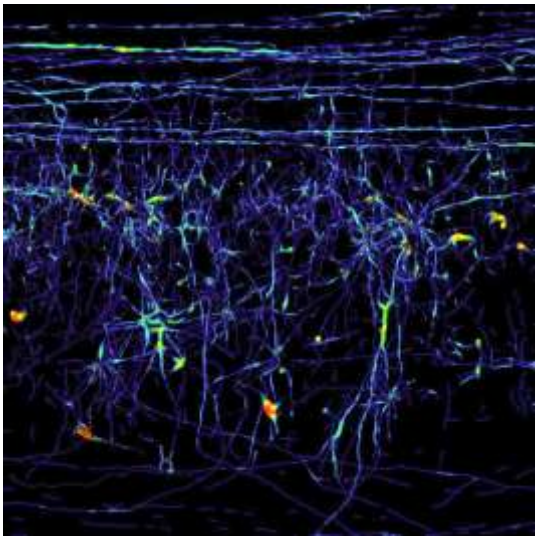
http://medicalxpress.com/news/2011-12-scientists-spinal-cord-transparent.html

Scientists succeed in making the spinal cord transparent

An international team has now developed a new method by virtue of which single nerve cells can be both examined in intact tissue and portrayed in all three dimensions



Medical Xpress - In the event of the spinal cord injury, the long nerve cell filaments, the axons, may become severed. For quite some time now, scientists have been investigating whether these axons can be stimulated to regenerate. Such growth takes place on a scale of only a few millimetres. To date, changes like this could be determined only by cutting the tissue in question into wafer-thin slices and examining these under a microscope. However, the two-dimensional sections provide only an inaccurate picture of the spatial distribution and progression of the cells. Together with an international team, scientists at the Max Planck Institute for Neurobiology in Martinsried have now developed a new method by virtue of which single nerve cells can be both examined in intact tissue and portrayed in all three dimensions.

***A spinal cord as if made of glass: The new method enables scientists to see nerve cell in the intact cellular network.* © MPI of Neurobiology / Ertürk**

The spinal cord is the most important pathway for relaying information from the skin, muscles and joints to the brain and back again. Damage to nerve cells in this region usually results in irreversible paralysis and loss of sensation. For many years, scientists have been doing their best to ascertain why nerve cells refuse to regenerate. They search for ways to stimulate these cells to resume their growth.

To establish whether a single cell is growing, the cell must be visible in the first place. Up to now, the procedure has been to cut the area of the spinal cord required for examination into ultra-thin slices. These are then examined under a microscope and the position and pathway of each cell is reconstructed. In exceptional cases, scientists could go to the trouble of first digitizing each slice and then reassembling the images, one by one, to produce a virtual 3D model. However, this is a very time-consuming endeavour, requiring days and sometimes even weeks to process the results of just one examination. Even worse, mistakes can easily creep in and falsify the results: The appendages of individual nerve cells might get squashed during the process of slicing, and the layers might be ever so slightly misaligned when set on top of each other. As Frank Bradke explains: "Although this might not seem dramatic to begin with it prevents us from establishing the length and extent of growth of single cells." Bradke and his team at the Max Planck Institute of Neurobiology have investigated the regeneration of nerve cells following injuries to the spinal cord. Since July he has been working at the German Centre for Neurodegenerative Diseases (DZNE) in Bonn. "However, since changes on this crucial scale are precisely what we need to see, we worked meticulously until we came up with a better technique", he continues.

The new technique is based on a method known as ultramicroscopy, which was developed by Hans Ulrich Dodt from the Technical University of Vienna. The Max Planck neurobiologists and an international team of colleagues have now taken this technique a step further. The principle is relatively straightforward. Spinal cord tissue is opaque due to the fact that the water and the proteins contained in it refract light differently. Thus, the scientists removed the water from a piece of tissue and replaced it by an emulsion that refracts light in exactly the same way as the proteins. This left them with a completely transparent piece of tissue. "It's the same effect as if you were to spread honey onto textured glass", Ali Ertürk, the study's first author adds. The opaque pane becomes crystal clear as soon as the honey has compensated for the surface irregularities.

The new method is a leap forward in regeneration research. By using fluorescent dyes to stain individual nerve cells, scientists can now trace their path from all angels in an otherwise transparent spinal cord section. This enables them to ascertain once and for all whether or not these nerve cells recommenced their growth following injury to the spine – an essential prerequisite for future research. "The really great thing is the fact that this method can also be easily applied to other kinds of tissue", Frank Bradke relates. For example, the blood *capillary system or the way a tumour is embedded in tissue could be portrayed and analysed in 3D.*

More information: *Ali Ertürk, Christoph P. Mauch, Farida Hellal, Friedrich Förstner, Tara Keck, Klaus Becker, Nina Jährling, Heinz Steffens, Melanie Richter, Mark Hübener, Edgar Kramer, Frank Kirchhoff, Hans Ulrich Dodt, Frank Bradke, 3D imaging of the unsectioned adult spinal cord to assess axon regeneration and glial responses after injury, Nature Medicine, online publication, December 25, 2011 Provided by Max-Planck-Gesellschaft*

http://www.eurekalert.org/pub_releases/2011-12/bu-o6m122211.php

Over 65 million years North American mammal evolution has tracked with climate change

Rise and fall of groups of fauna driven by temperature

PROVIDENCE, R.I. - History often seems to happen in waves – fashion and musical tastes turn over every decade and empires give way to new ones over centuries. A similar pattern characterizes the last 65 million years of natural history in North America, where a novel quantitative analysis has identified six distinct, consecutive waves of mammal species diversity, or "evolutionary faunas." What force of history determined the destiny of these groupings? The numbers say it was typically climate change.

"Although we've always known in a general way that mammals respond to climatic change over time, there has been controversy as to whether this can be demonstrated in a quantitative fashion," said Brown University evolutionary biology Professor Christine Janis. "We show that the rise and fall of these faunas is indeed correlated with climatic change – the rise or fall of global paleotemperatures – and also influenced by other more local perturbations such as immigration events."

This painting by artist Carl Buell depcits a scene from the late Eocene of North America. The rhino-like animals in the background are brontotheres. The pony-sized Hyracodon, a closer relative of living rhinos, in the foreground.
Credit: Courtesy of Carl Buell

Specifically, of the six waves of species diversity that Janis and her Spanish collaborators describe online this week in the Proceedings of the National Academy of Sciences, four show statistically significant correlations with major changes in temperature. The two transitions that show a weaker but still apparent correlation with the pattern correspond to periods when mammals from other continents happened to invade in large numbers, said Janis, who is the paper's senior and second author.

Previous studies of the potential connection between climate change and mammal species evolution have counted total species diversity in the fossil record over similar time periods. But in this analysis, led by postdoctoral scholar Borja Figueirido, the scientists asked whether there were any patterns within the species diversity that might be significant. They were guided by a similar methodology pioneered in a study of "evolutionary faunas" in marine invertebrates by Janis' late husband Jack Sepkoski, who was a paleontologist at the University of Chicago.

What the authors found is six distinct and consecutive groupings of mammal species that shared a common rise, peak and decline in their numbers. For example, the "Paleocene fauna" had largely given way to the "early-middle Eocene fauna" by about 50 million years ago. Moreover, the authors found that these transfers of dominance correlated with temperature shifts, as reflected in data on past levels of atmospheric oxygen (determined from the isotopes in the fossilized remains of deep sea microorganisms).

By the numbers, the research showed correlations between species diversity and temperature change, but qualitatively, it also provided a narrative of how the traits of typical species within each wave made sense given the changes in vegetation that followed changes in climate. For example, after a warming episode about 20 million years in the early Miocene epoch, the dominant vegetation transitioned from woodland to a savannah-like grassland. It is no surprise, therefore, that many of the herbivores that comprised the accompanying "Miocene fauna" had high-crowned teeth that allowed them to eat the foods from those savannah sources.

To the extent that the study helps clarify scientists' understanding of evolution amid climate changes, it does not do so to the extent that they can make specific predictions about the future, Janis said. But it seems all the clearer that climate change has repeatedly had meaningful effect over millions of years.

"Such perturbations, related to anthropogenic climatic change, are currently challenging the fauna of the world today, emphasizing the importance of the fossil record for our understanding of how past events affected the history of faunal diversification and extinction, and hence how future climactic changes may continue to influence life on earth," the authors wrote in the paper.

In addition to Janis and Figueirido at Brown, the other authors are Juan Perez-Claros and Paul Palmqvist at the University of Malaga and Miguel De Renzi at the University of Valencia in Spain. Figueirido is also affiliated with Malaga.
Grants from the Fulbright program, the Bushnell Foundation (to Brown) and the Spanish Ministry of Science and Innovation funded the research.

www.scientificamerican.com/article.cfm?id=the-secret-inner-life-of-bees

Bees Appear to Experience Moods

Provocative experiments suggest that insects have something resembling emotions

By Jason Castro | Monday, December 26, 2011 | 9

If you have never watched bees carefully, you are missing out. Look closely as they gently curl and uncoil their mouthparts around food, and you will sense that they are not just eating but enjoying their meal. Watch a bit more, and the hesitant flicks and sags of their antennae seem to convey some kind of emotion. Do those twitches signal annoyance? Or something like enthusiasm?

Whether bees really experience any of these emotions is an open scientific question. It is also an important one, with implications for how we should treat not just bees but the great majority of animals. Recently studies by Melissa Bateson and her colleagues at Newcastle University in England have rekindled the debate over these issues by showing that honeybees may experience something akin to moods.

Grumpy? Giddy? According to some measures, bees appear to experience moods. Image: Charles Krebs/Corbis

Using simple behavioral tests, Bateson's team showed that honeybees under stress tend to be pessimistic. Other tests have demonstrated that monkeys, dogs and starlings all tend to react similarly under duress and likewise see the proverbial glass as half empty. Although this finding does not - and cannot - prove that bees experience humanlike emotions, it does give pause. We should take seriously the possibility that insects, too, have emotions.

Beeline to the Brain

First, a little bit about bees. They are members of the diverse group of animals lacking backbones - indeed, more than 95 percent of all animal species are invertebrates. Despite the varied and often nuanced behaviors they can exhibit, invertebrates are sometimes regarded as life's second string, a mindless and unfeeling band of alien critters. If that seems somewhat melodramatic, just consider our willingness to boil some of them alive.

Those judgments tend to arise from arguments about invertebrates' failure to demonstrate the behaviors we usually associate with a pain response. Whereas the yelps and grimaces of other mammals are familiar to us as announcements of hurt, invertebrates can appear to take their injuries in stride. Insects are commonly observed using their crushed limbs with undiminished force when walking, for example, and a locust will reportedly carry on with a meal while it is being eaten by a mantis.

Other attempts to draw a dividing line between creatures that feel and those that do not are rooted in comparative brain anatomy. Invertebrates lack a cortex, an amygdala and many of the other major brain structures routinely implicated in human emotion. Their nervous systems are quite minimalist compared with ours: we have roughly 100,000 bee brains' worth of neurons in our head. Some invertebrates, however, including insects, do possess a rudimentary version of our stress response system. So the question remains: Do they experience emotion in a way that we would recognize, or do they simply react to the world with an elaborate set of reflexes?

To gain some traction on this fascinating question, Bateson's team followed the lead of recent investigations on "pessimistic biases" in animals. In humans, the pessimistic bias refers to our well-known tendency to perceive threats or anticipate negative outcomes more frequently when we are feeling anxious or depressed. For example, in tests where people are shown ambiguous statements such as "the doctor examined little Emily's growth," anxious individuals are less likely than others to conclude that Emily is fine and only her height was being checked.

Although the link between bad moods and negative judgments may not be terribly surprising, this correlation is still useful. We rely on it in our daily lives to make informed guesses about how people are feeling by observing their actions and choices. Scientifically, we can use it to study the emotions of creatures unable to tell us directly how they feel. The key here is to set up a controlled situation where animals encounter an ambiguous stimulus - think of it as a nonverbal version of the Emily statement.

In the initial setup of Bateson's experiment, a group of honeybees was trained to associate two simple odor mixtures with two different foods. One mixture, which consisted of one part hexanol to nine parts octanone, was repeatedly paired with sucrose, which bees find rewarding. The other odor mixture consisted of the same two chemicals in opposite proportions (nine parts hexanol to one part octanone) paired with quinine, a compound that most of us find bitter and bees will actively avoid after tasting. By using this technique, the

researchers hoped to overcome the bees' intrinsic responses to sucrose and quinine and test only their judgment of the new smells. After learning these odor-food associations, the bees responded as expected, uncoiling and extending their mouthparts in anticipation of food when the first odor mixture was presented and retracting them at offers of the second concoction.

