers working in the deep Pacific stumbled on bizarre ecosystems lush with clams, mussels and big tube worms - a cornucopia of abyssal life built on microbes that thrived in hot, mineral-rich waters welling up from volcanic cracks, feeding on the chemicals that leached into the seawater and serving as the basis for whole chains of life that got along just fine without sunlight.

In 1984, scientists found that the heat was not necessary. In exploring the depths of the Gulf of Mexico, they discovered sunless habitats powered by a new form of nourishment. The microbes that founded the food chain lived not on hot minerals but on cold petrochemicals seeping up from the icy seabed.

Today, scientists have identified roughly one hundred sites in the gulf where cold-seep communities of clams, mussels and tube worms flourish in the sunless depths. And they have accumulated evidence of many more - hundreds by some estimates, thousands by others - most especially in the gulf's deep, unexplored waters.

"It wouldn't surprise me if there were 2,000 communities, from suburbs to cities," said Ian R. MacDonald, an oceanographer at Florida State University who studies the dark ecosystems.

The world's richest known concentration of these remarkable communities is in the Gulf of Mexico. The life forms include tube worms up to eight feet long. Some of the creatures appear old enough, scientists say, to predate the arrival of Columbus in the New World.

Now, by horrific accident, these cold communities have become the subject of a quiet debate among scientists. The gulf is, of course, the site of the giant oil spill that began April 20 with the explosion of the Deepwater Horizon drill rig. The question is what the oil pouring into the gulf means for these deep, dark habitats.

Seep researchers have voiced strong concern about the threat to the dark ecosystems. The spill is a concentrated surge, they note, in contrast to the slow, diffuse, chronic seepage of petrochemicals across much of the gulf's northern slope. Many factors, like the density of oil in undersea plumes, the size of resulting oxygen drops and the potential toxicity of oil dispersants - all unknowns - could grow into threats that outweigh any possible benefits and damage or even destroy the dark ecosystems.

Last year, scientists discovered a community roughly five miles from where the BP well, a mile deep, subsequently blew out. Its inhabitants include mussels and tube worms. So it seems that researchers will have some answers sooner rather than later.

"There's lots of uncertainty," said Charles R. Fisher, a professor of biology at Pennsylvania State University, who is leading a federal study of the dark habitats and who observed the nearby community. "Our best hope is that the impact is neutral or a minor problem."

A few scientists say the gushing oil - despite its clear harm to pelicans, turtles and other forms of coastal life - might ultimately represent a subtle boon to the creatures of the cold seeps and even to the wider food chain.

"The gulf is such a great fishery because it's fed organic matter from oil," said Roger Sassen, a specialist on the cold seeps who recently retired from Texas A&M University. "It's preadapted to crude oil. The image of this spill being a complete disaster is not true." His stance seems to be a minority view.

Over roughly two decades, the federal government has spent at least $30 million uncovering and investigating the creatures of the cold seeps, a fair amount of money for basic ocean research. Washington has provided this money in an effort to ensure that oil development does no harm to the unusual ecosystems. Now, the nation's worst oil spill at sea - with tens of millions of gallons spewing to date - has thrown that goal into doubt.

The agency behind the exploration and surveying of the cold seeps is none other than the much-criticized Minerals Management Service of the Department of the Interior - not its oil regulators but a separate environmental arm, which long ago began hiring oceanographers, geologists, ecologists and marine biologists to investigate the gulf seabed and eventually pushed through regulations meant to protect the newly discovered ecosystems.

The minerals service is joining with other federal agencies to study whether the BP spill is harming the dark habitats. Scientists say ships may go to sea as soon as July, sending tethered robots down to the icy seabed to examine the seep communities and take samples for analysis.

It is a bittersweet moment for scientists like Dr. MacDonald of Florida State University, who has devoted his career to documenting the ecosystem's richness and complexity. In an interview, he said the sheer difficulty of trying to fathom the ecological impacts of the spill had left some of his colleagues dejected.

"Once, we had this career studying obscure animals down there," he said. "And now, it's looking at this - probably for the rest of my career. It becomes this huge unknown."

Inky darkness, icy temperatures and crushing pressures conspire to make studying the deep oceans arduous and remarkably costly. Humans are estimated to have glimpsed perhaps a millionth of the ocean floor.

By contrast, people looking at the surface of the gulf have known about the seeping oil for centuries. Spanish records dating from the 16th century note floating oil.

In the early 1980s, scientists investigating the oil seeps wondered if nearby creatures on the seabed might suffer chronic harm from pollution and serve as models for petrochemical risk. They lowered nets about a half mile down and pulled up, to their surprise, riots of healthy animals.

"We report the discovery of dense biological communities associated with regions of oil and gas seepage," six oceanographers at Texas A&M wrote in the journal Nature in September 1985.

The animals included snails, crabs, eels, clams and tube worms more than six feet long. The founding microbes of the food chain turned out to feed on seabed emissions of methane and hydrogen sulfide - a highly toxic chemical for land animals that has the odor of rotten eggs.

Plants derive energy from sunlight and make living tissue in a process known as photosynthesis. The corresponding method among the microbes of the dark abyss is known as chemosynthesis.

The minerals service proceeded to finance wide expeditions. It issued thick reports in 1988, 1992 and 2002. By then, scientists had discovered dozens of seep communities and found some of their inhabitants to be extraordinarily old.

In the journal Nature, Dr. Fisher of Pennsylvania State University and two colleagues reported that gulf tube worms could live more than 250 years - making them among the oldest animals on the planet.

The latest expeditions have looked at seep communities as deep as 1.7 miles - far down the continental slope toward the gulf's nether regions. In an interview, Dr. Fisher said investigations of the deeper communities suggested that tube worm species there grew slower and lived longer.

How long? "It's likely they can live a lot longer," he answered. "I'm uncomfortable with an exact number, but we're talking centuries - four, five or six centuries."

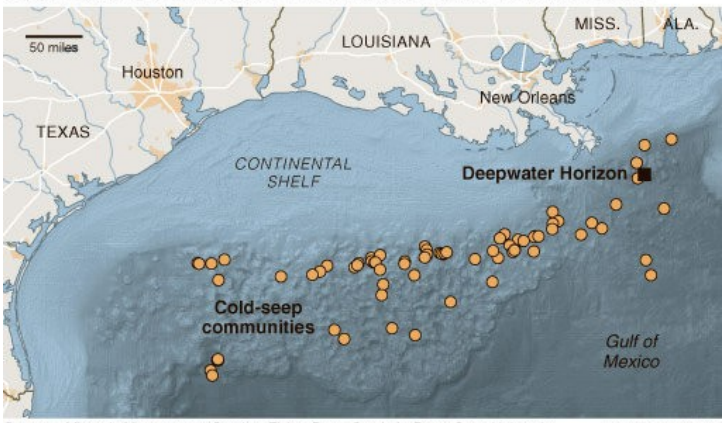
Over the years, scientists have found that the deep microbes not only eat exotic chemicals but also make carbonate (a building block of seashells) that forms a hard crust on the normally gooey seabed. The carbonate crusts can grow thick enough, they say, to reduce the flow of gas and oil through the seep communities and form attachment points for a variety of other sea creatures, especially deep corals and other filter feeders like brittle stars.

By probing the gulf's deep waters with sound and other imaging technologies, scientists have found evidence for the existence on the northern continental slope of roughly 8,000 regions of hard crust - all, they say, potentially home to old or new seep communities.

On its Web site, the minerals service freely admits "a management conflict" between encouraging oil development and protecting the dark ecosystems. It issued regulations in 1989 and has periodically toughened the rules, most recently in January.

Now, in the wake of the oil disaster, many seep researchers have voiced strong concern about the threat to the dark ecosystems. Dr. Fisher said that thick oil could coat the respiratory structures of the animals and cause them to suffocate, and that high concentrations might otherwise prove toxic.

COLD SEEPS Scientists have identified dozens of sites in the Gulf of Mexico where shellfish and tube worms flourish on petrochemicals seeping up from the seafloor.



Sources: Minerals Management Service; Fisher Deep-Sea Lab, Penn. State University

THE NEW YORK TIMES

Samantha B. Joye, a cold-seep scientist at the University of Georgia, told a House science subcommittee on June 9 that the BP blowout represented “an unprecedented perturbation to the Gulf of Mexico system.”

She expressed particular concern about the dispersants that BP is injecting a mile down into the spewing oil - in a largely successful effort to reduce the flow reaching the surface.

Dr. Joye said the surge of oil into subsurface waters could feed microbes that consume oxygen. If their numbers explode, she said, the result could be a spike in oxygen consumption so large that its deep levels drop precipitously.

The dark ecosystems, she noted, “can tolerate reduced oxygen concentrations.” But she cautioned that the BP spill will challenge their tolerance “beyond any previous insult.”

Now, oceanographers are preparing to dive deep to see how the dark communities are holding up. The lessons for oil precautions and regulatory care, they say, could have application not only for creatures in the inky depths of the Gulf of Mexico but also around the world.

“Everywhere they looked, they’ve found them,” said Norman L. Guinasso Jr., director of Geochemical and Environmental Research at Texas A&M. He cited discoveries of seep communities off Angola, Indonesia and Trinidad. In exploring the gulf, Dr. Guinasso said, scientists are struggling to fathom the strengths and vulnerabilities of some of the planet’s oldest and most novel creatures. “People,” he said, “are still learning.”

Growing brain is particularly flexible

Max Planck scientists investigate how the brain changes during growth

Science has long puzzled over why a baby's brain is particularly flexible and why it easily changes. Is it because babies have to learn a lot? A group of researchers from the Bernstein Network Computational Neuroscience, the Max Planck Institute for Dynamics and Self-Organization in Göttingen, the Schiller University in Jena and Princeton University (USA) have now put forward a new explanation: Maybe it is because the brain still has to grow. Using a combination of experiments, mathematical models and computer simulations they showed that neuronal connections in the visual cortex of cats are restructured during the growth phase and that this restructuring can be explained by self-organisational processes. The study was headed by Matthias Kaschube, former researcher at the Max Planck Institute for Dynamics and Self-Organization and now at Princeton University (USA). (PNAS, published online June 21, 2010)

The brain is continuously changing. Neuronal structures are not hard-wired, but are modified with every learning step and every experience. Certain areas of the brain of a newborn baby are particularly flexible, however. In animal experiments, the development of the visual cortex can be strongly influenced in the first months of life, for example, by different visual stimuli.

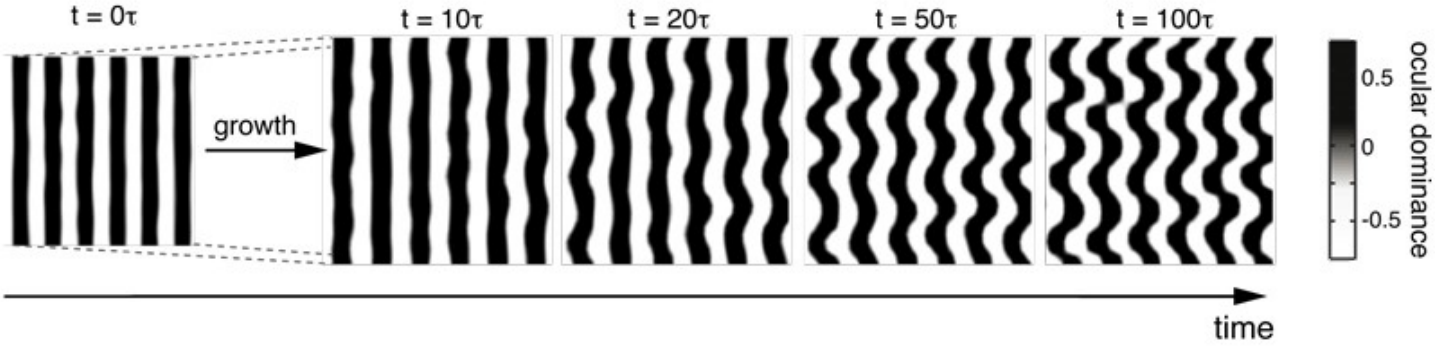


Fig.: Computer simulation of the development of ocular dominance columns in a simple model with cortical growth. Black areas correspond to a preference for the left eye, white areas a preference for the right eye. The pattern is initially striped and slowly dissolves after the growth into a zigzag pattern. A similar rearrangement is also shown by experimental studies on the visual cortex of the cat. **Image: Wolfgang Keil**

Nerve cells in the visual cortex of fully-grown animals divide up the processing of information from the eyes: Some "see" only the left eye, others only the right. Cells of right or left specialisation each lie close to one another in small groups, called columns. The researchers showed that during growth, these structures are not simply inflated - columns do not become larger but their number increases. Neither do new columns form from new nerve cells. The number of nerve cells remains almost unchanged, a large part of the growth of the visual cortex can be attributed to an increase in the number of non-neuronal cells. These changes can be explained by the fact that existing cells change their preference for the right or the left eye. In addition, another of the researchers' observations also points to such a restructuring: The arrangement of the columns changes. While the pattern initially looks stripy, these stripes dissolve in time and the pattern becomes more irregular.