This training allowed the scientists to study the bees' decision making by then testing their mouthing responses to a series of ambiguous odor mixtures. First, half the bees got a trip to the "vortexer." The experience was probably as unpleasant for them as it sounds to us. In a procedure meant to simulate a badger attack on a hive, the bees were shaken for one minute in a machine typically used to vigorously mix chemicals. If bees can indeed be made to feel cranky, surely this device would do the trick.

Next, both shaken and unshaken bees were tested on five mixtures of hexanol and octanone at different concentrations. Sure enough, both groups preferred extending their mouth to octanone-heavy mixtures, which predicted sugar, rather than hexanol-heavy mixtures, the scent of which predicted quinine. Interestingly, the shaken bees were less likely to advance toward any of the mixtures than their unperturbed counterparts.

In an analogue of the classic scenario of the half-empty glass versus the half-full glass, the bees were also presented with an equal mixture of hexanol and octanone. Bees that were spared the trip to the vortexer gave the concoction the benefit of the doubt, moving their mouth toward the food on close to 60 percent of the trials. Shaken bees, on the other hand, ignored or recoiled from these same ambiguous stimuli more than half the time. The stress of shaking had turned them into pessimists that interpreted the ambiguous odor as half threatening rather than half appetizing.

Both Shaken and Stirred

In addition to these behavioral measures, the scientists also tested for changes in the bees' neurotransmitter levels after shaking. The quantities of certain chemicals with known roles in insect learning (octopamine), aversive conditioning (dopamine) and aggression (serotonin) were all reduced by the procedure, suggesting that as with their mammalian counterparts, duress in bees causes sustained, system-wide changes in brain state - a possible analogue of mood. Together these behavioral and neurochemical tests reveal an unexpected dimension of bee cognition. Formally, we can say that when agitated, bees can take on a negative disposition, a state that alters both their thinking and their neurochemistry.

For now, however, we cannot conclude anything more sweeping about the emotional life of a bee. Bateson and her co-authors leave us with an intriguing plea for consistency, however, one that nudges us to think clearly about how we regard the minds and emotions of all creatures. Last year researchers tested dogs that appeared to suffer from separation anxiety for a pessimistic bias. When they encountered an uncertain food reward, the perturbed dogs also appeared less inclined to try the ambiguous treat, which the researchers interpreted as evidence that dogs indeed feel anxious when left alone. "It is logically inconsistent," Bateson and her colleagues say, to deduce that dogs and other similar animals express emotions "but to deny the same conclusion in the case of honeybees."

To put it another way, our criteria for assessing animal emotions should be blind to whether the animal has fur, feathers or an exoskeleton. Either bees and other invertebrates get a trial membership in the club of the genuinely anxious, or we must concede that our beloved pets' seemingly pessimistic actions imply nothing about their feelings. For a smitten dog owner, at least, the choice is probably obvious.

http://www.physorg.com/news/2011-12-couple-evidence-indicating-earliest-humans.html

Couple finds evidence indicating earliest humans lived by rivers and streams

Archeologists have debated whether earliest human ancestors lived by rivers and streams or whether they lived in woodlands

PhysOrg.com - When many people think of our earliest human ancestors, they think of the hot dried out dusty environments in Africa in which many of their remains were found. Unfortunately, such images don't take into account the changes in environment that have occurred since those times when early peoples walked the Earth. Archeologists of course have thought of such things and for many years have tossed ideas back and forth debating whether such people lived by rivers and streams, as did those that came later and built civilization along such places as the Nile or whether they lived in woodlands.

Now new evidence has come to light that suggests the former might be more likely. Husband and wife team Royhan and Nahid Gani have been studying the sediments surrounding the place where Ardipithecus ramidus, aka, "Ardi," was found in Ethiopia, and have, as they describe in their paper published in Nature Communications, found that most of the evidence in the area points to a group of people that lived near a very large river.

Ardi is believed to have lived some four and half million years ago in what is now Aramis, a hot and dry part of Ethiopia, but until now, no serious study had been done on the dirt in which the skeletal remains were found. After doing so, the Gani's discovered that the dirt was actually layers of sandstone that appear most likely to have been the result of an ancient stream overflowing it's banks periodically, leaving behind layers of sand. Branching out, the team discovered that the sediments indicated that such a stream was actually a river, likely twenty six feet deep and over twelve hundred feet wide.

Next they turned their attention to plant material that had been preserved in the sandstone, measuring their isotopes, and found that the material had come from grassy plants, suggesting a savannah type environment. But once again, widening their area of study, they also found that there were wide changes in the types of plant material in the area. This caused them to surmise that there were patches of forests near the rivers and streams.

Based on these two pieces of information, the team suggests that it appears Ardi, who many researchers believe is our oldest found ancestor, lived in a savannah, near fresh flowing water. Some suggest that such an environment would be consistent with learning to walk upright to see over the tall grasses.

More information: *River-margin habitat of Ardipithecus ramidus at Aramis, Ethiopia 4.4 million years ago, Nature Communications 2, Article number: 602 doi:10.1038/ncomms1610*

Abstract

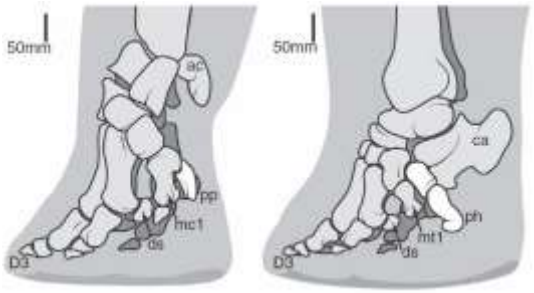
The nature and type of landscape that hominins (early humans) frequented has been of considerable interest. The recent works on Ardipithecus ramidus, a 4.4 million years old hominin found at Middle Awash, Ethiopia, provided critical information about the early part of human evolution. However, habitat characterization of this basal hominin has been highly contested. Here we present new sedimentological and stable isotopic (carbon and oxygen) data from Aramis, where the in situ, partial skeleton of Ar. ramidus (nicknamed 'Ardi') was excavated. These data are interpreted to indicate the presence of major rivers and associated mixed vegetations (grasses and trees) in adjacent floodplains. Our finding suggests that, in contrast to a woodland habitat far from a river, Ar. ramidus lived in a river-margin forest in an otherwise savanna (wooded grassland) landscape at Aramis, Ethiopia. Correct interpretation of habitat of Ar. ramidus is crucial for proper assessment of causes and mechanisms of early hominin evolution, including the development of bipedalism.

http://nyti.ms/v70Dd2

Bony 'Sixth Toe' Helps an Elephant's Stance

Researchers report that over 15 million years, elephants evolved a false sixth toe in the middle of the fatty pad on each foot to prop up the back of their feet

By SINDYA N. BHANOO



Their feet may look like solid, flat-bottomed tree trunks, but elephants actually stand tiptoed, more like dogs or deer. Now, researchers report that over the course of 15 million years, elephants evolved a false sixth toe in the middle of the fatty pad on each foot to prop up the back of their feet and support that tiptoed stance.

"About 55 million years ago, the earliest elephants were flat-footed," said John Hutchinson, a biologist at the Royal Veterinary College in London and the first author of a study in the journal Science that reports the findings.

These early elephants were relatively small, about the size of a pig, and Dr. Hutchinson said their feet "probably did not have space for the large fatty pad elephants have now."

The fossil evidence of the first elephants with false toes dates back about 40 million years, coinciding with the period when elephants began to grow large and occupy more diverse terrestrial habitats.

The false toes were first discovered 300 years ago by the Scottish surgeon Patrick Blair. Other scientists speculated that the appendages were made of cartilage, not bone.

But Dr. Hutchinson discovered that the false toes actually turn from cartilage to bone over 20 to 40 years. As elephants grow older, they need the additional support that calcified cartilage, or bone, can provide, he said.

http://www.scientificamerican.com/article.cfm?id=hype-over-the-perils-of-meth

Meth Hype Could Undermine Good Medicine

Overstating the dangers of methamphetamine may impede treatment of drug abusers, asserts a review by Columbia University researchers

By Gary Stix | Tuesday, December 27, 2011 | 12

The 1936 film Reefer Madness developed a cult following because of its over-the-top depiction of the evils of marijuana. Getting stoned and going to a midnight showing became a ritual for many college students.

The recognition that pot is not a direct route to an asylum for the criminally insane, as it was for one character in the film, fueled the hilarity for late-night moviegoers. The divergence between perception and reality has become an issue in recent years for other recreational drugs.

Last month four scientists from Columbia University published an analysis of previous studies on methamphetamine use that called into question some of the purported damaging effects of the drug on brain functioning. The review in Neuropsychopharmacology found that short-term effects of the drug actually improve attention, as well as visual and spatial perception, among other things.

Moreover, chronic users - the ones who would be expected to suffer most - remain largely unimpaired. The researchers found that they experience brain and cognitive changes "on a minority of measures" in brain imaging and psychological tests. "Cognitive functioning overwhelmingly falls within the normal range," the report states, while adding that researchers' pre-existing assumptions about meth's detrimental effects "should be reevaluated to document the actual pattern of cognitive effects caused by the drug."

While recognizing the potential for abuse, the researchers emphasize that misinterpretations of the scientific evidence can wrongly stigmatize drug abusers and lead to misguided policymaking. One study, for instance, asserted that meth abusers might be too cognitively damaged to benefit from rehabilitative treatments, such as cognitive behavioral therapies. "Findings from this review argue that such concerns are unwarranted," the researchers state.

In Thailand, efforts to stem meth use have gone as far as banning all amphetamines, a class of drug that is used medically for treatment of ADHD and other conditions. "My main goal really was to make sure that we are rigorous in the science before we are political," says Carl Hart, a substance abuse researcher at Columbia who was the lead author on the Neuropsychopharmacology paper. "I think, with meth, we have been political." (Neuropsychopharmacology is part of Nature Publishing Group, which also includes Scientific American.)

The article asserts that some of the misconceptions surrounding meth go beyond findings on mental functioning. Drug education campaigns often publish photographs of "meth mouth," severe tooth decay among users because of the lack of saliva. But dry mouth is a condition common to other drugs, such as the prescription antidepressant Cymbalta and the ADHD medication Adderall.

Hart says he was impelled to do the research because of distortions of the evidence for harm from crack cocaine. During the crack cocaine epidemic in the 1980s and 1990s, pronouncements about lasting prenatal harm to children whose mothers used the drug turned out to be overblown: long-term effects on brain development and behavior were fairly small, and children were sometimes ostracized or received medical diagnoses that were mistakenly attributed to effects from the drug.

The review by Hart and colleagues elicited a firm counterpoint from National Institute on Drug Abuse director Nora Volkow, some of whose research is critiqued in the Neuropsychopharmacology paper. "Because of the far-reaching public health implications of this issue, it is essential not to forget what we do know about meth-induced neuropathology, which is plenty troubling," she says. Volkow points out that the vascular effects of meth can lead to strokes and hemorrhages. The drug, she notes, has also been shown to produce inflammation, atrophy and structural changes in brain tissue. "Similarly worrisome is a recent report of increased incidence of Parkinson's diseases among individuals with a past history of methamphetamine abuse [compared with] the general population," she says, adding that meth abuse can be "neurotoxic to the human brain."

Hart responds that he and his colleagues were careful to consider the full body of scientific literature, including animal studies. He points out that many animal studies used to extrapolate possible deleterious cognitive effects in humans had administered large amounts of methamphetamine from the outset, a regimen unlike the gradual escalation in dosing undertaken by illicit drug users, which avoids these consequences. The article emphasizes that serious medical consequences, such as paranoia and hypertension leading to stroke, are rare and only result from sustained ingestion of very large doses.

Meth's persistent bad boy reputation means that medical marijuana dispensaries will not be expanding their offerings to include speed any time soon. Still, the idea is not as totally outlandish as it might seem.

A much cited commentary that appeared in Nature in December 2008 - an article co-authored by neuroscientists and ethicists - raised the prospect of routine use of "cognitive enhancement" drugs by the general public if they could be proved safe.

The few drugs already on the market that come closest to meeting the definition of cognitive enhancers include Adderall (dextroamphetamine and amphetamine) and Ritalin (methylphenidate), close chemical cousins of methamphetamine. Ritalin and Adderall, in fact, have developed a reputation as executive's little helpers in the business world and were cited in the Nature commentary.

Hart and his colleagues never suggested that methamphetamine could serve as a pick-me-up for meeting pending work deadlines. Their review, though, looked at more than 10 studies that found that short-term use of meth actually improves several cognitive measures, precisely the kind of evidence the authors of the Nature article were calling for when considering the merits of enhancement.

The debate over methamphetamine, used widely by soldiers during World War II, reveals the ambivalent societal relationship toward potentially addictive compounds that can also serve as performance boosters. The hate-love relationship will likely continue into the indefinite future.

http://medicalxpress.com/news/2011-12-malaria-parasite-african-slave-south.html

Researchers trace origins of malaria parasite from African slave trade to South America

A new study has found evidence to support the premise that malaria was brought to South America via the African slave trade in the sixteenth century

PhysOrg.com - A new study done using DNA analysis and partly undertaken by the University of California, Irvine, has found evidence to support the premise that malaria was brought to South America via the African slave trade in the sixteenth century, rather than much earlier as some have suggested. The results of the study, led by evolutionary biologist Francisco Ayala, are to be published in the Proceedings of the National Academy of Sciences, show that the malaria parasite apparently had two sites of introduction, one in the northern part of South America and another in the south.

For many years there has been much debate about just how long ago malaria was introduced to South American populations. Were it to have been thousands of years ago, as some have theorized, the parasite would have had to travel over the Atlantic Ocean by bird or perhaps carried aloft, embedded in dust particles. With this new research however, such theories are likely to be put to rest.

To trace the roots of the malaria parasite in South America, Ayala and his colleagues collected samples of blood from people that had been infected with the protozoan from seventeen countries in South America, the Middle East, Africa and Southeast Asia. As each sample was gathered, DNA analysis was undertaken, comparing known stretches from each sample with all of the others collected. The team then performed mosquito generational estimates to come up with an approximation of how many years prior the malaria parasite must have first appeared in South American people.

Because of the inexactness of deriving estimates, the team calculated both high and low estimates based on either 12 or 6 mosquito generations per year. For the former, the team estimated that malaria arrived on the shores of South America some 217 to 495 years ago. For the later, it came to somewhere between 434 and 900 years ago.

In one area of first introduction, which appears to have occurred in a northern part of the continent; via Mexico perhaps, or in Columbia, the time estimates calculated overlap the time period during which Spanish slave traders were operating in those areas. Likewise, the second area of introduction appears to overlap with the time frame consistent with Portuguese slave traders operating in what is now Brazil.

Thus, the team concludes, it appears highly likely that the malaria parasite was introduced into South America by European slave traders bringing infected people from Africa to work as forced laborers in the precious metal mines and sugar cane fields.

More information: *"Multiple independent introductions of Plasmodium falciparum in South America," by Erhan Yalcindag et al. Proceedings of the National Academy of Sciences, Dec 26 2011.*

http://www.pasthorizonspr.com/index.php/archives/12/2011/humans-on-many-roads-to-asia

Humans on many roads to Asia

Modern humans possibly populated Asia in at least two migration waves

The discovery by Russian archaeologists of the remains of an extinct prehistoric human during the excavation of Denisova Cave in Southern Siberia in 2008 was nothing short of a scientific sensation. The sequencing of the nuclear genome taken from a circa. 30,000-year-old finger bone revealed that Denisova man was neither a Neanderthal nor modern human, but a new form of hominin. Minute traces of the Denisova genome are still found in some individuals living today. The comparisons of the DNA of modern humans and prehistoric human species provide new indications of how human populations settled in Asia over 44,000 years ago.

Tracking Denisovan DNA

As scientists from Harvard Medical School in Boston (USA) and the Max Planck Institute for Evolutionary Anthropology in Leipzig have discovered, the Denisova hominin passed on genetic material not only to populations that live in New Guinea today, but also to Australian aborigines and population groups in the Philippines. David Reich, professor of Genetics at Harvard Medical School, says: "The Denisovan DNA is comparable to a medical contrast agent that can be used to make a person's blood vessels visible. It has such a

high recognition value that even small volumes can be detected in individuals. Therefore, we were able to track down Denisovan DNA in human dispersals. The sequencing of prehistoric DNA is an important tool for researching human evolution."

The scientists have discovered that, contrary to the information available up to now, modern humans possibly populated Asia in at least two migration waves. According to David Reich, the original inhabitants who still populate Southeast Asia and Oceania today came from the first migration wave. Later migrations formed populations in East Asia that are related to the population found in Southeast Asia today.

Accordingly, Denisova hominins were spread across an extraordinarily large ecological and geographical area extending from Siberia to tropical Southeast Asia. "The fact that Denisovan DNA can be detected in some but not other original inhabitant populations living in Southeast Asia today shows that numerous populations with and without Denisovan DNA existed over 44,000 years ago," says Mark Stoneking, professor at the Department of Evolutionary Genetics at the Max Planck Institute for Evolutionary Anthropology and leading author of the study. "The simplest explanation for the presence of Denisovan genetic material in some but not all groups is that Denisova people themselves lived in Southeast Asia."

In December 2010, Svante Pääbo from the Max Planck Institute for Evolutionary Anthropology reported in the journal Nature that Denisova hominins contributed genes to human populations living in New Guinea today.

Genetic footprint

The new study, which was initiated by Mark Stoneking – an expert in the field of human genetic variation in Southeast Asia and Oceania – is now researching the genetic footprint that the Denisova hominin has left behind in us modern humans. The scientists analysed the genomes of 33 populations living in Southeast Asia and Oceania today, including people from Borneo, Fiji, Indonesia, Malaysia, Australia, the Philippines, Papua New Guinea and Polynesia. Some of this data were already available and others were recorded in the context of the current study.

Figure from the study, with pie charts showing how much archaic Denisova ancestry each population has, as a percent of what is found in New Guinea. Denisovan genes are only detected in eastern Southeast Asia and Oceania; they are not detectable at all in mainland Asia. **© Art For Science n. David Reich**

The analysis carried out by the researchers shows that the Denisova hominin contributed genetic material not only to the people living in New Guinea today but also to Australian aborigines, the Mamanwa, a Philippine "Negrito" group, and some other populations in eastern Southeast Asia and Oceania. In contrast, western and northwestern groups, including other "Negrito" groups, such as the Onge people who inhabit the Andaman Islands and the Jehai of Malaysia, and the mainland East Asians did not mix with the Denisova people.

The researchers conclude from this that Denisova hominins interbred with modern humans at least 44,000 years ago, before the Australians and inhabitants of New Guinea separated from each other. As opposed to this, Southeast Asia was first colonised by modern humans who were not related to today's Chinese and Indonesian populations. The latter arrived in the course of subsequent migratory movements. This hypothesis on the

settlement of Southeast Asia and Oceania, which is referred to as the "South Route" has already been substantiated by archaeological finds. However, strong support in the form of genetic evidence has yet to be found.

http://www.sciencedaily.com/releases/2011/12/111227092931.htm

Understanding Left-Handedness

Left-handedness is sometimes the expression of a genetic defect or an early developmental disturbance

ScienceDaily - Left-handedness is sometimes the expression of a genetic defect or an early developmental disturbance. In this issue of Deutsches Ärzteblatt International, Stefan Gutwinski and coauthors present the current scientific understanding of left- and right-handedness.

Left-handedness is found in all cultural groups. It arose early in the course of human evolution and played a key role in the development of higher cognitive functions. Human speech, for example, is thought to have arisen as an outgrowth of the unilateral cerebral control of manual communication by gesticulation. Likewise, it was only after handedness had become well established that very fine motor functions of the human hand could develop.

Most of the time, left-handedness is simply a naturally occurring, normal variant. In some cases, however, it is disadvantageous and may well reflect a genetic defect or early developmental disturbance. Thus, both left-handedness and extreme right-handedness seem to be more common among persons suffering from certain diseases.

This phenomenon can be observed, for example, in epilepsy, schizophrenia, and autism. Furthermore, current research suggests that diminished activity of the left cerebral hemisphere compared to the right may lead to depression, and the opposite imbalance to mania.

Story Source: *The above story is reprinted from materials provided by Deutsches Aerzteblatt, via AlphaGalileo.*

Journal Reference:*Gutwinski S, Löscher A, Mahler L, Kalbitzer J, Heinz A, Bermpohl F. Understanding left-handedness. Dtsch Arztebl Int, 2011; 108(50): 849%u201353 DOI: 10.3238/arztebl.2011.0849*

www.newscientist.com/article/mg21228440.800-saladbar-strategy-the-battle-of-the-buffet.html

Salad-bar strategy: The battle of the buffet

Competition, greed and skulduggery are the name of the game if you want to eat your fill. Smorgasbord behaviour is surprisingly complex

27 December 2011 by Jamie Condliffe

A mathematician, an engineer and a psychologist go up to a buffet… No, it's not the start of a bad joke.

While most of us would dive into the sandwiches without thinking twice, these diners see a groaning table as a welcome opportunity to advance their research.

Look behind the salads, sausage rolls and bite-size pizzas and it turns out that buffets are a microcosm of greed, sexual politics and altruism - a place where our food choices are driven by factors we're often unaware of. Understand the science and you'll see buffets very differently next time you fill your plate.

The story starts with Lionel Levine of Cornell University in Ithaca, New York, and Katherine Stange of Stanford University, California. They were sharing food at a restaurant one day, and wondered: do certain choices lead to tastier platefuls when food must be divided up? You could wolf down everything in sight, of course, but these guys are mathematicians, so they turned to a more subtle approach: game theory.

Applying mathematics to a buffet is harder than it sounds, so they started by simplifying things. They modelled two people taking turns to pick items from a shared platter - hardly a buffet, more akin to a polite tapas-style meal. It was never going to generate a strategy for any occasion, but hopefully useful principles would nonetheless emerge. And for their bellies, the potential rewards were great.

First they assumed that each diner would have individual preferences. One might place pork pie at the top and beetroot at the bottom, for example, while others might salivate over sausage rolls. That ranking can be plugged into calculations by giving each food item a score, where higher-ranked foods are worth more points. The most enjoyable buffet meal would be the one that scores highest in total.

In some scenarios, the route to the most enjoyable plate was straightforward. If both people shared the same rankings, they should pick their favourites first. But Levine and Stange also uncovered a counter-intuitive effect: it doesn't always pay to take the favourite item first. To devise an optimum strategy, they say, you should take into account what your food rival considers to be the worst food on the table.

If that makes your brow furrow, consider this: if you know your fellow diner hates chicken legs, you know that can be the last morsel you aim to eat - even if it's one of your favourites. In principle, if you had full knowledge of your food rival's preferences, it would be possible to work backwards from their least favourite

and identify the optimum order in which to fill your plate, according to the pair's calculations, which will appear in American Mathematical Monthly (arxiv.org/abs/1104.0961).

So how do you know what to select first? In reality, the buffet might be long gone before you had worked it out. Even if you did, the researchers' strategy also assumes that you are at a rather polite buffet, taking turns, so it has its limitations. However, it does provide practical advice in some scenarios. For example, imagine Amanda is up against Brian, who she knows has the opposite ranking of tastes to her. Amanda loves sausages, hates pickled onions, and is middling about quiche. Brian loves pickled onions, hates sausages, shares the same view of quiche. Having identified that her favourites are safe, Amanda should prioritise morsels where their taste-ranking matched - the quiche, in other words.

Not surprisingly, Levine and Stange found their two-person buffet strategy didn't work when they applied it to a scenario with more people. Even so, they found that rushing into grabbing favourites is not always advisable. This time, however, they modelled two general approaches: the "boorish lout" who would always pick their favourite food and the "gallant knight" who makes selections that take into account the enjoyment of others as well as their own. They found that if any of the diners act boorish, everybody ends up with a less satisfying meal than if every person acts gallantly (arxiv.org/abs/1110.2712). So it can pay to be altruistic - but not if there are any selfish diners.