"This is an enormous achievement by the brain - undertaking such a restructuring while continuing to function," says Wolfgang Keil, scientist at the Max Planck Institute for Dynamics and Self-Organization

Göttingen and first author of the study. "There is no engineer behind this conducting the planning, the process must generate itself." The researchers used mathematical models and computer simulations to investigate how the brain could proceed to achieve this restructuring. On the one hand, the brain tries to keep the neighbourhood relations in the visual cortex as uniform as possible. On the other, the development of the visual cortex is determined by the visual process itself - cells which have once been stimulated more strongly by the left or right eye try to maintain this particular calling. The researchers' model explains the formation of columns by taking both these tendencies into account. The scientists showed that when the tissue grows and the size of the columns is kept constant, the columns in the computer model change exactly as they had observed in their experimental studies on the visual cortex of the cat: The stripes dissolve into a zigzag pattern and thus become more irregular. In this way, the researchers provide a mathematical basis which realistically describes how the visual cortex could restructure during the growth phase.

Original work: *Wolfgang Keil, Karl-Friedrich Schmidt, Siegrid Löwel and Matthias Kaschube* ***Reorganization of columnar architecture***

Pelican fossil poses evolutionary puzzle

*** 17:00 22 June 2010 by Jeff Hecht**

Pelicans that closely resembled those living today were scooping fish from the water while our ancestors were still swinging from the trees, a fossil discovery suggests. The identification of an extremely well preserved 30-million-year old fossilised beak raises interesting questions over why evolution has left the birds so little changed over such a long period.

Just like its modern counterpart (Image: A. Louchart)

The nearly complete beak of the 30-million-year old fossil, found in the Luberon area of south-eastern France, resembles those of the seven modern pelican species so closely that it falls within the genus Pelecanus, says Antoine Louchart of the University of Lyon, France.

Pelican beaks are the longest of any living birds. Beneath the beak is a flexible pouch that allows the birds to capture their prey in the water, then spit out the water before swallowing their meal. Like other bird beaks, they are rarely preserved as fossils, so little had been known about their early evolution.

Family resemblance

Louchart recognised the fossil, discovered in the 1980s, while examining specimens in the collection of his co-author Nicolas Tourment. Protected by being buried in fine-grained limestone, it includes most beak bones, plus parts of the skull and neck, and strongly resembles the modern great white pelican, Pelecanus onocrotalus.

The lack of evolutionary change could suggest the beak has reached an evolutionary optimum for flight or for eating. Louchart is not convinced that either of these hypotheses offers a complete explanation; he thinks something else may be involved but does not know what that might be.

The find not only pushes back the origins of pelicans, but of related birds too. "The groups now thought to be closest to pelicans, the shoebill and hamerkop, must also have differentiated very early, says Louchart.

"The pelican bill has been a successful adaptation or trait, in that it has remained very similar over time," says Rebecca Kimball of the University of Florida. Two years ago Kimball reported in Science (DOI: 10.1126/science.1157704) that pelicans were genetically close to near relatives, which she said would reflect their slow evolution. ***Journal reference:*** *Journal of Ornithology, DOI: 10.1007/s10336-010-0537-5*

Brain structure corresponds to personality

Personalities come in all kinds. Now psychological scientists have found that the size of different parts of people's brains correspond to their personalities; for example, conscientious people tend to have a bigger lateral prefrontal cortex, a region of the brain involved in planning and controlling behavior.

Psychologists have worked out that all personality traits can be divided into five factors, commonly called the Big Five: conscientiousness, extraversion, neuroticism, agreeableness, and openness/intellect. Colin DeYoung at the University of Minnesota and colleagues wanted to know if these personality factors correlated with the size of structures in the brain.

For the study, 116 volunteers answered a questionnaire to describe their personality, then had a brain imaging test that measured the relative size of different parts of the brain. A computer program was used to warp each brain image so that the relative sizes of different structures could be compared. Several links were found between the size of certain brain regions and personality. The research appears in Psychological Science, a journal of the Association for Psychological Science.

For example, "Everybody, I think, has a common sense of what extraversion is – someone who is talkative, outgoing, brash," says DeYoung. "They get more pleasure out of things like social interaction, amusement

parks, or really just about anything, and they're also more motivated to seek reward, which is part of why they're more assertive." That quest for reward is thought to be a leading factor in extraversion. Earlier studies had found parts of the brain that are active in considering rewards. So DeYoung and his colleagues reasoned that those regions should be bigger in people who are more extraverted. Indeed, they found that one of those regions, the medial orbitofrontal cortex – it's just above and behind the eyes – was significantly larger in study subjects with a lot of extraversion.

The study found similar associations for conscientiousness, which is associated with planning; neuroticism, a tendency to experience negative emotions that is associated with sensitivity to threat and punishment; and agreeableness, which relates to parts of the brain that allow us to understand each other's emotions, intentions, and mental states. Only openness/intellect didn't associate clearly with any of the predicted brain structures.

"This starts to indicate that we can actually find the biological systems that are responsible for these patterns of complex behavior and experience that make people individuals," says DeYoung. He points out, though, that this doesn't mean that your personality is fixed from birth; the brain grows and changes as it grows. Experiences change the brain as it develops, and those changes in the brain can change personality.

For more information about this study, please contact: Colin DeYoung cdeyoung@umn.edu

Filtering Donor Blood Reduces Heart, Lung Complications

Researchers at the University of Rochester Medical Center (URMC) have discovered another reason to filter the foreign white cells from donor blood: the resulting blood product is associated with dramatically fewer cardiopulmonary complications for patients who received a transfusion.

The study was published online by the journal, Transfusion. It is the latest in a large body of work led by Neil Blumberg, M.D., who for 25 years has been investigating the benefits of filtering or washing blood to create safer, simpler approaches to transfusion therapy.

The observational study was conducted during the seven years before and after 2000, when the URMC introduced universal leukoreduction, a process that filters the white cells from blood to be used for transfusions. Researchers looked at the number of reports of transfusion reactions during the 14-year period, and divided them by the total number of blood components transfused (778, 559).

Rates of acute, transfusion-related lung injury dropped 83 percent in the years after filtering took place, and transfusion-associated circulatory overload declined 49 percent, when compared to the rates prior to the year 2000. Both conditions are rare, but are among the most common causes of death following a transfusion.

“These data are very exciting because we described two unexpected and unexplained associations between adverse reactions and leukoreduction, “Blumberg said. “However, our observations do not prove cause and effect, and therefore require further investigation before we can say with certainty that leukoreduction is responsible for so many fewer cardiopulmonary complications.”

The Centers for Disease Control and Prevention is introducing a new blood surveillance system to track severe transfusion reactions, Blumberg said, which should provide more detailed information to support or refute the URMC study.

About five million people a year in the United States receive transfusions to replenish blood lost during surgery, serious injury or illness. While transfusions can be life-saving, they also lead to health complications.

In previous studies, Blumberg’s team has shown that the odds of post-surgical infection and death are greatly reduced by leukoreduction. White cells from donor blood can attack the immune system of the blood recipient; removing them diminishes the chances of an inflammatory response or infection, according to Blumberg’s research.

Transfusion-related lung injury is believed to happen when antibodies or other molecules from the donor’s white blood cells or plasma react in an adverse way with the recipient’s white blood cells. Circulatory overload is presumed to occur when the volume of blood given in a transfusion is too much for the recipient’s cardiovascular system. Researchers hypothesized that leukoreduction, which removes the white cells, would reduce those complications.

In 1998 Strong Memorial Hospital, a 739-bed facility owned by the URMC, became one of the first hospitals in the nation to use leukoreduced blood during heart surgeries. Two years later Strong extended its leukoreduction practices to all patients. Work done at URMC also has supported keeping transfusions to an absolute minimum. Blumberg’s evidence-based stance on the judicious use of transfusions and safer techniques has contributed greatly to the national and international dialogue on reducing in-hospital infections rates and controlling costs.

No extramural funding supported this study, although two researchers received partial salary support from National Institutes of Health grants. Data retrieval and analysis were conducted as part of a larger quality assurance initiative.

Co-authors: Joanna M. Heal, Kelly F. Gettings, Richard P. Phipps, Debra Masel, Majed A. Refaai, Scott A. Kirkley, and L. Benjamin Fialkow, from the Transfusion Medicine Unit and Department of Pathology and Laboratory Medicine, at the University of Rochester Medical Center. Phipps is also a professor of Environmental Medicine.

Lucy's Ancestor, 'Big Man,' Revealed

The discovery could reshape what scientists know about Lucy and her species.

content provided by Bruce Bower, Science News

An older guy has sauntered into Lucy's life, and some researchers believe he stands ready to recast much of what scientists know about the celebrated early hominid and her species.

Excavations in Ethiopia's Afar region have uncovered a 3.6-million-year-old partial male skeleton of the species Australopithecus afarensis. This is the first time since the excavation of Lucy in 1974 that paleoanthropologists have turned up more than isolated pieces of an adult from the species, which lived in East Africa from about 4 million to 3 million years ago.

A nearly complete skeleton of an A. afarensis child has been retrieved from another Ethiopian site.

Discoverers of the skeleton, led by anthropologist Yohannes Haile-Selassie of the Cleveland Museum of Natural History, consider this a Desi Arnaz moment. As the late actor often exclaimed on his classic television show, "Lucy, you got some 'splainin' to do!" But other researchers are not so convinced that the new fossil changes much of what they already knew about Lucy and her kind.

Big Man's long legs, relatively narrow chest and inwardly curving back denote a nearly humanlike gait and ground-based lifestyle. **Y. Haile Selassie et al./PNAS 2010**

Haile-Selassie's team has dubbed its new find Kadanuumuu, which means "big man" in the Afar language. At an estimated 5 to 5-and-a-half feet tall, he would have towered over 3 and a half-foot-tall Lucy. Excavations between 2005 and 2008 in a part of Afar called Woranso-Mille -- about 48 kilometers north of where Lucy's 3.2-million-year-old remains were found -- yielded fossils from 32 bones of the same individual.

Big Man's long legs, relatively narrow chest and inwardly curving back denote a nearly humanlike gait and ground-based lifestyle, according to a preliminary report published online June 21 in the Proceedings of the National Academy of Sciences. Lucy has often been portrayed as having had a fairly primitive two-legged gait and a penchant for tree climbing.

Big Man's humanlike shoulder blade differs as much from those of chimpanzees as it does from those of gorillas, Haile-Selassie says. The shape of that bone, combined with characteristics of five recovered ribs, suggest to Haile-Selassie's team that Big Man's chest had a humanlike shape. Earlier reconstructions of Lucy's rib cage had endowed her with a chimplike, funnel-shaped chest.

So despite chimps' close genetic relationship to people, he says, this new fossil evidence supports the view that chimps have evolved a great deal since diverging from a common human-chimp ancestor roughly 7 million years ago and are not good models for ancient hominids. Big Man's shoulder blade bolsters recent analyses of 4.4-million-year-old Ardipithecus ramidus that also challenge traditional views of ancient hominids as chimp-like.

Estimates of Lucy's build were based on comparisons to chimps and indicated to some scientists that she lacked the easy, straight-legged stride of people today. Haile-Selassie and his colleagues suspect that their final reconstruction of Big Man's anatomy will provide a better model for assessing what Lucy looked like.

"Whatever we've been saying about afarensis based on Lucy was mostly wrong," Haile-Selassie says. "The skeletal framework to enable efficient two-legged walking was established by the time her species had evolved."

Lucy's legs were short because of her small size, he adds. If Lucy had been as large as Big Man, her legs would have nearly equaled his in length, Haile-Selassie estimates.

Although lacking a skull and teeth, Big Man preserves most of the same skeletal parts as Lucy, as well as a nearly complete shoulder blade and a substantial part of the rib cage.

"This beautiful afarensis specimen confirms the unique skeletal shape of this species at a larger size than Lucy, in what appears to be a male," remarks anthropologist Carol Ward of the University of Missouri in Columbia.

A long-standing debate over how well Lucy's kind walked and whether they spent much time in the trees appears unlikely to abate as a result of Big Man's discovery, though. "There's nothing special I can see on this new find that will change anyone's opinion" on how the species navigated the landscape, comments Harvard University anthropologist Daniel Lieberman.

Haile-Selassie's team disagrees. Big Man demonstrates that A. afarensis spent most of the time on the ground, the researchers conclude.

"They were good walkers, but we don't know how well they ran," Haile-Selassie says. Big Man's long-legged stride indicates that members of his species could have made 3.6-million-year-old footprints found more than 30 years ago at Laetoli, Tanzania.

Anthropologist Owen Lovejoy of Kent State University in Ohio, a coauthor of the new paper, regards Big Man as having been an "excellent runner." His pelvis supported humanlike hamstring muscles and, as indicated by the Laetoli footprints, his feet had arches, Lovejoy holds.

Fossil hominid skeletons as complete as Big Man "are few and far between," says anthropologist William Jungers of Stony Brook University in New York. But the new find mostly confirms what was already known about Lucy, he asserts. Lucy's kind, including Big Man, were decent tree climbers, even if they couldn't hang from branches or swing from limb to limb as chimpanzees do, he says.

"Riddle me this," asks Jungers in considering Hailie-Selassie's emphasis on a ground-dwelling A. afarensis. "Where did they sleep? Did they wait for fruit to fall to the ground? Where did they go to escape predators?"

Groups of A. afarensis individuals must have devised ground-based strategies to ward off predators, Lovejoy responds. Some big cats would have negotiated trees better than Lucy's kind, he notes.

Jungers also doubts Lovejoy and Haile-Selassie's contention that a nearly humanlike gait had evolved in A. afarensis. Big Man includes only one nearly complete limb bone, from the lower left leg, which makes it difficult to estimate how long his legs were relative to his arms, Jungers contends.

Limb remains of hominid species that came after afarensis indicate that they evolved increasingly longer legs and a more efficient walking stance, Jungers adds.