Indeed, sometimes the only way to satisfy an appetite at a buffet is to pile your plate high while you can - and here's where some engineering know-how can apply. Software engineer Shen Hongrui, who lives in Beijing, China, found a way to fit an astonishing amount of food into one dish: piles reaching up to a metre tall. Shen had noticed that patrons of the salad buffet in Pizza Hut were asked to follow the rule: "one bowl, one visit". So he worked out how to build towers from salad items, and so maximise his haul. He even, with tongue firmly in cheek, ***published equations, diagrams and instructions online*** so others could repeat the feat. The key is to build a cylindrical tower using a base of radiating carrot sticks balanced on the bowl rim. "The foundations are very important, so choose dry and strong material," Shen advises. Then build walls of cucumber slices or fruit blocks, before filling the inside of the tower with any food items you want.

Bear in mind you may be thrown out for such mischief, though. Shen and his fellow salad architects were thwarted when Pizza Hut banned the practice in China. So, back to our hypothetical buffet. The engineers are busy building towers while the mathematicians scribble strategies on napkins. What are the psychologists up to? When they approach a buffet, they are more interested in spying on other people than eyeing up the food. Their findings could help explain many of the extra pounds you will inevitably pile on during the festive season.

Supersizing strategy

For example, Brian Wansink and colleagues at the Food and Brand Laboratory at Cornell University noticed that people with a high body mass index (BMI) sit on average 5 metres closer to a buffet than those with an average BMI, and 71 per cent face the food, compared with 26 per cent of people of average weight (Obesity, vol 16, p 1957). They were also more likely to go back for seconds. It's hardly earth-shattering news that larger people like food, of course, but with the right triggers anybody can be encouraged to gorge. Indeed, researchers at Georgia State University in Atlanta have shown that group size dramatically affects the number of calories consumed. If you are with one other person, you will eat 35 per cent more calories than if you dine alone. In a group of eight, you're looking at a whopping 90 per cent increase (Physiology & Behavior, vol 51, p 121).

The gender of eating companions also influences the food people eat - but it's more likely to influence women. In unpublished experiments, Wansink noticed that if a woman is next to a man at a buffet, about 12 per cent of what ends up on her plate will be determined by what he takes. If she's next to another woman, that jumps to 44 per cent. So women are influenced by both sexes. By contrast, men's choices were unaffected by either.

Clearly then, deciding between the sandwiches and pork pies is not such a straightforward task after all. A scientific mindset can be a terrible burden at the buffet. You can only imagine the hand-wringing that goes on at dessert. *Jamie Condliffe is a writer based in Oxford, UK*

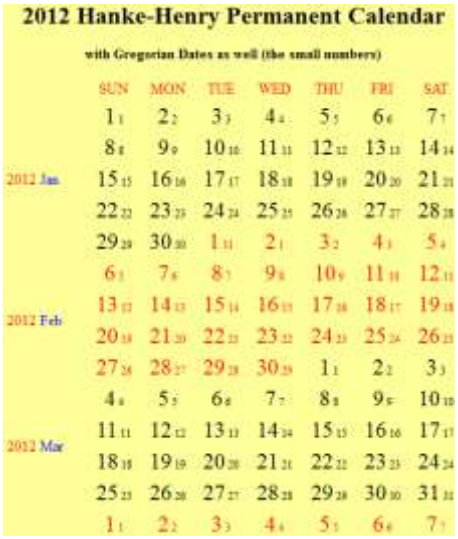
www.sciencedaily.com/releases/2011/12/111227142543.htm

Time for a Change? Overhauling the Calendar

Researchers at The Johns Hopkins University have discovered a way to make time stand still - at least when it comes to the yearly calendar.

ScienceDaily - Using computer programs and mathematical formulas, Richard Conn Henry, an astrophysicist in the Krieger School of Arts and Sciences and Steve H. Hanke, an applied economist in the Whiting School of Engineering, have created a new calendar in which each new 12-month period is identical to the one which came before, and remains that way from one year to the next in perpetuity.

Under the Hanke-Henry Permanent Calendar, for instance, if Christmas fell on a Sunday in 2012 (and it would), it will also fall on a Sunday in 2013, 2014 and beyond. In addition, under the new calendar, the rhyme "30 days hath September, April, June and November," would no longer apply, because September would have 31 days, as would June, March and December. All the rest have 30 (Try creating a rhyme using that.)



"Our plan offers a stable calendar that is absolutely identical from year to year and which allows the permanent, rational planning of annual activities, from school to work holidays," says Henry, who is also director of the Maryland Space Grant Consortium. "Think about how much time and effort are expended each year in redesigning the calendar of every single organization in the world and it becomes obvious that our calendar would make life much simpler and would have noteworthy benefits."

Among the practical advantages would be the convenience afforded by birthdays and holidays (as well as work holidays) falling on the same day of the week every year. But the economic benefits are even more profound, according to Hanke, an expert in international economics, including monetary policy.

"Our calendar would simplify financial calculations and eliminate what we call the 'rip off' factor," explains Hanke. "Determining how much interest accrues on mortgages, bonds, forward rate agreements, swaps and others, day counts are required. Our current calendar is full of anomalies that have led to the establishment of a wide range of conventions that attempt to simplify interest calculations. Our proposed permanent calendar has a predictable 91-day quarterly pattern of two months of 30 days and a third month of 31 days, which does away with the need for artificial day count conventions."

According to Hanke and Henry, their calendar is an improvement on the dozens of rival reform calendars proffered by individuals and institutions over the last century.

"Attempts at reform have failed in the past because all of the major ones have involved breaking the seven-day cycle of the week, which is not acceptable to many people because it violates the Fourth Commandment about keeping the Sabbath Day," Henry explains. "Our version never breaks that cycle."

Henry posits that his team's version is far more convenient, sensible and easier to use than the current Gregorian calendar, which has been in place for four centuries - ever since 1582, when Pope Gregory altered a calendar that was instituted in 46 BC by Julius Caesar.

In an effort to bring Caesar's calendar in synch with the seasons, the pope's team removed 11 days from the calendar in October, so that Oct. 4 was followed immediately by Oct. 15. This adjustment was necessary in order to deal with the same knotty problem that makes designing an effective and practical new calendar such a challenge: the fact that each Earth year is 365.2422 days long. Hanke and Henry deal with those extra "pieces" of days by dropping leap years entirely in favor of an extra week added at the end of December every five or six years. This brings the calendar in sync with the seasonal changes as the Earth circles the sun.

In addition to advocating the adoption of this new calendar, Hanke and Henry encourage the abolition of world time zones and the adoption of "Universal Time" (formerly known as Greenwich Mean Time) in order to synchronize dates and times worldwide, streamlining international business.

"One time throughout the world, one date throughout the world," they write, in a January 2012 Global Asia article about their proposals. "Business meetings, sports schedules and school calendars would be identical every year. Today's cacophony of time zones, daylight savings times and calendar fluctuations, year after year, would be over. The economy - that's all of us - would receive a permanent 'harmonization' dividend."

View a website about the Hanke-Henry Permanent Calendar here: http://henry.pha.jhu.edu/calendar.html
Read Hanke and Henry's January 2012 Global Asia article about calendar reform here:
http://www.cato.org/pub_display.php?pub_id=13940

http://www.physorg.com/news/2011-12-unexplored-link-airlines-profitability-accident.html

Study finds unexplored link between airlines' profitability and their accident rates

Airlines' accident risk is highest when they are performing very close to their financial targets

PhysOrg.com- Airlines' accident risk is highest when they are performing very close to their financial targets, according to a study by a professor in BYU's Marriott School of Management.

"The accident risk went down as they got further away from their financial goals in either direction," said Peter Madsen, assistant professor of organizational leadership and strategy. "Speaking generally, airlines are safest when their financial performance is either much better or must worse than it has been in the recent past."

The study will be published in a forthcoming issue of the Journal of Management, and is available online via the journal's "OnlineFirst" feature. It looked at 133 U.S. airlines from 1990 to 2007. Madsen's complex statistical analysis showed that for every 10 percent deviation in an airline's actual financial performance from its profitability goal, there is a 7 percent decrease in the likelihood of an accident. The results could be useful for airline managers and for regulators, who consider issues that affect millions of flights.

"I don't think people are saying consciously, 'We really want to hit this financial target, let's cut back on our safety expenditures,'" Madsen said. "But it's well documented that people will take risks to achieve goals, even if they don't realize they're doing it. Just being aware of these findings, and when you are close to hitting your targets, reminding people that safety is your number one concern, could reduce that tendency."

Additional financial incentives for safety "aren't a silver bullet," said Madsen, who has researched that subject. But they can balance the significance of financial or operational goals in employees' minds.

As for regulators, "this is an incredibly safe industry, so if we want to target the resources we spend on regulating it more effectively, we might want to focus on airlines performing close to their financial goals."

It's important to note that the risks Madsen studied are already miniscule.

"First-world airlines are almost incomprehensibly safe," he said, citing other research that reported a passenger would take a domestic flight every day for 36,000 years, on average, before dying in a crash. "It would be a mistake for anyone to use my findings to try to decide which airline to fly with."

Previous research into the link between profitability and safety in airlines has been inconsistent and even contradictory, typically seeking to explain the relationship in a"linear"fashion. Some studies found that safety improved as profits went up, others found that safety declined as profits went up. Madsen believes the new study identifies a better model for the effect of profitability on safety that could apply to lots of industries.

Madsen, who studies risk-taking in many industries, chose to focus this study on the airline industry because it's relatively easy to get lots of data about it. Even privately held airlines are required to disclose financial results, and the National Transportation Safety Board meticulously logs accidents.

During the period studied, the NTSB reported 915 accidents, which include death, serious injury or structural damage to aircraft. These ranged from fatal crashes to a plane being struck by a baggage cart. To double-check his results after his initial findings, Madsen ran his analysis again using airline "incidents," which are more broadly defined non-accidents that could affect the safety of the aircraft. The FAA reported 5,829 incidents during the period studied. The results held up.

"There was a very strong empirical pattern," Madsen said. That's why, although he did not examine data from other industries that have the potential to critically impact people's safety, he believes the findings apply to them as well – nuclear power, mining, maritime transportation, and more.

"It's quite likely you'd see the same pattern in other industries," Madsen said. "If anything, I think the airline industry is a conservative test because it is so safe and highly regulated." *Provided by Brigham Young University*

http://www.scientificamerican.com/article.cfm?id=when-viruses-invade-the-brain

When Viruses Invade the Brain

Neurodegenerative diseases may result from a nasal infection

By Stephani Sutherland | Wednesday, December 28, 2011 | 5

Neurodegenerative diseases were once considered disorders of the mind, rooted in psychology. Now viruses rank among the environmental factors thought to trigger brain-ravaging diseases such as multiple sclerosis (MS) and Alzheimer's disease. Human herpesvirus-6 (HHV-6), in particular, has been linked to MS in past studies. Neuroscientist Steven Jacobson and his colleagues at the National Institute of Neurological Disorders and Stroke have determined that the virus makes its entry to the human brain through the olfactory pathway, right along with the odors wafting into our nose.

The researchers tested samples of brain cells from people with MS and healthy control subjects and found evidence of the virus in the olfactory bulb in both groups. Infection via the nasal passage is probably quite common, as is harboring a dormant reservoir of HHV-6, but in people with MS, the virus is active. Genetics and other unknown environmental factors probably determine the likelihood of the virus reactivating once inside the brain, which can cause the disease to progress.

The virus appears to invade the brain by infecting a type of glial cell called olfactory ensheathing cells (OECs), which nourish smell-sensing neurons and guide them from the olfactory bulb to their targets in the nervous system. These targets include the limbic system, a group of evolutionarily old structures deep in the brain, "which is where viruses like to reactivate," Jacobson explains. He points out that olfactory neurons and their OECs are among the few brain cells known to regenerate throughout our life. This neurogenesis may keep our sense of smell sharp, but at the cost of providing the virus the opportunity to spread.

Tracing a virus' path to the brain

The olfactory system may provide a route to the brain for human herpesvirus-6, linked to neurologic disorders such as multiple sclerosis, encephalitis, and a form of epilepsy, a study suggests. Steven Jacobson and colleagues attempted to trace the virus' route of entry into the brain by examining brain tissue samples from human autopsies. Because the human olfactory system serves as a portal for some viruses, such as influenza and rabies viruses, the authors scoured olfactory tissues for signs of herpesvirus-6 by using a molecular technique that helped identify DNA from the virus. The authors detected HHV-6 DNA throughout the brain in autopsy samples from patients with multiple sclerosis and cancer; viral DNA was found largely in the olfactory bulb, a brain region involved in the detection of odors. In addition, HHV-6 DNA could be found in nasal mucus samples from healthy people, people suffering a loss of smell, and people with multiple sclerosis, suggesting that the nasal cavity, like saliva, might harbor the virus in healthy and diseased individuals. Further, the authors demonstrated that HHV-6 could successfully infect lab-grown human olfactory ensheathing cells, which help olfactory brain cells grow and establish connections in the brain. The finding suggests that the virus might deploy ensheathing cells as a bridge across the blood-brain barrier, according to the authors.

"Human herpesvirus-6 entry into the central nervous system through the olfactory pathway," by Erin Harberts, et al. 10.1073/pnas.1105143108

http://www.msnbc.msn.com/id/45807933/ns/business-retail/#.TvxKReSqnHk

Bugs may be resistant to genetically modified corn

A genetically engineered corn plant that makes its own insecticide may be losing its effectiveness because a pest appears to be developing resistance more quickly than expected

By RICK CALLAHAN

One of the nation's most widely planted crops - a genetically engineered corn plant that makes its own insecticide - may be losing its effectiveness because a major pest appears to be developing resistance more quickly than scientists expected. The U.S. food supply is not in any immediate danger because the problem remains isolated. But scientists fear potentially risky farming practices could be blunting the hybrid's sophisticated weaponry.

When it was introduced in 2003, so-called Bt corn seemed like the answer to farmers' dreams: It would allow growers to bring in bountiful harvests using fewer chemicals because the corn naturally produces a toxin that poisons western corn rootworms. The hybrid was such a swift success that it and similar varieties now account for 65 percent of all U.S. corn acres - grain that ends up in thousands of everyday foods such as cereal, sweeteners and cooking oil.

But over the last few summers, rootworms have feasted on the roots of Bt corn in parts of four Midwestern states, suggesting that some of the insects are becoming resistant to the crop's pest-fighting powers.

Scientists say the problem could be partly the result of farmers who've planted Bt corn year after year in the same fields.

Most farmers rotate corn with other crops in a practice long used to curb the spread of pests, but some have abandoned rotation because they need extra grain for livestock or because they have grain contracts with ethanol producers. Other farmers have eschewed the practice to cash in on high corn prices, which hit a record in June.

"Right now, quite frankly, it's very profitable to grow corn," said Michael Gray, a University of Illinois crop sciences professor who's tracking Bt corn damage in that state.

A scientist recently sounded an alarm throughout the biotech industry when he published findings concluding that rootworms in a handful of Bt cornfields in Iowa had evolved an ability to survive the corn's formidable defenses. Similar crop damage has been seen in parts of Illinois, Minnesota and Nebraska, but researchers are still investigating whether rootworms capable of surviving the Bt toxin were the cause.

University of Minnesota entomologist Kenneth Ostlie said the severity of rootworm damage to Bt fields in Minnesota has eased since the problem surfaced in 2009. Yet reports of damage have become more widespread, and he fears resistance could be spreading undetected because the damage rootworms inflict often isn't apparent.

Without strong winds, wet soil or both, plants can be damaged at the roots but remain upright, concealing the problem. He said the damage he observed in Minnesota came to light only because storms in 2009 toppled corn plants with damaged roots. "The analogy I often use with growers is that we're looking at an iceberg and all we see is the tip of the problem," Ostlie said. "And it's a little bit like looking at an iceberg through fog because the only time we know we have a problem is when we get the right weather conditions."

Seed maker Monsanto Co. created the Bt strain by splicing a gene from a common soil organism called Bacillus thuringiensis into the plant. The natural insecticide it makes is considered harmless to people and livestock.

Scientists always expected rootworms to develop some resistance to the toxin produced by that gene. But the worrisome signs of possible resistance have emerged sooner than many expected.

The Environmental Protection Agency recently chided Monsanto, declaring in a Nov. 22 report that it wasn't doing enough to monitor suspected resistance among rootworm populations. The report urged a tougher approach, including expanding monitoring efforts to a total of seven states, including Colorado, South Dakota and Wisconsin. The agency also wanted to ensure farmers in areas of concern begin using insecticides and other methods to combat possible resistance.

Monsanto insists there's no conclusive proof that rootworms have become immune to the crop, but the company said it regards the situation seriously and has been taking steps that are "directly in line" with federal recommendations.

Some scientists fear it could already be too late to prevent the rise of resistance, in large part because of the way some farmers have been planting the crop. They point to two factors: farmers who have abandoned crop rotation and others have neglected to plant non-Bt corn within Bt fields or in surrounding fields as a way to create a "refuge" for non-resistant rootworms in the hope they will mate with resistant rootworms and dilute their genes.

Experts worry that the actions of a few farmers could jeopardize an innovation that has significantly reduced pesticide use and saved growers billions of dollars in lost yields and chemical-control costs.

"This is a public good that should be protected for future generations and not squandered too quickly," said Gregory Jaffe, biotechnology director at the Center for Science and Public Policy.

Iowa State University entomologist Aaron Gassmann published research in July concluding that resistance had arisen among rootworms he collected in four Iowa fields. Those fields had been planted for three to six straight years with Bt corn - a practice that ensured any resistant rootworms could lay their eggs in an area that would offer plenty of food for the next generation. For now, the rootworm resistance in Iowa appears isolated, but Gassmann said that could change if farmers don't quickly take action. For one, the rootworm larvae grow into adult beetles that can fly, meaning resistant beetles could easily spread to new areas.

"I think this provides an important early warning," Gassmann said.

Besides rotating crops, farmers can also fight resistance by switching between Bt corn varieties, which produce different toxins, or planting newer varieties with multiple toxins. They can also treat damaged fields with insecticides to kill any resistant rootworms - or employ a combination of all those approaches.

The EPA requires growers to devote 20 percent of their fields to non-Bt corn. After the crop was released in 2003, nine out of 10 farmers met that standard. Now it's only seven or eight, Jaffe said.

Seed companies are supposed to cut off farmers with a record of violating the planting rules, which are specified in seed-purchasing contracts. To improve compliance, companies are now introducing blends that have ordinary seed premixed with Bt seed.

Brian Schaumburg, who farms 1,400 acres near the north-central Illinois town of Chenoa, plants as much Bt corn as he can every spring. But Schaumburg said he shifts his planting strategies every year - varying which Bt corn hybrids he plants and using pesticides when needed - to reduce the chances rootworm resistance might emerge in his fields. Schaumburg said he always plants the required refuge fields and believes very few farmers defy the rule. Those who do put the valuable crop at risk, he said. "If we don't do it right, we could lose these good tools," Schaumberg said.

If rootworms do become resistant to Bt corn, it "could become the most economically damaging example of insect resistance to a genetically modified crop in the U.S.," said Bruce Tabashnik, an entomologist at the University of Arizona. "It's a pest of great economic significance - a billion-dollar pest."

http://zocalopublicsquare.org/thepublicsquare/2011/11/30/how-doctors-die/read/nexus/

How Doctors Die

It's Not Like the Rest of Us, But It Should Be

by Ken Murray

Years ago, Charlie, a highly respected orthopedist and a mentor of mine, found a lump in his stomach. He had a surgeon explore the area, and the diagnosis was pancreatic cancer. This surgeon was one of the best in the country. He had even invented a new procedure for this exact cancer that could triple a patient's five-year-survival odds - from 5 percent to 15 percent - albeit with a poor quality of life. Charlie was uninterested. He went home the next day, closed his practice, and never set foot in a hospital again. He focused on spending time with family and feeling as good as possible. Several months later, he died at home. He got no chemotherapy, radiation, or surgical treatment. Medicare didn't spend much on him.

It's not a frequent topic of discussion, but doctors die, too. And they don't die like the rest of us. What's unusual about them is not how much treatment they get compared to most Americans, but how little. For all the time they spend fending off the deaths of others, they tend to be fairly serene when faced with death themselves.

They know exactly what is going to happen, they know the choices, and they generally have access to any sort of medical care they could want. But they go gently.

Of course, doctors don't want to die; they want to live. But they know enough about modern medicine to know its limits. And they know enough about death to know what all people fear most: dying in pain, and dying alone. They've talked about this with their families. They want to be sure, when the time comes, that no heroic measures will happen - that they will never experience, during their last moments on earth, someone breaking their ribs in an attempt to resuscitate them with CPR (that's what happens if CPR is done right).

Almost all medical professionals have seen what we call "futile care" being performed on people. That's when doctors bring the cutting edge of technology to bear on a grievously ill person near the end of life. The patient will get cut open, perforated with tubes, hooked up to machines, and assaulted with drugs. All of this occurs in the Intensive Care Unit at a cost of tens of thousands of dollars a day. What it buys is misery we would not inflict on a terrorist. I cannot count the number of times fellow physicians have told me, in words that vary only slightly, "Promise me if you find me like this that you'll kill me." They mean it. Some medical personnel wear medallions stamped "NO CODE" to tell physicians not to perform CPR on them. I have even seen it as a tattoo.

To administer medical care that makes people suffer is anguishing. Physicians are trained to gather information without revealing any of their own feelings, but in private, among fellow doctors, they'll vent. "How can anyone do that to their family members?" they'll ask. I suspect it's one reason physicians have higher rates of alcohol abuse and depression than professionals in most other fields. I know it's one reason I stopped participating in hospital care for the last 10 years of my practice.

How has it come to this - that doctors administer so much care that they wouldn't want for themselves? The simple, or not-so-simple, answer is this: patients, doctors, and the system.

To see how patients play a role, imagine a scenario in which someone has lost consciousness and been admitted to an emergency room. As is so often the case, no one has made a plan for this situation, and shocked and scared family members find themselves caught up in a maze of choices. They're overwhelmed. When doctors ask if they want "everything" done, they answer yes. Then the nightmare begins. Sometimes, a family really means "do everything," but often they just mean "do everything that's reasonable." The problem is that they may not know what's reasonable, nor, in their confusion and sorrow, will they ask about it or hear what a physician may be telling them. For their part, doctors told to do "everything" will do it, whether it is reasonable or not.

The above scenario is a common one. Feeding into the problem are unrealistic expectations of what doctors can accomplish. Many people think of CPR as a reliable lifesaver when, in fact, the results are usually poor. I've had hundreds of people brought to me in the emergency room after getting CPR. Exactly one, a healthy man who'd had no heart troubles (for those who want specifics, he had a "tension pneumothorax"), walked out of the hospital. If a patient suffers from severe illness, old age, or a terminal disease, the odds of a good outcome from CPR are infinitesimal, while the odds of suffering are overwhelming. Poor knowledge and misguided expectations lead to a lot of bad decisions.

But of course it's not just patients making these things happen. Doctors play an enabling role, too. The trouble is that even doctors who hate to administer futile care must find a way to address the wishes of patients and families. Imagine, once again, the emergency room with those grieving, possibly hysterical, family members. They do not know the doctor. Establishing trust and confidence under such circumstances is a very delicate thing. People are prepared to think the doctor is acting out of base motives, trying to save time, or money, or effort, especially if the doctor is advising against further treatment.

Some doctors are stronger communicators than others, and some doctors are more adamant, but the pressures they all face are similar. When I faced circumstances involving end-of-life choices, I adopted the approach of laying out only the options that I thought were reasonable (as I would in any situation) as early in the process as possible. When patients or families brought up unreasonable choices, I would discuss the issue in layman's terms that portrayed the downsides clearly. If patients or families still insisted on treatments I considered pointless or harmful, I would offer to transfer their care to another doctor or hospital.

Should I have been more forceful at times? I know that some of those transfers still haunt me. One of the patients of whom I was most fond was an attorney from a famous political family. She had severe diabetes and terrible circulation, and, at one point, she developed a painful sore on her foot. Knowing the hazards of hospitals, I did everything I could to keep her from resorting to surgery. Still, she sought out outside experts with whom I had no relationship. Not knowing as much about her as I did, they decided to perform bypass surgery on her chronically clogged blood vessels in both legs. This didn't restore her circulation, and the

surgical wounds wouldn't heal. Her feet became gangrenous, and she endured bilateral leg amputations. Two weeks later, in the famous medical center in which all this had occurred, she died.

It's easy to find fault with both doctors and patients in such stories, but in many ways all the parties are simply victims of a larger system that encourages excessive treatment. In some unfortunate cases, doctors use the fee-for-service model to do everything they can, no matter how pointless, to make money. More commonly, though, doctors are fearful of litigation and do whatever they're asked, with little feedback, to avoid getting in trouble.