In his view, hips conducive to walking slowly with legs wide apart evolved in an even earlier hominid, 6-million-year-old Orrorin tugenensis and characterized later Australopithecus species, including Lucy's kind.

Haile-Selassie counters that features of Big Man's pelvis related to walking closely resemble those of a 1.4-million to 900,000-year-old female Homo erectus from another Ethiopian site.

Big Man's legs also demonstrate that the comparably long legs of nearly 2-million-year-old South African hominids don't represent a transition to the Homo genus, Haile-Selassie asserts.

Haile-Selassie doubts that additional pieces of Big Man's skeleton will turn up. "If anything more was there, we would have found it by now," he says with a resigned laugh.

VLT detects first superstorm on exoplanet

The results appear this week in the journal Nature.

"HD209458b is definitely not a place for the faint-hearted. By studying the poisonous carbon monoxide gas with great accuracy we found evidence for a super wind, blowing at a speed of 5000 to 10 000 km per hour," says Ignas Snellen, who led the team of astronomers.

HD209458b is an exoplanet of about 60% the mass of Jupiter orbiting a solar-like star located 150 light-years from Earth towards the constellation of Pegasus (the Winged Horse). Circling at a distance of only one twentieth the Sun–Earth distance, the planet is heated intensely by its parent star, and has a surface temperature of about 1000 degrees Celsius on the hot side. But as the planet always has the same side to its star, one side is very hot, while the other is much cooler. "On Earth, big temperature differences inevitably lead to fierce winds, and as our new measurements reveal, the situation is no different on HD209458b," says team member Simon Albrecht.

HD209458b was the first exoplanet to be found transiting: every 3.5 days the planet moves in front of its host star, blocking a small portion of the starlight during a three-hour period. During such an event a tiny fraction of the starlight filters through the planet's atmosphere, leaving an imprint. A team of astronomers from the Leiden University, the Netherlands Institute for Space Research (SRON), and MIT in the United States, have used ESO's Very Large Telescope and its powerful CRIRES spectrograph to detect and analyse these faint fingerprints, observing the planet for about five hours, as it passed in front of its star. "CRIRES is the only instrument in the world that can deliver spectra that are sharp enough to determine the position of the carbon monoxide lines at a precision of 1 part in 100 000," says another team member Remco de Kok. "This high precision allows us to measure the velocity of the carbon monoxide gas for the first time using the Doppler effect."

The astronomers achieved several other firsts. They directly measured the velocity of the exoplanet as it orbits its home star. "In general, the mass of an exoplanet is determined by measuring the wobble of the star and assuming a mass for the star, according to theory. Here, we have been able to measure the motion of the planet as well, and thus determine both the mass of the star and of the planet," says co-author Ernst de Mooij.

Also for the first time, the astronomers measured how much carbon is present in the atmosphere of this planet. "It seems that H209458b is actually as carbon-rich as Jupiter and Saturn. This could indicate that it was formed in the same way," says Snellen. "In the future, astronomers may be able to use this type of observation to study the atmospheres of Earth-like planets, to determine whether life also exists elsewhere in the Universe."

More information *This research was presented in a paper that appears this week in the journal Nature: "The orbital motion, absolute mass, and high-altitude winds of exoplanet HD209458b", by I. Snellen et al.*
The team is composed of Ignas A. G. Snellen and Ernst J. W. de Mooij, (Leiden Observatory, The Netherlands), Remco J. de Kok (SRON, Utrecht, The Netherlands), and Simon Albrecht (Massachusetts Institute of Technology, USA).
Research paper: http://www.eso.org/public/archives/releases/sciencepapers/eso1026/eso1026.pdf
More info: Exoplanet Media kit: http://www.eso.org/public/outreach/products/press-kits/pdf/exoplanet_lowres.pdf

Fungi, Feces Show Comet Didn't Kill Ice Age Mammals?

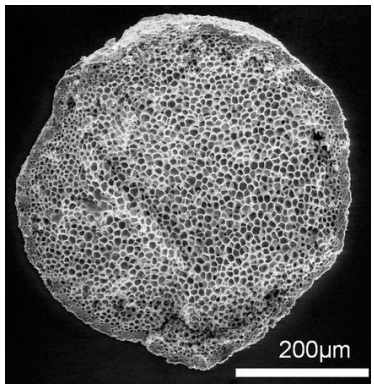
John Roach for National Geographic News

Tiny balls of fungus and feces may disprove the theory that a huge space rock exploded over North America about 12,900 years ago, triggering a thousand-year cold snap, according to a new study.

The ancient temperature drop, called the Younger Dryas, has been well documented in the geologic record, including soil and ice core samples.

The cool-down also coincides with the extinction of mammoths and other Ice Age mammals in North America, and it's thought to have spurred our hunter-gatherer ancestors in the Middle East to adopt an agricultural lifestyle.

But the theory that a comet or asteroid explosion is behind the cooling event is wrong, according to study leader Andrew C. Scott, a paleobotanist at Royal Holloway University in London.



A microscope picture shows the spongy texture of a carbon spherule. **Image courtesy AGU**

For years proponents of the impact theory have cited tiny spherules of carbon found in a layer of charred sediment throughout North America that dates to the Younger Dryas period.

According to the theory, these spherules are organic matter subjected to intense heat after debris from an exploded meteor rained down on Earth, sparking massive wildfires.

The new research, however, detected carbon spherules in soil layers from before, during, and after the Younger Dryas, making it hard to argue that the particles are products of a sudden impact. What's more, Scott's team found that most of the spherules are similar to tightly packed balls of fungus found in modern soils that have been exposed to low to moderate heat during wildfires. Plant and soil fungi are known to create these balls of material to help them survive extreme conditions. Other elongated forms of the spherules match modern fecal pellets from insects.

"All these particles are of natural biological origin and are not related to either intense wildfires or cosmic impacts," Scott said in an email. "The press and public are very interested in catastrophic explanations," he added. "But it is important that when evidence stacks up to show the theory does not work, then it should be abandoned."

What About the Nanodiamonds?

In fact, most experts acknowledge that carbon spherules are found throughout the geological record, including biological forms associated with wildfires, said James Kennett, an emeritus geologist at the University of California, Santa Barbara, who supports the cosmic-impact hypothesis.

However, the spherules are not often found in large quantities, he said, and there is "a peak in carbon spherules at the Younger Dryas boundary." What's more, those spherules are found alongside microscopic diamonds, or nanodiamonds, which often form under the conditions caused by extraterrestrial impacts.

The new study does not report evidence of nanodiamonds, Kennett noted, which is expected, since the team wasn't directly looking for them. "So their [reported] data is consistent," Kennett said.

Study leader Scott said that his team has studied the nanodiamond issue, but he's not yet able to discuss the results. He did, however, hint that the particles might not be nanodiamonds at all: Fungal spores the team examined have similar microscopic features. And, Scott said, "obviously [spores] are not nanodiamonds."

The carbon spherule study has been accepted for publication in the journal Geophysical Research Letters.

Polio research gives new insight into tackling vaccine-derived poliovirus

A vaccine-derived strain of poliovirus that has spread in recent years is serious but it can be tackled with an existing vaccine

A vaccine-derived strain of poliovirus that has spread in recent years is serious but it can be tackled with an existing vaccine, according to a new study published today in the New England Journal of Medicine.

Vaccine-derived polioviruses can emerge on rare occasions in under-immunised populations, when the attenuated virus contained in a vaccine mutates and recombines with other viruses, to create a circulating vaccine-derived strain.

The researchers behind today's study say their findings highlight the importance of completing polio eradication. They also say that should wild-type poliovirus be eradicated, routine vaccination with oral polio vaccines will need to cease, in order to prevent further vaccine-derived strains of the virus from emerging.

The study was carried out by researchers from the Medical Research Council Centre for Outbreak Analysis and Modelling at Imperial College London, working with the Government of Nigeria and the World Health Organization (WHO) research teams.

Poliovirus is highly infectious and primarily affects children under five years of age. Around one in 200 of the people infected with polio develop permanent paralysis, which can be fatal.

Polio was virtually wiped out by the early 2000s following a major vaccination drive by the Global Polio Eradication Initiative, but since then the number of cases of paralysis reported has plateaued, remaining roughly constant at between one and two thousand each year from 2003 to 2009, dropping only recently in 2010.

The first reported polio outbreak resulting from a circulating vaccine-derived poliovirus, known as a cVDPV, occurred in Hispaniola in 2000. Prior to today's study, there was little evidence available about the severity and potential impact of this kind of poliovirus.

Although billions of doses of oral vaccine have been distributed in the last decade, just 14 cVDPV outbreaks have been reported, affecting 15 countries. These outbreaks have usually been limited in size.

For the new study, researchers looked at the largest recorded outbreak of a cVDPV to date, which began to circulate in Nigeria in 2005. The authors examined data from 278 children paralysed by this cVDPV, and compared them with children paralysed by wild-type poliovirus in the country. Their analysis showed that this serotype 2 cVDPV is as easily transmitted and likely to cause severe disease as wild-type poliovirus of the same serotype.

The study also shows that vaccination with trivalent OPV, one of the main types of vaccine currently used to combat polio, is highly effective in preventing paralysis by this serotype 2 cVDPV.

The research shows that it is even more effective against cVDPV than against the wild-type polioviruses that are currently circulating, which can also be targeted with a different vaccine.

The new findings mean that it is particularly vital that efforts to vaccinate children with trivalent OPV continue in Nigeria and neighbouring countries, to protect children against all strains of polio. The scientists hope their findings will help countries to devise the right vaccine strategies to eradicate polio.

Helen Jenkins, the lead author of the study from the Medical Research Council Centre for Outbreak Analysis and Modelling at Imperial College London, said: "Our research shows that vaccine-derived polioviruses must be taken seriously and that we have the right tools to tackle them. We've had a lot of success against polio in the past and we're optimistic that ultimately we should be able to eradicate it completely.

"However, our study shows that we can't be complacent about the virus. It's still vital for us to protect children from this dangerous and debilitating disease and we have to make sure we continue to vaccinate as many children as possible in affected countries for as long as wild-type poliovirus continues to circulate," added Ms Jenkins.

Senior study author Dr Nicholas Grassly, also from the Medical Research Council Centre for Outbreak Analysis and Modelling at Imperial College London, added: "There has been some debate about the significance of circulating vaccine-derived polioviruses for the eradication initiative. Our research shows these viruses can be as pathogenic and transmissible as wild-type polioviruses and outbreaks must be responded to with just as much vigour."

Dr Bruce Aylward, Director of the Global Polio Eradication Initiative at WHO, added: "These new findings suggest that if cVDPVs are allowed to circulate for a long enough time, eventually they can regain a similar capacity to spread and paralyse as wild polioviruses. This means that they should be subject to the same outbreak response measures as wild polioviruses. These results also underscore the need to eventually stop all OPV use in routine immunization programmes after wild polioviruses have been eradicated, to ensure that all children are protected from all possible risks of polio in future."

This study was funded by the Medical Research Council and the Royal Society.

Notes to editors:

1. "Implications of a circulating vaccine-derived poliovirus (cVDPV) in Nigeria for polio eradication" New England Journal of Medicine, Wednesday 23 June 2010

Lead author: Helen Jenkins, Imperial College London (for full list of authors please see paper) Download a proof copy of the study (strictly embargoed) using this link: https://fileexchange.imperial.ac.uk/files/3eba66aa7b6/Nigeria%20cVDPV%20paper%20R2%20clean.doc

Separation between Neanderthal and Homo sapiens might have occurred 500,000 years earlier

The separation of Neardenthal and Homo sapiens might have occurred at least one million years ago, more than 500.000 years earlier than previously believed after DNA-based analyses. A doctoral thesis conducted at the National Center for Research on Human Evolution (Centro Nacional de Investigación sobre la Evolución Humana) -associated with the University of Granada-, analysed the teeth of almost all species of hominids that have existed during the past 4 million years. Quantitative methods were employed and they managed to identify Neanderthal features in ancient European populations.

The main purpose of this research –whose author is Aida Gómez Robles- was to reconstruct the history of evolution of Human species using the information provided by the teeth, which are the most numerous and best preserved remains of the fossil record. To this purpose, a large sample of dental fossils from different sites in Africa, Asia and Europe was analysed. The morphological differences of each dental class was assessed and the ability of each tooth to identify the species to which its owner belonged was analysed.

The researcher concluded that it is possible to correctly determine the species to which an isolated tooth belonged with a success rate ranging from 60% to 80%. Although these values are not very high, they increase as different dental classes from the same individual are added. That means that if several teeth from the same individual are analysed, the probability of correctly identifying the species can reach 100%.

Aida Gómez Robles explains that, from all the species of hominids currently known "none of them has a probability higher than 5% to be the common ancestor of Neardenthals and Homo sapiens. Therefore, the common ancestor of this lineage is likely to have not been discovered yet".

Computer Simulation

What is innovative about this study is that computer simulation was employed to observe the effects of environmental changes on morphology of the teeth. Similar studies had been conducted on the evolution and development of different groups of mammals, but never on human evolution.

Additionally, the research conducted at CENIEH and at the University of Granada is pioneer –together with recent studies based on the shape of the skull- in using mathematical methods to make and estimation of the morphology of the teeth of common ancestors in the evolutionary tree of the human species. "However, in this study, only dental morphology was analysed. The same methodology can be used to rebuild other parts of the skeletum of that species, which would provide other models that would serve as a reference for future comparative studies of new fossil finds."