Even when the right preparations have been made, the system can still swallow people up. One of my patients was a man named Jack, a 78-year-old who had been ill for years and undergone about 15 major surgical procedures. He explained to me that he never, under any circumstances, wanted to be placed on life support machines again. One Saturday, however, Jack suffered a massive stroke and got admitted to the emergency room unconscious, without his wife. Doctors did everything possible to resuscitate him and put him on life support in the ICU. This was Jack's worst nightmare. When I arrived at the hospital and took over Jack's care, I spoke to his wife and to hospital staff, bringing in my office notes with his care preferences. Then I turned off the life support machines and sat with him. He died two hours later.

Even with all his wishes documented, Jack hadn't died as he'd hoped. The system had intervened. One of the nurses, I later found out, even reported my unplugging of Jack to the authorities as a possible homicide. Nothing came of it, of course; Jack's wishes had been spelled out explicitly, and he'd left the paperwork to prove it. But the prospect of a police investigation is terrifying for any physician. I could far more easily have left Jack on life support against his stated wishes, prolonging his life, and his suffering, a few more weeks. I would even have made a little more money, and Medicare would have ended up with an additional $500,000 bill. It's no wonder many doctors err on the side of overtreatment.

But doctors still don't over-treat themselves. They see the consequences of this constantly. Almost anyone can find a way to die in peace at home, and pain can be managed better than ever. Hospice care, which focuses on providing terminally ill patients with comfort and dignity rather than on futile cures, provides most people with much better final days. Amazingly, studies have found that people placed in hospice care often live longer than people with the same disease who are seeking active cures. I was struck to hear on the radio recently that the famous reporter Tom Wicker had "died peacefully at home, surrounded by his family." Such stories are, thankfully, increasingly common.

Several years ago, my older cousin Torch (born at home by the light of a flashlight - or torch) had a seizure that turned out to be the result of lung cancer that had gone to his brain. I arranged for him to see various specialists, and we learned that with aggressive treatment of his condition, including three to five hospital visits a week for chemotherapy, he would live perhaps four months. Ultimately, Torch decided against any treatment and simply took pills for brain swelling. He moved in with me.

We spent the next eight months doing a bunch of things that he enjoyed, having fun together like we hadn't had in decades. We went to Disneyland, his first time. We'd hang out at home. Torch was a sports nut, and he was very happy to watch sports and eat my cooking. He even gained a bit of weight, eating his favorite foods rather than hospital foods. He had no serious pain, and he remained high-spirited. One day, he didn't wake up. He spent the next three days in a coma-like sleep and then died. The cost of his medical care for those eight months, for the one drug he was taking, was about $20.

Torch was no doctor, but he knew he wanted a life of quality, not just quantity. Don't most of us? If there is a state of the art of end-of-life care, it is this: death with dignity. As for me, my physician has my choices. They were easy to make, as they are for most physicians. There will be no heroics, and I will go gentle into that good night. Like my mentor Charlie. Like my cousin Torch. Like my fellow doctors.

Ken Murray, MD, is Clinical Assistant Professor of Family Medicine at USC.

http://medicalxpress.com/news/2011-12-source-defuses-copyright-law-threat.html

Open source licensing defuses copyright law's threat to medicine

Enforcing copyright law could interfere with patient care, stifle innovation and discourage research. Using open source licensing could prevent the problem

Medical Xpress - Enforcing copyright law could potentially interfere with patient care, stifle innovation and discourage research, but using open source licensing instead can prevent the problem, according to a physician – who practices both at the University of California, San Francisco and the San Francisco VA Medical Center – and a legal scholar at the UC Hastings College of Law.

"For a long time, doctors have been able to ignore copyright, but that is changing in a dramatic way," said John Newman, MD, PhD, of UCSF and SFVAMC. "The exercise of copyright is creating a threat to basic

medical care," said Robin Feldman, JD, professor of law and Director of the Law and Bioscience Project at UC Hastings.

They discuss the issue in a "Perspective" in the Dec. 29 issue of the New England Journal of Medicine.

The incident that prompted Newman and Feldman's analysis was the removal from the internet of the Sweet 16, a freely available clinical assessment tool used by physicians to screen patients for cognitive problems. The tool was taken down because of legal action by the creators of a similar tool called the Mini-Mental State Examination (MMSE).

Clinical tools tend to resemble one another, Newman said, "not because their creators are unoriginal, but because the tools are based on the same research and the same science."

Newman and Feldman recount that in 2000, the creators of the MMSE, first published in 1975 and "the de facto standard for cognitive screening," began to enforce ownership rights; soon after, they started charging a licensing fee for each copy of the examination. In March 2011, the Sweet 16, which contained comparable types of questions, was removed from the public domain at the request of the MMSE creators. Newman called it "the first case I am aware of where a clinical tool was taken down from publication in an apparent copyright dispute." The authors of the MMSE have not commented on the case.

Newman said that the incident could have very wide-ranging effects because there are "hundreds and hundreds of tools that we use in medicine every day to make clinical decisions about a patient – from assessing pain to assessing functional status to doing cognitive testing to deciding someone's risk of a hip fracture – that fall under copyright law." Their creators "could decide to do the same thing that the authors of the MMSE did – start charging for their use and attempt to shut down the availability of comparable tools."

The resulting flurry of legal actions would not only affect patient care, but impede the improvement of clinical tools, Feldman said. "Traditionally, in medicine, tests were created, people shared their work, and those who improved the work shared their improvements," she said. "No one expected fences to be erected around these works, and then a toll charged to cross the fence."

To prevent such a scenario, Newman and Feldman recommend that the creators of new and existing clinical tools place their works under open source copyright, known colloquially as "copyleft."

Under open source copyright, explained Feldman, "the author retains all rights to the work, as in traditional copyright, but grants everyone else the right to freely use, modify, copy, and distribute that work, as long as they do so under the same open terms."

Google, Apple, Facebook and Twitter all make use of open source software within their products, Feldman said. "It's a very well-developed and well-respected method of protecting copyright while allowing public use and encouraging continual improvement." Newman speculated that if open source copyright is not employed in medicine, "In 20 years, we could be in a world where as physicians walk down the hallway interviewing patients, they're tallying up the licensing fees they need to pay for doing their day's work, and hospitals are suing each other or making cross-licensing arrangements to manage each other's intellectual property. It doesn't make sense in terms of fostering progress and innovation, but it's a potential consequence of the law."

Newman acknowledged that the creators of the MMSE "were acting under the law. This is not about the actions of one person or one company, but about how the law applies to our work in medicine. We need to fix the problem on a global scale and change the way we behave, because any one of us might choose to act in the same way." *Provided by University of California, San Francisco*

http://medicalxpress.com/news/2011-12-swine-flu-strain-resistant-tamiflu.html

Swine flu strain that is resistant to Tamiflu is spreading more easily

The version of so-called swine flu that is resistant to the drug Tamiflu is spreading more easily in the land Down Under.

The flu season is still young in the United States and the rest of the Northern Hemisphere, but Australia wrapped up its flu season months ago, and public health officials there have some disturbing news to report: The version of so-called swine flu that is resistant to the drug Tamiflu is spreading more easily in the land Down Under.

For those in need of a refresher course, swine flu refers to the H1N1 flu virus that caused a pandemic in 2009. It emerged in April in Mexico and spread swiftly around the globe, traveling to 214 countries and territories and killing more than 18,000 people, according to the World Health Organization. Humans were unusually vulnerable to this particular strain - a combination of viruses from birds, pigs and people - because their immune systems had never encountered it before.

Tamiflu, also known by the generic name oseltamivir, was frequently prescribed to patients, and it didn't take long for a version of H1N1 to emerge that was resistant to the drug. Luckily, this strain was a minor player,

infecting less than 1 percent of people who were tested. In those cases, it spread between people only when they were in closed settings or had close contact with one another. Fast-forward to 2011. In and around the Australian city of Newcastle, the Tamiflu-resistant H1N1 virus was spreading more easily among humans, according to a report being published in Thursday's edition of the New England Journal of Medicine.

Public health officials took virus samples from 182 patients treated in doctors' offices and hospitals between May and August. They found that 29 of those samples - or 16 percent - turned out to be resistant to Tamiflu.

The 29 patients ranged in age from 4 months to 62 years, with a median age of 31; 17 of the patients were female, including three who were pregnant. Among all 29 patients, the most common flu symptoms were cough (experienced by 86 percent of patients) and fever (affecting 76 percent of patients). Seven patients required admission to the hospital, but none was treated in the ICU and none died.

Genetic analysis of the flu samples revealed that all of the 29 patients were infected with a single strain. Most of these patients lived within about 30 miles of Newcastle, the seventh largest city in Australia. (Two related strains were detected elsewhere in Australia, including 100 miles away in Sydney, the country's largest city.)

It is unclear how the Tamiflu-resistant strain spread from person to person. Eight of the patients lived with another person who was infected, and two other patients rode together in a car. The rest of the patients "had no known epidemiologic link," according to the report. The authors of the report, including three scientists working for the World Health Organization, warned flu experts in the Northern Hemisphere to be on the lookout for this flu strain - or any other strain that is resistant to Tamiflu - this winter.

http://news.discovery.com/earth/invasive-tasty-tiger-prawns-prowl-gulf-waters-111229.html

Invasive, Tasty Tiger Prawns Prowl Gulf Waters

Bring out the melted butter and cocktail sauce. There's an invasive species to eat.

By Tim Wall | Thu Dec 29, 2011 12:56 PM ET

Nearly 100 sightings of the giant tiger prawn (Penaeus monodon) have been reported in Louisiana waters in 2011, according to Houma Today, a big jump from the 25 to 30 reported in past years. Considering that some of the sightings numbered close to 100 individuals, there seems to be a growing population of the nonnative shrimp prowling Gulf waters. This year, the U.S. Geological Survey received increasing reports of the species in Mississippi, Florida, Louisiana and Texas, marking the Lone Star State's first taste of the tiger prawn, reported the Houston Chronicle.

The invasive crustaceans can offer up to 13 inches and 11 ounces of deliciousness, which is why U.. farmers brought the prawns here from their home waters on the coasts of Australia, South East Asia, South Asia and East Africa.

The black and yellow striped prawns may have started their invasion after escaping from a aquaculture operation in South Carolina in 1988, noted the Houston Chronicle. Or they could have made their break after hurricanes Katrina and Rita in 2005.

“There’s a certain unknown about what ecological impacts that something nonindigenous like this can have on the local environment,” said Marty Bourgeois, a biologist with the Louisiana Department of Wildlife and Fisheries, in Houma Today.

Tiger prawn are voracious predators and are known to harbor numerous diseases that could spread to white and brown shrimp, oysters, and crabs in the Gulf.

There may be one way to lick this problem, literally. The Louisiana Department of Wildlife and Fisheries has advised fisherman that the prawns should not be thrown back into any waters other than a boiling soup pot.

“I haven’t had them myself, but I’ve been told they have a sweet flavor,” Bourgeois said.

Tiger prawns could join the list of invasive species humans seek to control by eating, like wild pigs, lionfish and nutria, noted Mother Nature Network.

The tiger prawn also fetches a higher price than many other shrimp. But Leslie Hartman, of the Texas Parks and Wildlife Department, is skeptical the economic value will outweigh the damage to the native shrimp population.

"It could be another crop, but at the expense of our native crop," Hartman said in the Houston Chronicle.

For right now, researchers are trying to track down the source of the prawns using genetic evidence.

“We’re collecting them, and we’ve got some researchers looking at the genetics,” Bourgeois said. “It may help explain if they’re spawning here or if they’re riding the current into the area somehow.”

Only adults have been found in Louisiana waters, so researchers hope they may be breeding farther south and migrating north.

http://www.securitynewsdaily.com/hacker-satellites-internet-censorship-1457/

Hackers Plan Satellites To Block Internet Censorship

The Chaos Computer Club wants to send satellites into orbit to block Internet censorship

Dec 30, 2011 | 3:21 PM ET | By Matt Liebowitz, SecurityNewsDaily Staff Writer

"Let's take the Internet out of the control of terrestrial entities." This call to arms, issued by hacker activist Nick Farr, is the rallying cry behind a new plan to launch satellites into space to prevent Internet censorship. Farr, a spokesperson for the Germany-based Chaos Computer Club, outlined the group's mission at this week's Chaos Communication Congress in Berlin, the BBC reported.

Calling for an "uncensorable Internet in space," Farr outlined the CCC's Hackerspace Global Grid, a project that also will involve setting up low-cost ground stations to track and communicate with the fast-moving satellites.

The time is now

Farr, who introduced and began soliciting donations for the Hackerspace Global Grid this summer, said the project is now a top priority because of the Stop Online Piracy Act (SOPA), a bill that some critics say could have catastrophic effects on freedom of communication and the way people connect to the Internet.

"Hackers are about open information; we believe communication is a human right," Farr said. The CCC's only motive in launching the proposed satellites is knowledge, he said, and the desire to "put humanity back in space in a meaningful way." Working with Constellation, a German aerospace research initiative, the Hackerspace Global Grid plans to have three prototype ground stations in place by the first half of 2012.

Tricky tech and a legal black hole

The hackers might not have an easy go of it, Alan Woodward, a computer science professor at the University of Surrey, told the BBC. "Low-Earth-orbit satellites, such as have been launched by amateurs so far, do not stay in a single place but rather orbit, typically every 90 minutes," Woodward said. "That's not to say they can't be used for communications, but obviously only for the relatively brief periods that they are in your view." "It's difficult to see how such satellites could be used as a viable communications grid other than in bursts," he added.

There's a legal black hole to contend with, as well: Outer space is not governed by the countries beneath it, Woodward explained, so while the CCC's satellites could function as planned, "any country could take the law into their own hands and disable the satellites."

www.wired.com/reviews/2011/12/reviews_pcr/

Whip Up Some DNA With a Home PCR Machine

Open PCR Thermal Cycler Household - $599

Reviewed by Aaron Rowe Email Author · December 27, 2011

Let's say you want to identify the mold on that leftover pizza or do a very discreet paternity test. You're going to need DNA. A lot of it. Labs take the few molecules from a cheek swab and replicate them with a PCR machine until there are billions. But those machines cost $3,000 and up.

The new OpenPCR box does the same for the cost of an iPad, and it's about as easy to use. Place a little bit of your sample into a 0.2-ml plastic tube along with a few microliters of PCR mix, drop the tube into one of the dimples on top of the box, and enter the times and temperatures on the desktop control software. few hours and dozens of heating and cooling cycles later, you've got enough DNA for sorting and sequencing. You do have a sequencing machine, right?

WIRED Excellent documentation. Coffeemaker footprint. Works with Windows, Mac, or Linux machines.

TIRED Assembly takes four hours. Pedestrian control software. No optics for monitoring reactions as they progress.

http://www.wired.com/wiredscience/2011/12/scorpion-fluorescence/

Glowing Scorpion Exoskeletons May Be Giant Eyes

Scorpion bodies are studded with eyes, sometimes as many as twelve — and scientists may have found one more.

By Dave Mosher Email Author

A scorpion's entire exoskeleton may act as one giant light receptor, a full-body proto-eye that detects shadows cast by moonlight and starlight. That's still just a hypothesis, but it would help explain why they glow so brilliantly under ultraviolet light. "It might be a sort of alarm that's always going off until the scorpion finds

shelter," said biologist Douglas Gaffin of the University of Oklahoma. "Shade might turn down the alarm on that part of their body, so they preferentially move in that direction."

No matter their color in daylight, be it jet-black or translucent, ultraviolet light makes pigments embedded in their exoskeletons emit photons. That property is called fluorescence, and nobody knows quite why scorpions possess it. Suggested explanations include mating signals or evolutionary leftovers of natural sunscreen needed before they became nocturnal. Whatever the case, 430 million-year-old fossils of scorpion relatives called eurypterids suggest their fluorescence has been around for a very long time.

Fluorescent scorpion Furryscaly/Flickr

Gaffin, leader of a study published Dec. 19 in Animal Behavior, noticed during scorpion collection expeditions that one desert grassland species, called Paruroctonus utahensis, always seemed to scurry under something, even in total darkness. "You eventually wonder, "how do they find that one blade of grass and stay under it?" he said. Gaffin wasn't the first to wonder if fluorescence played a part, perhaps by converting ultraviolet sunlight and moonlight into a color visible to scorpion eyes, which are attuned to greenish wavelengths.

One researcher bleached fluorescent pigments from scorpions, covered their eyes and showed they could no longer discern shelter from open space. Another study showed nerves in their tails fired when green light (the same color of fluorescence) was shined on the body part.

Taking the research a step further, Gaffin and his colleagues recorded the behavior of more than 100 scorpions under UV, green light and longer wavelengths their eyes couldn't see. The researchers completely blocked some scorpions' eyes with foil to determine whether exoskeletons alone could "see" anything. They found that eyes-blocked scorpions moved just as erratically under UV light as their unblinkered brethren.

"Maybe they're collecting stray UV light, maybe starlight, and pigments turn it to green, and that's what their nervous system is picking up on," Gaffin said. "How do they do this? I don't know." Starlight is far dimmer than moonlight, barely enough to make scorpion pigments fluoresce. But Gaffin said the vast quantity of pigments may add up in sensitivity to something comparable to an eye. To probe the idea further, Gaffin plans to coat scorpions with UV-blocking sunscreen. There's just one problem: It kills them in a couple of days. "I might cover them in scotch tape, then put the sunscreen on that," Gaffin said. "I'll find something that works."

Citation: *"Scorpion fluorescence and reaction to light." By Douglas D. Gaffin, Lloyd A. Bumm, Matthew S. Taylor, Nataliya V. Popokina and Shivani Mann. Animal Behavior, published online ahead of print. DOI: 10.1016/j.anbehav.2011.11.014*

http://www.wired.com/wiredscience/2011/12/aristarchus-crater/

Dazzling Satellite Views of Vast Moon Crater

One of the brightest features on the moon's surface, Aristarchus can easily be spotted with the naked eye, though even modest binoculars will greatly enhance the view.

By Adam Mann Email Author

Going one better, NASA's Lunar Reconnaissance Orbiter snapped this spectacular image as it swooped down to just 16 miles above the lunar surface, or just twice as high as commercial airliners fly on Earth.

Twice as deep as the Grand Canyon and 26 miles wide, Aristarchus was created when an asteroid hit the moon approximately 450 million years ago. The impact excavated deep into the lunar crust and produced dark clumps and streamers of pyroclastic ash—glasses formed during fiery eruptions similar to those in the Hawaiian Islands. Ledges seen on the wall are topped with sagging blocks of pre-impact lunar crust.

The full panorama photo shows an area nearly two miles high and 15 miles wide. But features down to just 15 inches across can be resolved, so try zooming in on your favorite boulder.

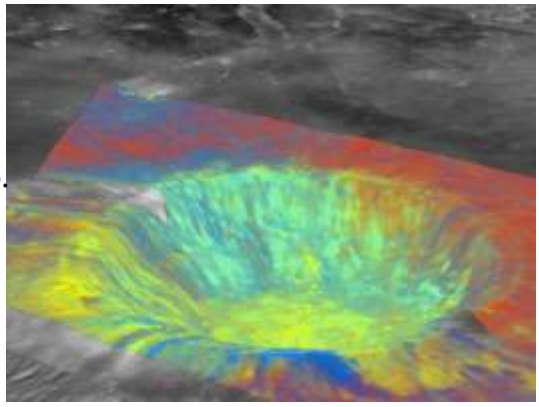
This towering silver wall is one small section of the moon's enormous Aristarchus crater. **Images: NASA/GSFC/Arizona State University**

Aristarchus crater is located in the northwest part of the moon's near side. East and south of the crater lies the largest lunar mare, Oceanus Procellarum, created by enormous outpourings of lava early in the moon's history.

Northwest of the crater is the mysterious Aristarchus plateau, one of the most geologically diverse areas on the moon. Strange features known as transient lunar phenomenon have appeared on this plain, though scientists are still mystified as to their cause.

NASA's Hubble space telescope imaged Aristarchus crater using ultraviolet and visible wavelengths to produce this psychedelic photo. It potentially reveals the presence of ilmenite, a titanium mineral rich in oxygen.

Ilmenite is important because its oxygen can be easily extracted, making it valuable for rocket fuel and life support. Because of this, Aristarchus was high on the list of possible landing sites for the Apollo program and may be considered once again should people ever return to the moon.



Aristarchus in Color **Image: NASA**

http://www.scientificamerican.com/podcast/episode.cfm?id=the-elderly-react-slowly-because-th-11-12-31

The Elderly React Slowly Because They Want To Be Right

Recent studies have found that the elderly may respond more slowly to specific tasks but not because their cognitive skills are slower. Christie Nicholson reports

Download MP3

Older folks may appear to react or process info slowly. But there may be a method to their meander-ness: they're making sure they get it right.

Scientists gave undergrads and adults over 60 visual tests. In one, a computer screen would show an array of asterisks and the subjects had to choose as fast as they could whether there were between 31 and 50 or between 51 and 70. In a second test, the subjects saw a string of letters and quickly decided whether the letters spelled a real English word or not.

The researchers found little difference in accuracy between the younger and older subjects, although undergrads had significantly faster response times. But the older participants' slower response times were not all the result of a decline in skills. In other tests, the older subjects were encouraged to decide faster, and their response times greatly decreased with hardly any loss of accuracy.

The researchers think it might be a greater desire to avoid mistakes that makes the elderly more deliberate. Because, as the old adage says: if you don't have time to do something right, how will you find the time to do it again?

http://medicalxpress.com/news/2012-01-facebook-route-kidney.html

For some in need, Facebook is route to new kidney

Here's another reason for holdouts to join the social media site Facebook: It's a great place to find a kidney.

(AP) - Between the kid photos and reminiscences about high school, more and more pleas for help from people with failing kidneys are popping up. Facebook and other social media sites are quickly becoming a go-to place to find a generous person with a kidney to spare, according to the people asking for help and some national organizations that facilitate matches.

Damon Brown found a kidney on Facebook after telling his story on a special page the Seattle dad created under the name, "Damon Kidney." His friends and family forwarded the link to everyone they knew and on Jan. 3 a woman his wife has known for years, but not someone they consider a close family friend, will be giving him a kidney.

"She said it wasn't really for me. It was for my kids, because they deserve to have a dad around," said Brown, 38.

Brown's story is not unique, said April Paschke, a spokeswoman for the United Network for Organ Sharing, a private nonprofit organization that manages the nation's organ transplant system for the federal government.

"We see more and more people matched up by social media," she said. "It's an extension of the way we communicate. Before we found the Internet, people found other ways: through a church bulletin, word of mouth or an advertisement even."

This past year, a man in Michigan also found a kidney donor through Facebook, and a Florida woman found one through Craigslist.

Damon Brown admits he was a little embarrassed to ask for help so publicly. Except for telling close friends and family, the Seattle father of two young boys had been keeping his illness pretty quiet.

He was on the official transplant list and had started mobile dialysis through Northwest Kidney Centers but Brown was seeing his health deteriorate - he was constantly tired and achy. He couldn't sit on the bed to tell bedtime stories to 5-year-old Julian and 3-year-old Theo because he had to stay close to his dialysis machine.

"I'm a strong guy, but I would have to say, it's been rough this year," he said. Brown had put himself on the long wait list for a kidney from a deceased donor, knowing he would have to wait at least three years before he was called.

After one particularly difficult visit with his doctor, Damon and his wife, Bethany, decided to create the Facebook page, which has attracted more than 1,400 friends.

A few weeks ago, after the transplant was approved and scheduled, Brown posted the good news to his Facebook friends. More than 300 people responded: "Whoo hoo....what a great Christmas present," wrote Kelly L. Hallissey. "This is awesome!! Praying for you and your family for positive news and a great way to begin 2012!" wrote Brenda Tomtan.

Many people are not aware that kidney and liver donations can now come from living donors.

In 2010, 16,800 kidney transplants were performed in the United States, of which 6,277 came from living donors, according to the United Network for Organ Sharing. An average of 46 kidney transplants take place each day in this country, while another 13 people who have been waiting for a kidney die each day. About 90,000 are on the transplant list right now.

Jacqueline Ryall, 45, said she felt a need to donate a kidney to Brown to give back her own good health and all she has been given. She's not a mom and gushed about how beautiful Damon and Bethany's kids are.