To carry out this study, Gómez Robles employed fossils from a number of archaeological-paleontological sites, such as that of the Gran Colina and the Sima de los Huesos, located in Atapuerca range (Burgos, Spain), and the site of Dmanisi in the Republic of Georgia. She also studied different fossil collections by visiting international institutions as the National Museum of Georgia, the Institute of Human Paleontology and the Museum of Mankind in Paris, the European Research Centre Tautavel (France), the Senckenberg Institute Frankfurt, the Museum of Natural History in Berlin, the Institute of Vertebrate Paleontology and Paleoanthropology in Beijing and the Museum of Natural History in New York and Cleveland.

Although the results of this research were disclosed in two articles published in one of the most prestigious journals in the field of human evolution, Journal of Human Evolution (2007 and 2008), they will be thoroughly presented within a few months.

Polio outbreak in Tajikistan is cause for alarm

Rising rates could spill into other countries

Ottawa, Canada - The rapidly growing polio outbreak in Tajikistan raises serious concerns that the disease could spread to other regions in the world, states an editorial http://www.cmaj.ca/cgi/doi/10.1503/cmaj.100831 in CMAJ (Canadian Medical Association Journal) www.cmaj.ca. It is imperative that health agencies attempt to limit further spread by ensuring high vaccination rates.

Polio is a serious disease that can cause paralysis and death in both children and adults. However, vaccines had largely eradicated the disease, until vaccination rates dipped below the minimum 90% coverage mark recommended by the WHO. There is no cure for polio - prevention with vaccines is the only defense.

This is the first persistent outbreak of polio in a country that was previously certified to be polio-free. The outbreak represents 75% of the world's polio cases and far exceeds that of India and Nigeria, which are usually the sources of polio outbreaks.

"Too many regions and communities have ceased to worry about polio," writes Dr. Paul Hébert, Editor-in-Chief, CMAJ with Dr. Noni MacDonald, Public Health Editor. "As a consequence, vaccine uptake rates are all too often well below effective prevention levels."

Countries such as the Ukraine and Georgia are below the 90% target, and regions within Canada and some European countries have low community uptake rates. In Ontario, for example, childhood immunization rates are only in the high 70% to low 80% range, comparable to rates in Tajikistan. Concerns about vaccine safety, anti-government views and religious strictures against vaccinations have contributed to this lower uptake.

Individuals without polio symptoms started the Tajikistan outbreak with cases now appearing in Russia and Uzbekistan. Global travel can hasten the spread of the disease.

Urgent action is needed beyond the mass polio vaccine campaigns now underway in Tajikistan. The WHO must be more proactive in raising awareness of the issue beyond posting the growing numbers on its Global Polio Eradication website. The Public Health Agency of Canada must issue immediate guidance on the importance of polio vaccination, and the provinces and territories need to ramp up programs to improve vaccination uptake rates.

"The threat of polio is no longer simply theoretical," conclude the authors. "We are only one asymptomatic traveller away from an outbreak because of low vaccination rates."

Evidence that nanoparticles in sunscreens could be toxic if accidentally eaten

Scientists are reporting that particle size affects the toxicity of zinc oxide, a material widely used in sunscreens. Particles smaller than 100 nanometers are slightly more toxic to colon cells than conventional zinc oxide. Solid zinc oxide was more toxic than equivalent amounts of soluble zinc, and direct particle to cell contact was required to cause cell death. Their study is in ACS' Chemical Research in Toxicology, a monthly journal.

Philip Moos and colleagues note that there is ongoing concern about the potential toxicity of nanoparticles of various materials, which may have different physical and chemical properties than larger particles. Barely 1/50,000 the width of a human hair, nanoparticles are used in foods, cosmetics and other consumer products. Some sunscreens contain nanoparticles of zinc oxide. "Unintended exposure to nano-sized zinc oxide from children accidentally eating sunscreen products is a typical public concern, motivating the study of the effects of nanomaterials in the colon," the scientists note.

Their experiments with cell cultures of colon cells compared the effects of zinc oxide nanoparticles to zinc oxide sold as a conventional powder. They found that the nanoparticles were twice as toxic to the cells as the larger particles. Although the nominal particle size was 1,000 times larger, the conventional zinc oxide contained a wide range of particle sizes and included material small enough to be considered as nanoparticles. The concentration of nanoparticles that was toxic to the colon cells was equivalent to eating 2 grams of sunscreen - about 0.1 ounce. This study used isolated cells to study biochemical effects and did not consider the changes to particles during passage through the digestive tract. The scientists say that further research should be done to determine whether zinc nanoparticle toxicity occurs in laboratory animals and people.

Article For Immediate Release "ZnO Particulate Matter Requires Cell Contact for Toxicity in Human Colon Cancer Cells"

Nematodes vanquish billion dollar pest

Nematodes vanquish western corn rootworm pest

The larvae of Diabrotica virgifera virgifera beetles wreak havoc on maize. Feasting on the plants' roots, they are estimated to cause $1 billion of damage every year in the US. Ted Turlings from the University of Neuchâtel, Switzerland, explains that the pest, known as western corn rootworm, only arrived in Serbia in the 1990s, but since then it has marched through at least 11 European countries. 'Pesticides work to control the pest, but they are not environmentally friendly,' explains Turlings and adds, 'When it arrived in Germany in 2007 they wanted to eradicate it but the pesticide that they used killed millions of bees.' Looking for an alternative, more ecological, form of pest control, Turlings wondered whether predatory nematodes (microscopic worms) that munch on insects could defeat the pest. Knowing that Heterorhabditis bacteriophora, which kills western corn rootworm larvae, is relatively unresponsive to an alarm signal ((E)-beta-caryophyllene, which is released by the infested roots) Turlings has successfully improve H. bacteriophora's response to caryophyllene by selective breeding of the nematodes. He publishes the results of his bid to produce an effective biopesticide in The Journal of Experimental Biology on 25th June 2010 at http://jeb.biologists.org.

Using an 'olfactometer' (six tubes radiating out from a central point) packed with damp sand for the nematodes to crawl through, Ivan Hiltpold inserted capillaries into the sand, which released different odours at the end of three of the olfactometer's arms. Then he released H. bacteriophora nematodes at the centre of the olfactometer and allowed the nematodes to choose which odour they tracked. Timing how long it took 500 nematodes to reach the end of the trail in the caryophyllene arm of the olfactometer, Hiltpod collected the worms and allowed them to breed. Gathering the offspring 10 days later, he tested their responses to the three odours and again selected the 500 nematodes that reached the end of the caryophyllene trail first for breeding. Repeating the selection process 6 times, Hiltpold improved the nematode's performance significantly, decreasing the time it took 500 worms to reach the end of the caryophyllene trail from 10h to 2h.

Next Hiltpold tested how improving the nematode's response to caryophyllene had impacted on their potency. Sprinkling the selected nematodes directly on the pest larvae and waiting to see how many larvae died, he was relieved to find that the selected nematodes were only slightly less infectious than their forebears. This loss of potency could be overcome easily by the worm's increased response to caryophyllene, but how would the selected nematodes perform in a field?

'We couldn't test the nematodes in Switzerland because the western corn rootworm is not present yet, so we had to travel to Hungary,' says Turlings. Teaming up with Stefan Toepfer and Ulrich Kuhlmann from CABI Europe-Switzerland who had access to western corn rootworm infected fields sown with two varieties of maize (one that produced caryophyllene and another that did not), Turlings' colleague, Mariane Baroni, sprayed solutions of the selected nematodes between the rows of maize in some plots and sprayed solutions of the unselected nematodes on other plots in the same fields. Then the team waited to see whether the selected nematodes offered any protection against the pest.

They did. The variety of maize that released caryophyllene was healthier than the variety that did not release caryophyllene after treatment with the selected nematodes; and the selected nematodes killed more pest larvae near the caryophyllene releasing maize than the unselected nematodes did.

Turlings says that this result is encouraging, but admits that there is more to be done before the nematodes can be used commercially. For instance, US varieties of maize have lost the caryophyllene alarm signal and application of the biopesticide is costly and problematic, but Turlings is optimistic that his team can crack both of these problems to add the nematodes to the maize farmer's arsenal.

JOURNAL OF EXPERIMENTAL BIOLOGY AS THE SOURCE AND, IF REPORTING ONLINE, PLEASE ***REFERENCE****: Hiltpold, I., Baroni, M., Toepfer, S., Kuhlmann, U. and Turlings, T. C. J. (2010). Selection of entomopathogenic nematodes for enhanced responsiveness to a volatile root signal helps to control a major root pest. J. Exp. Biol. 213, 2417-2423.*

Behavior breakthrough: Like animals, plants demonstrate complex ability to integrate information

A University of Alberta research team has discovered that a plant's strategy to capture nutrients in the soil is the result of integration of different types of information. U of A ecologist J.C. Cahill says the plant's strategy mirrors the daily risk-versus-reward dilemmas that animals experience in their quest for food.

Biologists established long ago that an animal uses information about both the location of a food supply and potential competitors to determine an optimal foraging strategy. Its subsequent behavioral response is based on whether the food supply is rich enough to accept the risks associated with engaging in competition with other animals.

Cahill found plants also have the ability to integrate information about the location of both food and competitors. As a result, plants demonstrate unique behavioural strategies to capture soil resources.

Previous studies show plants alter the growth of their roots in relation to the placement of food or a competing plant. Cahill and his colleagues now show an integration of both location and competition information in plants. "This ability to integrate information is a level of complexity never seen in plants before," said Cahill. "This is something we assumed only happened with animals."

Using a mini-rhizotron camera, referred to by Cahill's team as a "camera on a stick," the researchers compared the root movement of potted plants in relation to various positions of nutrients and competing plants.

The roots of one plant in a pot where nutrients were evenly distributed occupied the entire breadth of the soil.

When two plants occupied a single pot and the nutrients were evenly distributed, the roots stopped growing laterally towards each other. There was complete segregation of the root systems; the plants avoided contact with one another. Cahill says in terms of risk versus reward, the plants avoided each other because the rewards were low. But when nutrients were placed between two plants sharing a single pot, both plants grew their roots much closer towards each other. Cahill says in this case the rewards were high, and the plants risked increased competition.

Virus-plus-susceptibility gene combo triggers disease

Mice that carry a gene variant earlier linked to the inflammatory bowel disorder known as Crohn's disease only succumb to symptoms if they've also been infected by a common virus, according to a study reported in the June 25th issue of the journal Cell, a Cell Press publication.

The findings offer an explanation for what appears to be a fairly general and perplexing phenomenon: that common gene variants can be tied to infrequent severe disease, the researchers say. It might also explain why mice carrying mutations in human disease susceptibility genes do not always spontaneously reproduce the symptoms of disease. In the past, scientists had often chocked those discrepancies up to inherent differences between mice and men.

The research team led by Thaddeus Stappenbeck and Herbert Virgin of Washington University School of Medicine in St. Louis made the discovery by accident. "This was definitely serendipity," Stappenbeck said.

Two years ago the researchers showed that mice carrying an ATG16L1 gene variant that had been associated with Crohn's diease in humans develop strikingly similar abnormalities in immune cells of the gut known as Paneth cells.

They later placed mice carrying the disease variant in a facility with an "enhanced barrier" to keep out viruses. The animals bedding, cages, food and water were all sterilized under heat and pressure before use and the mice were routinely screened for viral infections.

"In the first mice we looked at [in the enhanced barrier], their gut phenotype was gone," Stappenbeck said. "We had not realized that the virus was a key piece of the puzzle."

When mice raised in the enhanced barrier facility were exposed to a common norovirus known as MNV, they developed symptoms consistent with Crohn's disease within seven days.

While the idea that autoimmune and other diseases might be influenced by viral infections has been around, "this is the first really clear indication of a disease caused by a susceptibility gene and a specific virus," Stappenbeck said. "That's what caught our attention."

The ATG16L1 disease variant in question is found in about half of all people of European descent. But it is just one of more than 30 genes that appear to have some association with Crohn's disease, and it only raises an individual's risk of developing the disease by two-fold. The new findings in mice might explain why that is.

The researchers report that the virus-plus-susceptibility gene interaction generated abnormalities in the gut and a unique pattern of gene activity in Paneth cells. The symptoms were prevented in animals treated with broad spectrum antibiotics.

The findings support what the researchers call a combinatorial view of complex disease, in which the reproduction of the complete set of disease symptoms depends on a combination of specific variants of multiple genes together with particular environmental factors. Under this view, Crohn's disease and other complex conditions might be more aptly described as collections of related but partially distinct diseases.

"It is worth noting that not all Crohn's disease patients exhibit identical symptoms or pathologies, and the nature of Crohn's disease varies over time even within one individual," the researchers write. "In addition, therapeutic interventions that improve conditions for some do not always alleviate disease in others. Therefore, complex diseases may represent a combinatorial confluence of pathologic responses, each with overlapping but nonidentical genetic and environmental causes and therefore therapeutic responses."

The picture that emerges has profound implications for the way scientists view the relationship between genes, environment and health or disease. It also suggests a need to take a much closer look at any underlying viral infections in patients with other chronic diseases, such as diabetes and multiple sclerosis, which have also been linked to common genetic variants.

"We propose that studies examining associations between disease susceptibility and genetic variation should consider the history and current status of viral infections in the individuals," the researchers said. "Similarly, studies examining the correlation between viral infections and disease would benefit from sorting individuals based on genetic background. If we can improve our knowledge in this area, the concept of personalized medicines may come closer to clinical application."

The researchers include Ken Cadwell, Washington University School of Medicine, St. Louis, MO; Khushbu K. Patel, Washington University School of Medicine, St. Louis, MO; Nicole S. Maloney, Washington University School of Medicine, St. Louis, MO; Ta-Chiang Liu, Washington University School of Medicine, St. Louis, MO; Aylwin C.Y. Ng, Massachusetts General Hospital, Harvard Medical School, Boston, MA, Broad Institute of MIT and Harvard, Cambridge, MA; Chad E. Storer, Pfizer Global Research and Development, St. Louis, MO; Richard D. Head, Pfizer Global Research and Development, St. Louis, MO; Ramnik Xavier, Massachusetts General Hospital, Harvard Medical School, Boston, MA, Broad Institute of MIT and Harvard, Cambridge, MA; Thaddeus S. Stappenbeck, Washington University School of Medicine, St. Louis, MO; and Herbert W. Virgin, Washington University School of Medicine, St. Louis, MO, Midwest Regional Center of Excellence for Biodefense and Emerging Infectious Diseases Research, St. Louis, MO.

Chronic fatigue syndrome: suspicion is back on virus

Being Human Health

A leading scientist at the US National Institutes of Health (NIH) supports the theory that a retrovirus causes chronic fatigue syndrome (CFS) and says that government researchers have independently confirmed the association.

The link between xenotropic murine leukemia virus-related virus (XMRV) and CFS was reported last year by scientists at the Whitmore Peterson Institute in Reno, Nevada. But it has since come under heavy criticism after several groups failed to replicate the association with their own patients.

However, Harvey Alter, an infectious disease expert at NIH, gave a talk on protecting the blood supply from disease at a closed workshop in Zagreb, last month with a slide that called the XMRV-CFS association "extremely strong and likely true, despite the controversy", the Wall Street Journal reports.

The same slide also indicates that scientists at NIH and the Food and Drug Administration have confirmed the link between CFS and XMRV themselves. His team also estimates that XMRV and related viruses are present in 3 to 7 per cent of blood donors.

The news is generating a lot of buzz on CFS patient forums, where hopes have been high that the connection would offer a solid explanation - and potentially a treatment - for the enigmatic condition.

Touch: How a hard chair creates a hard heart

Through textures, shapes, weights and temperatures, the sense of touch influences both our thoughts and behavior. In a series of six experiments documented in the June 25 issue of the journal Science, a Yale-led team of psychologists demonstrated how dramatically our sense of touch affects how we view the world.

Interviewers holding a heavy clipboard, compared to a light one, thought job applicants took their work more seriously. Subjects who read a passage about an interaction between two people were more likely to characterize it as adversarial if they had first handled rough jigsaw puzzle pieces, compared to smooth ones. And people sitting in hard, cushionless chairs were less willing to compromise in price negotiations than people who sat in soft, comfortable chairs.

"It is behavioral priming through the seat of the pants," said John A. Bargh of Yale, co-author of the paper along with former Yale researchers Joshua M. Ackerman, now of the Massachusetts Institute of Technology, and Christopher C. Nocera of Harvard.

The work builds upon Bargh's 2008 study with Yale Ph.D. student Lawrence Williams, now of the University of Colorado, which found that people judge other people to be more generous and caring after they had briefly held a warm cup of coffee, rather than a cold drink.

"The old concepts of mind-body dualism are turning out not to be true at all," Bargh said. "Our minds are deeply and organically linked to our bodies."

Bargh notes that physical concepts such as roughness, hardness, and warmth are among the first that infants develop. They are critical to how young children and adults eventually develop abstract concepts about people and relationships, such as discerning the meaning of a warm smile or a hard heart, he said. Touch is a very important sense for exploration of the world, he added, and so these sensations help create the mental scaffold upon which we build our understandings of the world as we grow older.

This reality, he notes, is reflected in many everyday expressions such as "weighing in with an opinion," "having a rough day" or "taking a hard line."

"These physical experiences not only shape the foundation of our thoughts and perceptions, but influence our behavior towards others, sometimes just because we are sitting in a hard instead of a soft chair," Bargh said.

Antihypertensive drugs may protect against Alzheimer's disease

Drugs may promote memory function and reduce cognitive deterioration without influencing blood pressure

Researchers at Mount Sinai School of Medicine have found that the drug carvedilol, currently prescribed for the treatment of hypertension, may lessen the degenerative impact of Alzheimer's disease and promote healthy memory functions. The new findings are published in two studies in the current issues of Neurobiology of Aging and the Journal of Alzheimer's Disease.

"These studies are certainly very exciting, and suggest for the first time that certain antihypertensive drugs already available to the public may independently influence memory functions while reducing degenerative pathological features of the Alzheimer's disease brain," said study author Giulio Maria Pasinetti, MD, PhD, Saunders Family Professor of Neurology and Director of the Center of Excellence for Novel Approaches to Neurotherapeutics at Mount Sinai School of Medicine.

Dr. Pasinetti's team found for the first time that carvedilol, a blood pressure lowering agent, is capable of exerting activities that significantly reduce Alzheimer's disease-type brain and memory degeneration. This benefit was achieved without blood pressure lowering activity in mice genetically modified to develop Alzheimer's disease brain degeneration and memory impairment. These data were published in Neurobiology of Aging.

In a second study published in the Journal of Alzheimer's Disease, the research team led by Dr. Pasinetti assessed how mice learned new tasks and information and recall of past information chemically stored in the brain. They found that carvedilol treatment was capable of promoting memory function, based on assessments of learning new tasks and information and recall of past information, which is already chemically stored in the brain.

In the study, one group of mice received carvedilol treatment and the other group did not. The scientists conducted behavioral and learning tests with each group of mice, and determined that it took the mice in the carvedilol significantly less time to remember tasks than the other group.

"Ongoing clinical research is in progress to test the benefits of carvedilol, which may prove to be an effective agent in the treatment of symptoms of Alzheimer's disease," said Dr. Pasinetti. "We look forward to further studying this drug in the human population."

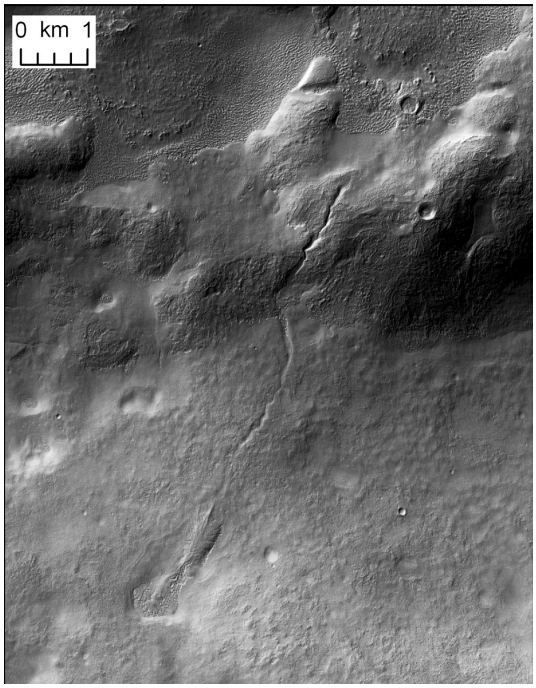
Brown Team Finds Widespread Glacial Meltwater Valleys on Mars

A research team led by Brown University has documented dozens of channels carved by melted water from glaciers located in the midlatitude region of Mars. The glaciofluvial valleys were carved in Mars' most recent epoch, the team reports, supporting the idea that the Red Planet was home to diverse watery environments in its recent past. Results are published in Icarus.

PROVIDENCE, R.I. [Brown University] - Planetary scientists have uncovered telltale signs of water on Mars - frozen and liquid - in the earliest period of the Red Planet's history. A new claim, made public this month, is that a deep ocean covered some of the northern latitudes.

But the evidence for water grows much more scant after the Noachian era, which ended 3.5 billion years ago. Now Brown University planetary geologists have documented running water that sprang from glaciers throughout the Martian middle latitudes as recently as the Amazonian epoch, several hundred million years ago. These glaciofluvial valleys were, in essence, tributaries of water created when enough sunlight reached the glaciers to melt a thin layer on the surface. This, the Brown researchers write, led to "limited surface melting" that formed channels that ran for several kilometers and could be more than 150 feet wide.

The finding is "more than 'Yes, we found water,'" said Caleb Fassett, postdoctoral research associate in geological sciences and lead author of the paper published in Icarus. "What we see now is there's this complex history of different environments where water is being formed."



Glacial Rivers Brown University researchers have found evidence that melting glaciers spawned rivers on Mars as recently as several hundred million years ago. This image shows a river that sprang from a past glacier from an unnamed crater in Mars' middle latitudes. **Credit: NASA/JPL/MSSS**

: Caleb Fassett Caleb Fassett Fassett, with Brown research analyst James Dickson, professor James Head III, and geologists from Boston University and Portland State University, analyzed 15,000 images snapped by the Context Camera (CTX) aboard the Mars Reconnaissance Orbiter to compile the first survey of glaciofluvial valleys on Mars. The survey was sparked by a glaciofluvial valley that Dickson, Fassett, and Head spotted within the Lyot crater, located in the planet's middle latitudes. The team, in a paper last year in Geophysical Research Letters, dated that meltwater-inspired feature to the Amazonian.

In his survey, Fassett found dozens of other Amazonian-era ice deposits that spawned supraglacial and proglacial valleys, most of them located on the interior and exterior of craters in Mars' midlatitude belt. "The youthfulness (of the features) is surprising," he said. "We think of [post-Noachian] Mars as really, really cold and really, really dry, so the fact that these exist, in those kinds of conditions, is changing how we view the history of water on the planet."

What makes the finding even more intriguing is that the Brown planetary scientists can study what they believe are similar conditions on Earth. Teams from Brown and Boston University have visited the Antarctic Dry Valleys for years, where the surfaces of glaciers melt during the austral summer, sparking enough meltwater to carve a channel. The team will return to the Dry Valleys later this year to continue the study of this microclimate.

"It's sort of crazy," said Dickson, a member of the Brown team who stayed in the Dry Valleys for three months last year. "You're freezing cold and there's glacial ice everywhere, and it gets just warm enough that you get a river."

Fassett plans to search for more glaciofluvial valleys as more images come from the CTX, which has mapped roughly 40 percent of the planet.

Contributing authors include Joseph Levy of Portland State (who earned his Ph.D. at Brown last year) and David Marchant of Boston University. The research was funded by NASA.

Morphine and Other Pain Relief Drugs Used in Cancer Surgery May Spur Return of Malignancy

Could the anesthesia and painkillers used to make operations and recovery bearable also influence the risk that cancer will return?

By Adam Marcus

Morphine is often a cancer patient's best and final friend. So it came as a shock when researchers at the University of Minnesota published a study showing that doses of morphine similar to those used to ease pain actually spurred the growth of human breast cancer cells grafted into mice. "These results indicate that clinical use of morphine could potentially be harmful" in some cancer patients, the scientists wrote in 2002 in Cancer Research.

The results were indeed a surprise - at first, says Kalpna Gupta, a co-author of the 2002 paper and an assistant professor in the Hematology, Oncology and Transplantation Division in the Department of Medicine at the University of Minnesota. "Then I read the literature, and it began to make a lot of sense," she adds.

The findings went relatively unnoticed, despite the study's potentially apple cart–toppling conclusion. Nearly a decade later, however, mounting evidence suggests the group was onto something.

A raft of studies in laboratory animals, molecular models and cancer patients suggest that pain drugs given during and after cancer surgery stimulate the growth and spread of certain tumors.

Cancer seems to thrive on exposure to opioids, particularly morphine, the most widely used narcotic for relief of surgical pain. In the presence of these drugs tumors grow faster and develop more extensive networks of the blood vessels they rely on to feed their expansion - a process called angiogenesis, says Jonathan Moss, an anesthesiologist at the University of Chicago (U. of C.) Medical Center.

The key actors here likely are mu-opioid receptors, molecules on cell membranes that allow opioids to bind to them and interact with the cell itself, he says. Moss has shown that animals lacking these receptors do not develop lung cancer when injected with cancer cells. "If they don't have the receptor they don't get the tumor," adds Moss, whose group presented its findings at a cancer meeting last November and is now submitting them for publication. "That implies that the mu-opioid receptor is somehow involved in tumor progression."

And a team led by Moss and U. of C. Medical Center assistant professor of medicine Patrick Singleton as well as other groups, have also given drugs that block opioid receptors to mice with cancer. The result is a sharp reduction in the growth and spread of tumors, according to Moss and Singleton's findings. Still, Moss admits that more data in people are needed. "You can cure a lot of cancers in mice," he says, "and not necessarily have any effect in humans." Opioids also may make blood vessels leaky, making tissues more receptive to cancer cells looking for places to build a tumor, Moss says.

A similar link to a risk for returning cancer is cropping up in studies of the form of anesthesia provided during cancer surgeries. Patients who undergo general anesthesia typically require more opioid painkillers after surgery than those who receive general anesthetics - which keep patients asleep but do not deaden nerves - plus injections of local anesthetic to block the nerves at or near the site of surgery.

On top of that, the latter approach - called regional anesthesia, or a nerve block - is thought to reduce the stress of surgery on the body's immune system. Scientists think weakened immunity in the aftermath of cancer surgery might promote recurrence later. Here's why: when surgeons remove a tumor, they inevitably leave behind a few straggler cancer cells. Cells that slough into the bloodstream can take hold at distant sites - and a metastasis is born.

Drifting cancer cells are not unlike invading bacteria, says Edward Nemergut, an anesthesiologist at the University of Virginia (U.V.A.) Health System in Charlottesville: "They spread when cancer is resected [removed], and you need a functioning immune system to take care of them. When the immune system is suppressed, it's less effective at doing that."

Results from a 2006 study in Ireland and the U.S. suggest that patients who undergo surgery to remove breast or prostate cancer might be less prone to recurrence if they are administered regional anesthesia during their procedures, rather than general anesthesia alone. And this approach may be more effective at preventing the disease from returning and spreading than treatment with chemotherapy after the operation, says Marcel Durieux, an anesthesiologist at the U.V.A. Health System .

Along the same lines, Daniel Sessler, an anesthesiologist at Cleveland Clinic in Ohio, is leading two randomized trials looking at whether nerve blocks added to general anesthesia reduce metastases in patients undergoing surgery to remove either breast or lung cancer. The studies are expected to include at least 1,000 patients and should start producing answers in about three years. Cancer specialists have been highly skeptical of the notion that drugs given for hours or days surrounding surgery can influence the spread of tumors months

or years later. "And I don't blame them for a second," Sessler adds. "I'll remain skeptical, too, unless the theory is confirmed in large randomized trials."

The human data so far are retrospective - scientists cannot isolate the potential effect of anesthesia from the effects of other factors such as blood transfusion, temperature regulation and statin administration during surgery. "The retrospective data are very intriguing and we have a good physiological rationale for why it may be happening," says Durieux, co-author of a review article on the surgery–cancer connection in the June 2010 issue of Anesthesia & Analgesia. "On the other hand, this may go away once we do well-controlled clinical trials."

Lung-on-a-chip points to alternative to animal tests

*** 19:00 24 June 2010 by Duncan Graham-Rowe**

A living, breathing lung-on-a-chip has been developed that can mimic the boundary between the lung's air sacs and its capillaries. It's at this boundary that inhaled pathogens and potentially harmful nanoparticles pass into the bloodstream. Reproducing those processes on a chip could one day provide an alternative to animal testing for drug development and toxicity screening.

The coin-sized lung-on-a-chip consists of a simple network of microfluidic channels etched into a rubbery, transparent polymer called polydimethylsiloxane (PDMS). The central channel contains two layers of human cells, separated by a porous membrane (see image). In the upper layer the cells come from alveoli, the cavities deep inside the lung where gases pass between the lungs and the bloodstream. The lower layer contains endothelium cells from the capillaries that carry oxygen-rich blood away.

Does almost everything a real lung does **(Image: Kristin Johnson/Harvard Medical School/Science)**

Breathe in…

As well as mimicking the cellular structure of the lung, the chip copies its behaviour too: it can "breathe". As air pressure in two channels flanking the main channel is periodically reduced and increased, the central membrane is widened, stretching the cells as it does to, before they contract once more as the pressure is increased, says Donald Ingber, director of the Wyss Institute for Biologically Inspired Engineering at Harvard University, and leader of the lung-on-a-chip team.

Because the device is transparent, it's possible to make real-time measurements of the inflammatory response that occurs when pathogens or silica nanoparticles are introduced into the airflow chamber. The measurements are made using high-resolution fluorescence microscopy. The extent to which these particles pass into the simulated bloodstream can also be recorded, Ingber says.

These measurements show that the "breathing" mechanism appears to encourage the uptake of silica nanoparticles – a result that the team found also occurs when they introduced the same nanoparticles into a mouse lung connected to a ventilator.

Lifelike response

The fact that the lung-on-a-chip behaves so much like the real mouse lung is an encouraging sign that ethically acceptable and cheaper alternatives to animal testing may be on the way. Cell-culture techniques, which are also being investigated as an option, cannot take into account important mechanical influences that help regulate the organs, such as the stretching of lung tissue caused by breathing. "This is something that has been missing from almost all in vitro models," Ingber says.

Anthony Holmes, of the UK National Centre for the Replacement, Refinement and Reduction of Animals in Research in London, agrees. "There's lot of evidence that the normal functions of organs require certain physical stimulations," he says. The lungs are one example but it applies equally to bone, cartilage and other tissues. "It's a nice model and an interesting approach."

"It's wonderful that it breathes, and definitely a step in the right direction," says Kelly BéruBé, a cell biologist at Cardiff University, UK, who acts as scientific adviser to the UK's Safer Medicines Trust. But she warns that the immortalised cell lines used in the lung-on-a-chip tend not to have the same properties as "primary" cells taken from patients. "Unless they can get primary cells, they are not going to be able to replace animal tests." *Journal reference: Science, DOI: 10.1126/science.1188302*

24-week fetuses cannot feel pain

*** 13:04 25 June 2010 by Andy Coghlan**

Fetuses aged 24 weeks or less do not have the brain connections to feel pain, according to a working party report published this week by the UK Royal College of Obstetricians and Gynaecologists (RCOG). Its conclusion is the latest to challenge the rationale for a law introduced in the US state of Nebraska in April. This

law, which bans almost all abortions beyond 20 weeks of pregnancy, was introduced primarily on the grounds that the fetus feels pain.

The report, which reviews recent scientific literature on the subject, also concludes that the fetus is sedated throughout pregnancy by chemicals such as adenosine contained in the amniotic fluid that surrounds it.

Pain-free existence

Because the fetus is unable to feel pain before 24 weeks, no pain relief is needed for medical procedures up to that time, including abortion, the report concludes. This reverses the position the RCOG took in its previous report on fetal pain in 1997, which supported the use of analgesia.

"We have now advised that analgesia is not indicated up to 24 weeks," says Allan Templeton, chairman of the working group that produced the report. He adds that administering painkillers carries risks of harming the fetus.

The report concludes that fetuses under 24 weeks must be pain-free, because at that age the wiring doesn't exist to send pain signals from nerves around the body to the cortex, the area of the brain where pain is experienced. At which later point such connections form is unknown, so analgesia should still be considered after 24 weeks, the RCOG says.

When Nebraska legislators debated the state's new abortion law, it was claimed that fetuses must feel pain because they have the same reflex reactions to pain as children and adults. Templeton dismisses this reasoning. "There are indeed reflex responses, but in our view, because the nerves are not wired up to the cortex, they are reflex actions without experience of pain," he says.

The report notes that the same reflexes are seen in seriously malformed fetuses that have no brain at all, and therefore can't possibly experience pain.

Pain signals

Templeton says the working party rejected the claims of Kanwaljeet Anand of Le Bonheur Children's Medical Center in Memphis, Tennessee, who contends that young fetuses can feel pain in a more primitive part of the brain called the subcortex, which receives pain signals before the cortex has been wired up.

"Our scientists say there's no evidence that the subcortex can provide for the pain experience," Templeton told New Scientist. Anand's evidence is widely cited by anti-abortion groups.

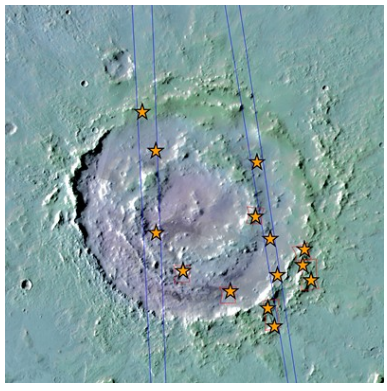
Templeton says that Anand's evidence comes mainly from observations of responses in babies born prematurely, and that it cannot be assumed that these are expressions of pain, rather than painless reflex responses.

"Anand's conclusions apply only to neonates," Templeton says. "He has written opinions about how that might apply also to fetuses, but it's not evidence, it's opinion."

The report argues that pain responses may begin to develop only after a baby is born, and no longer sedated in the womb, and that this may explain why neonates experience pain differently to fetuses. "It is only after birth, with the separation of the baby from the uterus and the umbilical cord, that wakefulness truly begins," it concludes.

Wet era on early Mars was global

Water rested in some craters on early Mars



Lyot crater and the locations of the hydrated minerals

Conditions favourable to life may once have existed all over Mars. Detailed studies of minerals found inside craters show that liquid water was widespread, not only in the southern highlands, but also beneath the northern plains.

ESA's Mars Express and NASA's Mars Reconnaissance Orbiter have discovered hydrated silicate minerals in the northern lowlands of Mars, a clear indication that water once flowed there.

The spacecraft have previously discovered thousands of small outcrops in the southern hemisphere where rock minerals have been altered by water. Many of these exist in the form of hydrated clay minerals known as phyllosilicates, and indicate that the planet's southern hemisphere was once much warmer and wetter than it is today.

However, until this week, no sites with hydrated silicate minerals had been found in the northern lowlands, where thick blankets of lava and sediments up to several kilometres thick hamper efforts to probe the underlying bedrock.

The first hints that there may be hydrated silicates beneath the northern plains were provided by Mars Express' OMEGA sensor. However, the outcrops were small and more detailed observations were required to confirm their presence. The OMEGA team sifted higher resolution data from a sensor on NASA's orbiter.

Their search concentrated on 91 sizeable impact craters where incoming asteroids had punched down several kilometres, exposing ancient crustal material. As reported this week in the journal Science, at least nine craters were found to contain phyllosilicates or other hydrated silicates.

These minerals, which formed in wet environments on the surface or underground, were identical to those found in the southern hemisphere.

“We can now say that the planet was altered on a global scale by liquid water more than 4 billion years ago,” says John Carter, University of Paris, the report’s lead author.

With the small sample of widely scattered sites, it is difficult to draw conclusions about the type of environment all that time ago. However, the nature and locations of the minerals provide some clues.

“They are rich in iron and magnesium, but less in aluminium. Together with the close proximity of olivine, which is easily modified by water, this indicates that the exposure to water lasted only tens to hundreds of millions of years,” says Jean-Pierre Bibring, the OMEGA Principal Investigator from the University of Paris.

Although Mars’ potential habitability did not last long, remarkably its record is still preserved in phyllosilicate-rich spots.

A number of scientists have suggested that a shallow ocean subsequently covered the lava-coated northern plains. However, no evidence in support of this is provided by the new results.

“Our studies do not find any signs of the lava plains in the north being altered by water,” says Dr Bibring.

On a positive note, the new results may suggest sites for future landers because evidence for water during the early history of Mars suggests that conditions may have been favourable for the evolution of primitive life.

“These results reveal the history of Mars derived from the planet’s mineralogy,” says Olivier Witasse, ESA Project Scientist for Mars Express. “It is another example of the fruitful cooperation between European and American scientists.”

Why losing a loved one can be lethal

*** 25 June 2010 by Ewen Callaway**

WHY do some widows and widowers quickly follow their spouses to the grave? It seems the so-called widowhood effect could be caused by the combined effects of stress and age-related changes in the immune system.

Previous studies found that among elderly men and women the risk of dying within three months of being widowed increases between 30 and 90 per cent. It had been suggested that this might be connected with changes in the immune system, yet exactly how was unclear.

Now new research has identified some of those changes, and shown that increased cortisol levels caused by stressful events such as bereavement worsen the situation.

Dehydroepiandrosterone sulphate, or DHEAS, is best known as an intermediary of sex hormones like testosterone and oestrogen, yet it also has a role in the immune system. While cortisol dampens immune responses, DHEAS boosts them. Levels of DHEAS usually peak and begin declining when people are in their thirties.

Janet Lord, an immunologist at the University of Birmingham, UK, has previously found that people over the age of 66 who had a hip fracture had higher blood cortisol to DHEAS ratios than similarly aged people without fractures. Those with the largest disparities were most likely to develop bacterial infections, and Lord's team showed that in these people, white blood cells called neutrophils - a first line of defence against pathogenic bacteria - were less potent (Aging Cell, DOI: 10.1111/j.1474-9726.2005.00178.x).

When activated, neutrophils unleash a range of toxic molecules that kill pathogens. Now Lord's team has demonstrated that the presence of DHEAS causes neutrophils to produce one of their more lethal compounds, superoxide (Molecular Endocrinology, DOI: 10.1210/me.2009-0390).

In another ongoing but as yet unpublished study, Lord studied widows and widowers aged 65 and over who had been bereaved during the previous two months. Preliminary results suggest they have higher cortisol to DHEAS ratios and lower neutrophil function than people who have not recently lost their partner.

"When your cortisol is high, when you're in a stressed situation, that's when the lack of DHEAS will be important," she says. Lord's team plans to give supplements of a chemical closely related to DHEAS to people for three months after hip fractures to see if it increases neutrophil function.

Peter Hornsby, at the University of Texas Health Science Center in San Antonio, says the new work is the "clearest, cleanest" proof that DHEAS can have a direct immune system effect. However, he is yet to be convinced that its drop in old age compromises the immune system, even under stress.

Proposed Rules Would Allow Metric Only Labeling for Some Products

The National Institute of Standards and Technology (NIST) has issued two publications calling for the amendment of labeling laws to allow the voluntary use of only metric units on some consumer products. NIST researchers suggest that adoption of metric labeling will lead to greater agreement between state and federal labeling laws and simplify domestic and international commerce.

juice cartons showing different types of labeling

The Fair Packaging and Labeling Act (FPLA) specifies the type of information that must appear on a consumer product label, including the kind of product, name of the manufacturer or responsible party, and net contents. Products that aren't covered by the federal law are regulated by the states, which generally follow the guidance of the Uniform Packaging and Labeling Regulations (UPLR), a publication produced by NIST and the National Conference on Weights and Measures (NCWM). The rules in the UPLR are recommended regulations that only become law if and when adopted by individual states.

From left to right, cartons A and B feature a dual net quantity of contents statement on the label, as required under the current Fair Packaging and Labeling Act (FPLA). Carton C (far right) features only a metric label, as is recommended by the Uniform Packaging and Labeling Regulation (UPLR), but prohibited by the FPLA. A proposed FPLA amendment would permit U.S. manufacturers to choose either dual or metric labeling for their products.

In 1992, NIST and the NCWM supported Congress's decision to amend the FPLA to allow manufacturers to label their products with U.S. customary units (inch/pound/pint, etc.) and metric units (centimeter/kilogram/liter, etc.), known as dual unit labeling. Since then, NIST and the NCWM have been working with the states to help them adopt laws that would permit metric only labeling of products under their jurisdiction. Forty-eight states have adopted this approach.

However, some manufacturers worry that the option to label products solely with metric units will confuse consumers and that it will force manufacturers to redesign product packaging.

To allay these concerns, NIST Metric Program coordinator Elizabeth Gentry notes that many products, especially wine and distilled spirits, have been sold with metric-only labels since the early 1980s. A study by her group found that 193 of 1,137 products surveyed in 19 retail stores were labeled with metric units only. More than half of those products were made or distributed by U.S. companies. Moreover, she notes that, under the proposal, use of metric only labeling would be voluntary, as would packaging modifications.

Gentry says there is nothing compelling manufacturers to change package sizing simply because they have the option to use only metric units on their labels. Manufacturers would be free to continue including U.S. customary units (inch/pound/pint, etc.) in the dual unit labeling scheme. The proposed changes to the FPLA would not apply to unit pricing, advertising, recipes, nutrition labeling or other general pricing information.

"We're suggesting these changes to the FPLA in response to requests by U.S. manufacturers and consumers," says Gentry. "Manufacturers want to take control of the limited space on their packaging and giving them the option of using only metric units will offer manufacturers more flexibility."

Download NIST's guide to Voluntary Metric Labeling.
Download NIST's Labeling Marketplace Assessment.

Bubbles, Bread and Beer

By OLIVIA JUDSON

Olivia Judson on the influence of science and biology on modern life.

A couple of teaspoons of dried yeast. A pinch of sugar. A cup of warm water. And a few minutes later, you'll have a foamy, bubbly brew of lively yeast cells, ready to be added to a bowl of flour and turned into bread.

Kirsty Wigglesworth/Associated Press A pint of beer in a London pub.

Saccharomyces cerevisiae, also known as baker's yeast, is one of the most useful beings known to humans. We rely on it for making bread and beer; but it is also a denizen of the laboratory, one of the most studied organisms on the planet. Which is why I'm nominating it for Life-form of the Month: June.

But what is it? Yeasts are fungi - so they are related to mushrooms. And fungi are, strangely, quite close relations of ours. Or at least, they are more closely related to animals than they are to plants. Like animals, they digest their food - though fungi do it not by swallowing, but by releasing chemicals into the environment. The

chemicals break down the food - like rotting wood - into smaller molecules, and the fungus then imports these smaller molecules into its cells.

Sometimes this takes on sinister dimensions. For example, if you are nematode worm crawling through the soil, you may get stuck in a sticky web. But in this web there is no spider. The web itself is alive: it is not made of silk, but of the filaments of a fungus. The web itself will digest you. Other fungi set snares - they produce rings of cells that swell up when a worm passes through, catching it round the middle. The fungus then digests the worm at its leisure.

Fungi hold several world records. Some species can live in drier environments than any other organisms, including bacteria. Some species have huge numbers of sexes - the mushroom Schizophyllum commune is estimated to have as many as 20,000. (This doesn't mean that 20,000 individuals must assemble for some sort of shroomed-out orgy; sexes are a set of genetic rules for which pairs of individuals can swap genes with each other. Members of the same sex do not swap genes.)

Further accomplishments: the first "tree" appears to have been a fungus of some sort - it lived in the Devonian period, around 400 million years ago - and sometimes stood as tall as nine meters (almost 30 feet). And although today's fungi don't stretch towards the skies, some of them are massive. Single individuals of the species Armillaria bulbosa have been estimated to cover 15 hectares (37 acres) and weigh 10,000 kilograms (22,000 pounds). Funky.

Fungi are also famous for evolving associations with other organisms. Some are parasitic, like the smuts that attack our crops. But many are beneficial. Lichens are associations between fungi and algae or certain bacteria; and many plants depend on fungi to provide them with nutrients from the soil. Humans depend on certain fungi for penicillin, and for foods like truffles. And bread.

Studying yeast genes gives us a window into what some of our most essential genes are doing.

Which brings me back to yeast. Yeasts are lowly beings: they have but a single cell. But that doesn't mean they aren't mighty. Baker's yeast, in particular, has proven to have some powerful attributes. Especially in the laboratory. For one thing, it grows easily and fast - it can go through several generations between the time you have your morning toast and your evening beer.

Compared to us, Saccharomyces cerevisiae has few genes - it has around 6,500, while we have more than three times that many. All the same, the study of this organism has illuminated many aspects of human biology. It is, for example, an important tool for studying diseases of the nervous system like Friedreich's ataxia, an inherited condition that inflicts, among other things, slurred speech and stumbling gaits on those who have it.

This may seem bizarre. How can an organism with one cell - and no nervous system - be useful for studying the degeneration of the human nervous system? There are a couple of parts to the answer.

The first is that humans and yeast have many genes in common: about 60 percent of yeast genes are known to have human equivalents, and almost a quarter of human disease-causing genes have equivalents in yeast. Studying yeast genes thus gives us a window into what some of our most essential genes are doing. Indeed, suppose you create a yeast "knock out" - you remove one of the yeast genes. Often, this will have a clear and detrimental impact on how the organism grows. Now, replace the knocked-out gene with the human version - and like as not, you will have restored the yeast to its former frothy self.

Moreover, many degenerative diseases are due to mutated genes that cause the build up of misshapen proteins inside cells. Looking at the appropriate mutations in yeast can thus help us to discover what is going wrong, and why it is that our nerve cells begin to die.

All in all, it's quite a set of accomplishments for a being that has only one cell. And with that in mind (picture the thought bubbles over my head), I think I'll go and loaf about with a beer.

Notes:

Nice general introductions to fungi *can be found in the relevant chapters of Dawkins, R. 2004. "The Ancestor's Tale: A Pilgrimage to the Dawn of Life." Weidenfeld and Nicolson; and Margulis, L. and Schwartz, K. V. 1998. "Five Kingdoms: an Illustrated Guide to the Phyla of Life on Earth." W. H. Freeman. Both also give accounts of how fungi are more closely related to animals rather than plants, and give descriptions of how fungi secrete enzymes into the environment. The role of Saccharomyces in brewing and baking is well known. Ditto, the fact that some fungi form lichens, others associate with the roots of plants, and still others cause nasty diseases. However, an interesting and concise review of the variety of fungal lifestyles can be found in McLaughlin, D. J. et al. 2009. "The search for the fungal tree of life." Trends in Microbiology 17: 488-497.*

For an overview of the fungi that capture nematodes*, and the variety of ways they do it, see Yang, Y. et al. 2007. "Evolution of nematode-trapping cells of predatory fungi of the Orbiliaceae based on evidence from rRNA-encoding DNA and multiprotein sequences." Proceedings of the National Academy of Sciences USA 104: 8379-8384.*

For some fungi tolerating some of the driest environments on the planet see, for example, Williams, J. P. and Hallsworth, J. E. 2009. "Limits of life in hostile environments: no barriers to biosphere function?" Environmental Microbiology 11: 3292-3308;

and Onofri, S. et al. 2004. "Antarctic microfungi as models for exobiology." Planetary and Space Science 52: 229-237. For 20,000 sexes in Schizophyllum, and for a general discussion of how such complex mating systems work, see Kothe, E. 1996. "Tetrapolar fungal mating types: sexes by the thousands." FEMS Microbiology Reviews 18: 65-87.

***For the first "tree" being a fungus**, see Hueber, F. M. 2001. "Rotted wood-alga-fungus: the history and life of Prototaxites Dawson 1859." Review of Palaeobotany and Palynology 116: 123-158; and Boyce, C. K. et al. 2007. "Devonian landscape heterogeneity recorded by a giant fungus." Geology 35: 399-402. Some authors argue that Prototaxites is in fact a lichen (though this still makes it a fungus in part): see Selosse, M.-A. 2002. "Prototaxites: a 400 MYR old giant fossil, a saprophytic holobasidiomycete, or a lichen?" Mycological Research News 106: 642-644. For the huge size of Armillaria bulbosa, see Smith, M. L., Bruhn, J. N., and Anderson, J. B. 1992. "The fungus Armillaria bulbosa is among the largest and oldest living organisms." Nature 356: 428-431.*

***The role of baker's yeast as a laboratory organism** is well known. Its potential for helping elucidate human diseases was pointed out some time ago - see, for example, Bassett, D. E. Jr., Boguski, M. S. and Hieter, P. 1996. "Yeast genes and human disease." Nature 379: 589-590; and Botstein, D., Chervitz, S. A. and Cherry, J. M. 1997. "Yeast as a model organism." Science 277: 1259-1260. For my discussion of yeast and degenerative diseases, I drew heavily on two papers: Knight, S. A. B. et al. 1999. "The yeast connection to Friedrich ataxia." American Journal of Human Genetics 64: 365-371; and especially Khurana, V. and Lindquist, S. 2010. "Modelling neurodegeneration in Saccharomyces cerevisiae: why cook with baker's yeast." Nature Reviews Neuroscience 11: 436-449. For anyone interested in this subject, this last paper contains a wealth of useful information, and was part of what inspired me to write this article.*

Many thanks to Oliver Morton and Jonathan Swire for insights, comments and suggestions. This column is dedicated to my late mother who, when I was a child, taught me to make bread.

Tutankhamen 'killed by sickle-cell disease'

*** 19:45 25 June 2010 by Jo Marchant**

King Tutankhamen, Egypt's boy king, was killed by the inherited blood disorder sickle-cell disease – not malaria. So says a German team in what appears to be the best shot yet at solving the mystery of the pharaoh's early demise. From falling off a chariot to murder by poison, the cause of Tutankhamen's death has been a source of avid speculation since his mummified youthful remains were discovered in 1922. He was 19 when he died around 1324 BC after ruling for just nine years.

The first extensive scientific investigation of the mummy was reported by Egypt's chief archaeologist Zahi Hawass and colleagues earlier this year (JAMA, vol 303, p 638). After running a battery of tests, including X-rays and genetic analysis, they concluded that an inherited bone disorder weakened the king, before an attack of malaria finished him off.

Key pieces of evidence were severe necrosis in the bones of Tutankhamen's left foot, and the detection of genes from Plasmodium falciparum, the parasite that causes malaria.

But in a letter to JAMA this week, Christian Timmann and Christian Meyer of the Bernhard Nocht Institute for Tropical Medicine in Hamburg, Germany, suggest that Hawass's observations can be explained much more elegantly by a diagnosis of sickle cell disease (SCD).

Early death

People with SCD carry a mutation in the gene for haemoglobin which causes their red blood cells to become rigid and sickle-shaped. A single copy of the sickle-cell gene confers increased immunity to malaria, so it tends to be common in areas where the infection is endemic – such as ancient Egypt. People with two copies of the gene suffer severe anaemia and often die young.

Timmann and Meyer point out that SCD is the most common cause of bone damage like Tutankhamun's. The deformed blood cells block capillaries, preventing oxygen from reaching bone tissue. Tutankhamen's parents are thought to be related, boosting the chance that they both carried the sickle-cell gene.

People with SCD can still carry the malaria parasite in their blood, despite their increased immunity. In King Tut's case, such an infection could have triggered a fatal "sickle cell crisis" in which his essential organs were starved of oxygen, Timmann says.

Members of Hawass's team describe the suggestion as "interesting and plausible" and say that they are "currently investigating". That would presumably require testing Tutankhamen's mummy for the presence of the sickle-cell gene.

Timmann's lab has developed a test: given access to the DNA, "we could do it in an hour", he says. But if that is the line the Egyptians are taking, they are going it alone. Timmann says he contacted them, offering to collaborate, but has received no reply.

Other researchers would also like to receive information from the Egyptian team. In a second letter in JAMA this week, a pair of US researchers suggests that King Tut and his relatives might have had a hormonal disorder which causes, among other things, deformed skulls and small male genitals. They need detailed photographs of the skull of Tut's father to confirm their theory, but the Egyptian team has exclusive access to the mummies and has not yet released the relevant pictures. *Journal reference: JAMA, vol 303, p 2473*

Amelia Earhart May Have Survived Months as Castaway

The famous pilot and her navigator may have eaten turtles, fish and bird to survive on a remote island after making an emergency landing.

By Rossella Lorenzi

Amelia Earhart, the legendary pilot who disappeared 73 years ago while flying over the Pacific Ocean in a record attempt to fly around the world at the equator, may have survived several weeks, or even months as a castaway on a remote South Pacific island, according to preliminary results of a two-week expedition on the tiny coral atoll believed to be her final resting place.

"There is evidence on the island suggesting that a castaway was there for weeks and possibly months," Ric Gillespie, executive director of The International Group for Historic Aircraft Recovery (TIGHAR), told Discovery News.

Gillespie has just returned from an expedition on Nikumaroro, the uninhabited tropical island in the southwestern Pacific republic of Kiribati where Earhart and her navigator Fred Noonan are believed to have landed when running out of fuel.

"We noticed that the forest can be an excellent source of water for a castaway in an island where there is no fresh water. After heavy rain, you can easily collect water from the bowl-shaped hollows in the buka trees. We also found a campsite and nine fire features containing thousands of fish, turtle and bird bones. This might suggest that many meals took place there," Gillespie said.

TIGHAR's expedition to Nikumaroro was the tenth since 1989. During the previous campaigns, the team uncovered a number of artifacts which, combined with archival research, provide strong circumstantial evidence for a castaway presence.

"On this expedition we have recovered nearly 100 objects," Gillespie said. Among the items, 10 are being tested by a Canadian lab for DNA. "We are talking about 'touch DNA,' genetic material that can be retrieved from objects that have been touched," he explained.

The best candidate for contact DNA appears to be a small glass jar that was found broken in five pieces, most likely a cosmetic jar. Other candidates for DNA extraction include two buttons, parts of a pocket knife that was beaten apart to detach the blades for some reason, a cloth that appears to have been shaped as a bow, and cosmetic fragments of rouge from a woman's compact.

The excavation took place on the island's remote southeast end, in an area called the Seven Site, where the campsite and fire features were found.

"Only someone who really knew the island could choose this place. This is Nikumaroro's best place, it has shade and breeze, and it is close to the lagoon and the ocean. Here, red-tailed tropicbirds are nesting and are very easy to catch," Gillespie said.

The site is densely vegetated with shrubs known as Scaevola frutescens,and may be where the castaways' last meals were consumed. Indeed, it is here that a partial skeleton of a castaway was found in 1940.

Recovered by British Colonial Service Officer Gerald Gallagher, human remains were described in a forensic report and attributed to an individual "more likely female than male," "more likely white than Polynesian or other Pacific Islander," "most likely between 5 feet 5 inches and 5 feet 9 inches in height." Unfortunately the bones have been lost.

Gillespie believes that many of the bones might have been carried off by crabs, suggesting an unmerciful end for Earhart.

"In our experience, the crabs can be a serious problem. When we sat down to eat lunch, there were hundreds of these crabs climbing on our shoes. If you lay down, they think you are dead and they pinch pieces out of you," Gillespie said.

Abandoned for weeks on a desert island where temperatures often exceed 100 degrees, even in the shade, Earhart may have succumbed to any number of causes, including injury and infection, food poisoning from toxic fish, or simply dehydration.

"We do know that 1938 was one of the most severe drought years on the island, so if she survived long enough to get into that period, she could have been in real trouble," Gillespie said

Ironically, Earhart might have died surrounded by a paracetamol-like drug. The invasive Scaevola frutescens, which posed a nightmare to TIGHAR's archaeologists, is in fact a plant full of therapeutic properties.

Bark, roots and leaves are used in folk medicine to treat dysentery, headache, ciguatera (food poisoning associated with the ingestion of tropical fish) and tachycardia.

According to Rajappan Manavalan and colleagues at the department of pharmacy of Annamalai University, India, the plant has been proven to be "an excellent remedy as antidiabetic, antipyretic, antiinflamatory, anticoagulant and as skeletal muscle relaxant without any adverse reactions."

The ups and downs of speech that we all understand

*** 26 June 2010 by Eugenie Samuel Reich**

Anyone who has tried to learn a new language knows how difficult it can be to learn a different grammar. Wouldn't it be great if there were rules of grammar that applied to all languages?

Perhaps there are. Norvin Richards of the Massachusetts Institute of Technology has proposed a universal rule linking intonation with where we place question-words like "what" and "who" in a sentence. This is the first time anyone has found a link between intonation and word order in questions, and it could also help explain how babies learn to speak.

In some languages, a statement can be turned into a question by, for example, replacing the object of the sentence with a question-word and changing the intonation. In other languages, including English, the question-word also moves relative to the word it replaces: "Heather is buying a book" becomes "What is Heather buying?".

In his new book Uttering Trees, Richards claims that by studying the complex patterns affecting intonation in different languages, he can predict whether the question-word will move and where it will go. He says he has checked this for 20 languages, such as Japanese and Basque, where the rules of intonation are precise enough for the idea to be tested.

Intonation can be mapped as patterns of pitch that are separated by breaks. Richards found that whether the question-word moves relative to the word it replaces depends on whether these breaks tend to come at the beginning of phrases or at the end.

"It's a really neat idea," says Seth Cable, at the University of Massachusetts at Amherst. Cable is reasonably convinced that the rule applies to all the languages Richards has tested, although he says that it's a thornier issue whether it will apply to the rest of the world's languages.

"If correct, it is a very important discovery," says Maria Luisa Zubizarreta at the University of Southern California in Los Angeles. Such a connection between syntax and intonation would help to explain how babies unravel word order from the continuous streams of sound that they hear, with changes in intonation acting as cues to grammar, she says.

Ancient voyager's tomb found in E China

A recently excavated tomb in Nanjing has been confirmed to be the grave of Zheng He, a eunuch from the early Ming Dynasty who led historic voyages to Southeast Asia and eastern Africa. The tomb was discovered accidentally on June 18th by workers at a construction site near Zutang Mountain that also holds the tombs of many other Ming Dynasty eunuchs, the Yangtse Evening News reported.

A worker cleans soil at the entrance to the tomb. (Photo: Yangtse Evening News)

The tomb was 8.5 meters long and 4 meters wide and was built with blue bricks, which archaeologists said were only used in structures belonging to dignitaries during the time of Zheng He.

But experts believed his remains were not placed in the tomb because of the long distance between Nanjing and India, where he died during a visit in 1433.

Born in 1371, Zheng He was an excellent navigator and diplomat in the Ming Dynasty. He led the royal fleet to southwest Asia and east Africa on seven occasions from 1405 to 1433, nearly a century before Christopher Columbus discovered the American continent in 1492. So*urce: CRIENGLISH*

Serbian site may have hosted first copper makers

Finds intensify debate over Old World origins of metal production

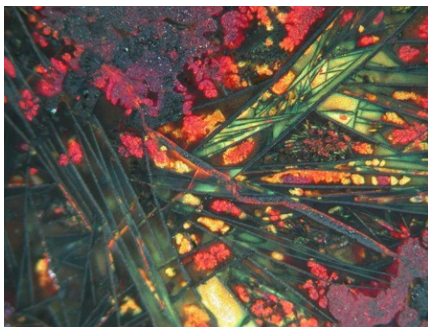
By Bruce Bower

An archaeological site in southeastern Europe has shown its metal. This ancient settlement contains the oldest securely dated evidence of copper making, from 7,000 years ago, and suggests that copper smelting may been invented in separate parts of Asia and Europe at that time rather than spreading from a single source.

The find extends the known record of copper smelting by about 500 years, an archaeological team headed by Miljana Radivojević and Thilo Rehren of University College London reports in an upcoming Journal of

Archaeological Science. The pair were joined by Serbian researchers, led by Dušan Šljivar of the National Museum Belgrade, and German scientists directed by Ernst Pernicka of the University of Tübingen.

Chemical and microscopic analyses of previously unearthed material from Serbia's Belovode site have identified pieces of copper slag, the residue of an intense heating process used to separate copper from other ore elements. The raw material came from nearby copper-ore deposits in Serbia or Bulgaria, they add.



"Our finds provide the earliest secure dates for copper smelting and indicate the existence of different, possibly independent centers of invention of metallurgy," Rehren says. Metallurgy is the process of extracting metals from ore in order to create useful objects.

Large numbers of copper artifacts have been found at southeastern European sites dating to more than 6,000 years ago, Rehren notes.

Pieces of copper slag discovered in Serbia make the region the oldest known site of copper making found to date. A microscopic image of the slag, covering half a millimeter of the material's surface, displays multi-hued crystals of copper and other metal oxides. **M. Radivojevic**

His proposal challenges a longstanding view that copper smelting spread to Europe after originating in or near the Fertile Crescent region of what's now southern Iran. Archaeologists have dated copper smelting in the Middle East to about 6,500 years ago.

Although Belovode now stands as the world's oldest known copper-smelting site, that status probably won't last, remarks archaeologist Benjamin Roberts of the British Museum in London. "It's likely we'll see copper-smelting evidence at least contemporary with Belovode from the Fertile Crescent once research programs are in place at well-excavated sites," he predicts.

Copper smelting may have originated in what's now Turkey, comments archaeologist Christopher Thornton of the University of Pennsylvania in Philadelphia. By 10,000 years ago, people living there were making beads and other ornaments from copper ore and heating the ore at low temperatures to make it more pliable, he says. Scattered evidence of early smelting in that region has yet to be thoroughly studied. Roberts and Thornton agree that copper making was probably invented in one spot, either in Turkey or the Middle East.

Rehren's group is now examining possible copper slag from sites in Turkey and Iran that date to 7,000 years ago or more.

Radiocarbon dates for animal bones excavated at Belovode indicate that the site was occupied from 7,350 to 6,650 years ago. Jewelry and other Belovode finds come from southeastern Europe's ancient Vinča culture, known for having used copper vessels and other metal items.

Chemical analyses of metallic-looking bits from Belovode identified five pieces of copper slag. Large amounts of iron, manganese, zinc and cobalt in this material likely derived from smelted copper ores, Rehren's team says. Differences in the concentration of elements across samples indicate that each was produced in a separate smelting event. Slag pieces were laced with ash from wood that presumably had been burned to create smelting temperatures of about 1,100° Celsius.

Microscopic studies of slag pieces revealed glassy areas and crystallized metal oxides that had formed during a process of heating the material until it liquefied, followed by cooling.

A drop of once-molten metal found in a Belovode house contains pure copper, the researchers add. Lead-isotope ratios of the Belovode slag and the copper drop link them to ore deposits in Serbia and Bulgaria.

No smelting chambers, such as elongated ceramic cylinders recovered at later Copper Age sites in southwestern Asia, have been found at Belovode. Vinca residents may have dug pits for copper smelting, the scientists speculate.

Citations & References: *Radivojevic, M., et al. 2010. On the origins of extractive metallurgy: New evidence from Europe. published online June 19, Journal of Archaeological Science. doi:10.1016/j.jas.2010.06.012.*

Hayabusa asteroid capsule opening gets under way

By Jonathan Amos

Japanese scientists have begun to open the Hayabusa asteroid capsule.

The canister, which returned to Earth on 13 June, is being worked on at the Japanese space agency's (Jaxa) Sagamihara Campus in Kanagawa. It is hoped the vessel will contain small amounts of dust grabbed from the surface of asteroid Itokawa by a spacecraft in 2005.

Researchers said they had already detected a trace gas in the capsule but had yet to identify it.

"We still don't know exactly what kind of gas it is, but the researchers confirmed a trace of low-pressured gas in the capsule," a Jaxa official told AFP.

One of the scientists' key tasks is to make sure the vessel is handled in perfectly sterile conditions. They have to be certain that any substances they recover are extraterrestrial and not merely Earthly contamination.

It is expected to take at least a week to properly open the capsule to get access to its sample containment box.

Scientists say any residues could give them new insights into the early history of the Solar System and the materials that went into building the planets.

"If the capsule contains fragments of at least 10 microns (thousandths of a millimetre), researchers can make an analysis," the Jaxa spokeswoman said. The capsule's return two weeks ago marked the culmination of a remarkable seven-year adventure, which saw the Hayabusa mission spend three weeks orbiting asteroid Itokawa and attempt to pluck dust from its surface.

The $200m mission encountered many technical problems, from being hit by a solar flare to experiencing propulsion glitches. But each time an issue came up, the Japanese project team found an elegant solution to keep Hayabusa alive and bring it back to Earth - albeit three years late.

Science correspondent, BBC News Capsule opening facility (Jaxa) Work begins on the Hayabusa capsule at the Sagamihara Campus

The sample capsule fell safely to Earth in Australia thanks to its heat-shield and a parachute. The main Hayabusa spacecraft, however, was destroyed on re-entry to the atmosphere.

Antarctic Garbage Patch Coming?

Analysis by Michael Reilly

You've heard about the Pacific garbage patch and the Atlantic garbage patch, each a sobering sign of how when we throw things away, they don't go "away" -- they often go into the sea, where they remain for a long, long time.

Much of the global ocean remains uncharted in terms of pollution, but unfortunately the more we look, the more we find. And now even the most remote, pristine waters on the planet -- the coastal seas of Antarctica -- are being invaded by plastic debris.

In a series of surveys conducted during the austral summer of 2007-2008, researchers at the British Antarctic Survey and Greenpeace trawled the region, skimming surface waters and digging into the seabed. Even in the exceedingly remote Davis and Durmont D'Urville seas they found errant fishing buoys and a plastic cup. Plastic packaging was found floating in the Amundsen Sea (see map).

It doesn't sound like much, but finding trash in the far corners of the planet is a worrying sign. The research team, led by David Barnes of the British Antarctic Survey, believe the debris they found represents the leading edge of a tide of man-made refuse that is just now starting to make its way into the most secluded parts of our oceans.

If there's good news, it's this: sledges dragged along the seafloor turned up a healthy, vibrant Antarctic ecosystem, and nothing else. Plastic bits are ubiquitous in beach sands and coastal sediments throughout much of the world, but the reach of humanity's profound plastic habit and throw-away culture has so far failed to reach the bottom of these southern seas.

The researchers, though, have a gloomy outlook for what they might find in a future trip to the region. In a letter to the journal Marine Environmental Research, they write:

The seabeds immediately surrounding continental Antarctica are probably the last environments on the planet yet to be reached by plastics, but with pieces floating into the surface of the Amundsen Sea this seems likely to change soon. Our knowledge now touches every sea, but so does our legacy of lost and discarded plastic.