"The real reason I'm doing this is he's got kids and he's a good guy," she said. "My life is in a good place. I've been given lots and I have a responsibility to give back."

Ryall said her elderly mother does not understand why she would give a kidney to someone other than her own brother and sister, and her family is worried about her health going forward.

After her own research, however, Ryall decided it's relatively safe for a woman in good health to donate a kidney. If something is going to go wrong with her own kidneys, she has heard they usually fail in twos.

"Right now it feels like absolutely the right thing to do," she said, adding that she hopes her decision will help make other people less afraid to do the same thing.

News media coverage of his quest flooded his hospital with so many requests for information - from total strangers - that Brown said he was asked to pull back on his publicity efforts. Four people passed the initial screening and came in for tests. Now that he sees a happy ending coming for himself, Brown would like to do whatever he can to help others.

April Capone, the previous mayor of East Haven, Conn., knows what Brown means about the attraction of happy endings.

Two years ago, she was sitting in her office checking her Facebook feed, when a post from one of her constituents popped up saying he needed a kidney.

"At that moment, Carlos was at Mayo, testing to get on the transplant list," said Capone, 36. "He really didn't tell anyone he was sick. The doctor said, `if you don't do it, no one is going to know'." So Carlos Sanchez pulled out his cell phone and posted the request and Capone responded immediately.

"I knew from the second I saw his post that I was going to be a donor," said Capone, who barely knew Sanchez at the time. Now they're as close as siblings, talk on the phone almost daily and meet for lunch regularly.

Capone said she had no personal reason for donating a kidney; she just want to save a life.

"It was the best thing I ever did with my life," she said. "I wish I had more; I would do it again."

Scott, Amundsen... and Nobu Shirase

Japan also had a heroic explorer dashing to the South Pole 100 years ago – and he did it on a shoestring

29 December 2011 by **Stephanie Pain**

FOR a few weeks in January 1912, Antarctica was teeming with explorers. Roald Amundsen and his Norwegian party had reached the South Pole on 14 December and were speeding back to the coast. On 17 January, Robert Scott and the men of the British Antarctic expedition had arrived at the pole to find they had been beaten to it. Dejected, they began to retrace their steps in what turned out to be their final journey. Just then, a third man with polar aspirations arrived on the scene. Nobu Shirase was a little late but no less determined to cover himself in glory.

In the story of the race to the South Pole, Shirase is the invisible man. A Japanese explorer, his part in one of the greatest adventure stories of the 20th century is hardly known outside his own country. Yet as Scott was

nearing the pole and with the world still unaware of Amundsen's triumph, Shirase and the Japanese Antarctic expedition sailed into Antarctica's Bay of Whales in the smallest ship ever to try its luck in these perilous waters. On 19 January 1912, the little wooden schooner sailed up to the edge of the Ross ice shelf and left Shirase and his men to scale the immense wall of ice ready for a daring dash south.

Lieutenant Shirase was a middle-aged army reservist who since boyhood had dreamed of becoming a polar explorer. In Japan, the very idea was startling. When Shirase was born, people were forbidden to leave the country on pain of death. The overthrow of the ruling dynasty in 1868 brought modernisation and new ideas, but they didn't extend as far as polar exploration. Undeterred, Shirase toughened himself up in readiness. He didn't drink or smoke. He spurned the warmth of a fire in winter and refused hot food and drinks. Like Amundsen, he initially set his sights on the North Pole. But after the American Robert Peary claimed to have reached it in 1909, both men hastily revamped their plans. Instead, like Scott, they would aim for the last big prize: the South Pole.

In January 1910, Shirase put his plans before the elected officials of Japan's Imperial Diet. "Within three years," he told the assembled politicians, "I vow to raise our Japanese imperial flag at the South Pole." For many, the question wasn't could he do it but what was the point? It wasn't just about being first to the pole, Shirase said. It was also about science.

The agenda for would-be Antarctic explorers had been set 15 years earlier by the International Geographical Congress. As the last unknown continent, the congress declared, the Antarctic offered the chance to add to knowledge in almost every branch of science. So, like the British, Shirase presented his expedition as a quest for knowledge rather than a bid for personal glory. He would bring back rocks and fossils, make meteorological measurements and explore unknown parts of the continent.

The Japanese team had no previous experience of polar exploration (Image: John Dickie Collection/Alexander Turnbull Library, Wellington NZ)

The response was cool. Neither the government nor the public had much appetite for such a venture and the press poked fun at the whole idea. Shirase struggled both to raise funds and to find scientists to accompany him. His supporters accused the nation's scientists of being too keen on home comforts and too cowardly to risk their lives for science. Who needed them anyway, argued one. It didn't take an Einstein to collect rocks or jot down the temperature or wind speed.

A few months later, Japan's former prime minister Shigenobu Okuma came to Shirase's rescue. With Okuma's backing, Shirase scraped together enough money to buy and equip a small schooner, quickly renamed the Kainan Maru, or "Southern Pioneer". He eventually acquired a scientist, too, albeit not one known in the usual scientific circles.

At the end of November 1910, the Kainan Maru finally left Tokyo with 27 men and 28 Siberian dogs on board. Before leaving, Shirase confidently outlined his plans to the press. He would reach Antarctica in February, during the southern summer.

Then, like Amundsen and Scott, he would spend the winter exploring and preparing for his push to the pole the following spring: "On 15 September, when the winter will have ended, the party will proceed to the pole." His men, he proclaimed, would travel more than 1400 kilometres over the ice in 155 days and "return to the rendezvous by the latter part of February 1912".

Things didn't go according to plan. The difficulty raising funds had already delayed the expedition. Bad weather delayed it further. The storm-battered Kainan Maru didn't reach New Zealand until 8 February; Amundsen and Scott had already been in Antarctica a month and were now preparing for winter.

When the ship stopped at Wellington to take on supplies, New Zealand's reporters flocked to the quayside. They were astonished. At 200 tonnes and 30 metres long, the "strange little three-masted vessel" was half the size of Amundsen's ship, Fram, and a third the size of Scott's Terra Nova. True, the hull was reinforced with extra planking and iron plate, but the ship had only the feeblest engine to help force its way through ice. Could it really survive in the unforgiving Southern Ocean?

Few doubted Shirase's courage, but most reckoned the expedition to be ill-prepared and poorly equipped. For transport the Japanese had lightweight sledges, "toy things" made of bamboo and wood, and more than half

their dogs had died en route to New Zealand. As for provisions, they were both peculiar and paltry. The European explorers were fuelled by pemmican - a high-energy mix of meat and lard. Did these men really intend to walk to the pole on a diet of rice and plum pickles, cured beans and dried cuttlefish?

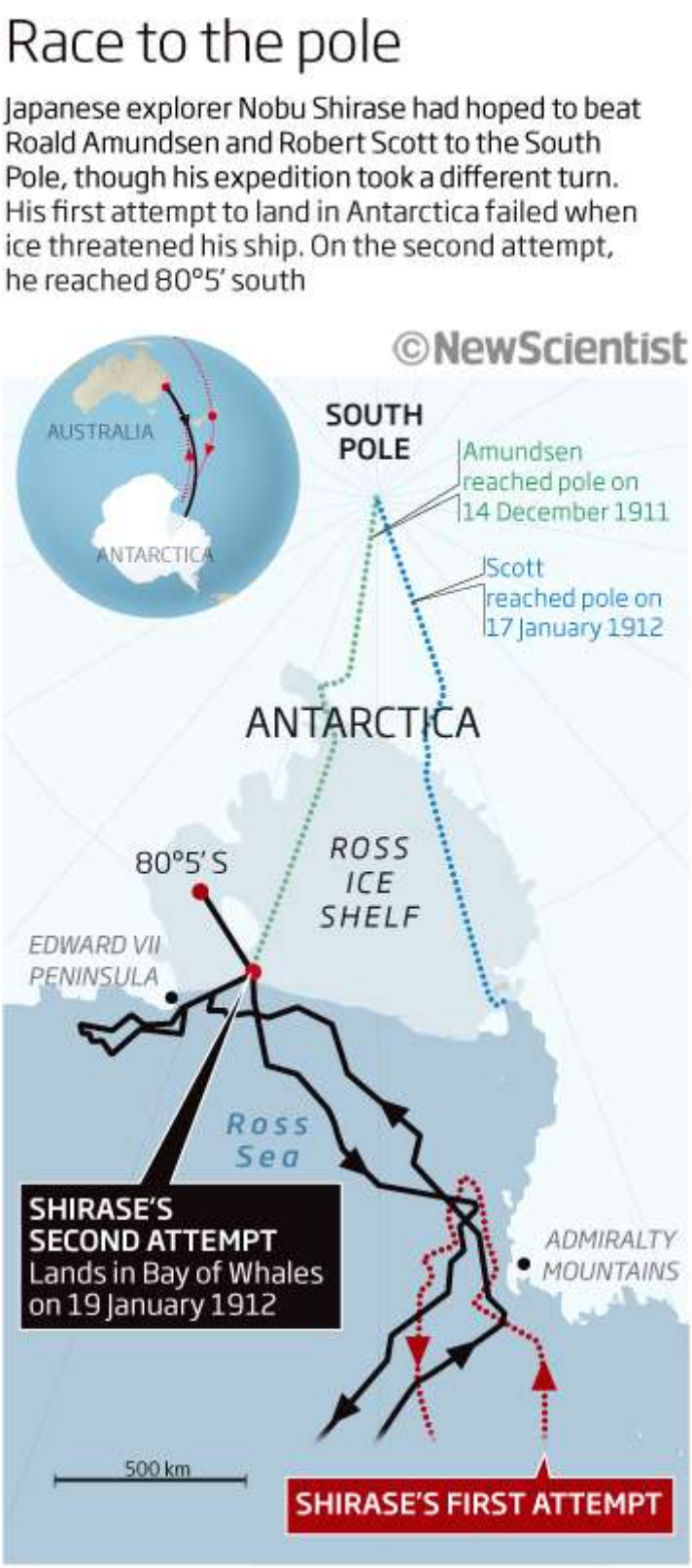
Then there were the team's maps, or lack of them. According to *The New Zealand Times*, the ship's only guide to Antarctic waters was a copy of part of a British admiralty chart marked with the route of Ernest Shackleton's recent Nimrod expedition. Shirase had expected to obtain a chart in New Zealand. "Unless this expectation turns out to be correct, the Kainan Maru will have to be navigated south of latitude 60° south upon a photographic reproduction 8 inches by 10," reported the paper.

But Shirase's biggest challenge was time. Antarctica is only accessible by sea for a few weeks in summer and expeditions usually aimed to arrive in January or February. By March, ships risked being trapped in sea ice until the next spring. "Even with their determination and daring, our Japanese friends are running it rather fine," opined *The Press* of Christchurch. Undeterred, on 11 February the Kainan Maru left Wellington and sailed straight into stormy weather and waves bigger than the captain had ever seen. By the end of the month the ship was picking its way through ice-dotted waters. Then, on 6 March, the lookout spied the Admiralty mountains, a string of peaks on the western side of Antarctica's Ross Sea.

The Kainan Maru skirted the coast looking for a place to land. "We saw only icebergs, snow and penguins," the chief officer later told *The Sydney Morning Herald*. The ice began to close in, threatening to trap them for the winter, an experience no one was likely to survive. With a deft piece of seamanship, the Kainan Maru's captain wriggled the ship out of the ice and turned north. They would have to wait out the winter in warmer climes. On 1 May, the Kainan Maru unexpectedly sailed into Sydney Harbour.

Shirase's arrival took Australia by surprise. Anti-Japanese sentiments were running high following Japan's military victories in Russia and China and the people of Sydney were suspicious. With its little ship and one surviving dog, few believed the expedition was genuine. Were the Japanese furtively hunting new sealing grounds? Or were they spies checking out Sydney's defences? Even if they were trying for the pole, many thought they shouldn't be. According to the laws of exploring etiquette, Scott had announced his intentions first and others should wait their turn - something Amundsen was also criticised for.

Not everyone was hostile. A wealthy landowner in a posh Sydney suburb invited the Japanese team to camp on his land, and Shirase found an ally in geologist Tannatt Edgeworth David. The previous year, as part of the Nimrod expedition, David had reached the south magnetic pole. Shirase was a bona fide explorer, David told the press. He had made the mistake of starting out too late, but under the circumstances, he did well to get as far south as he did.



The pull of the pole

Six months later, with a fresh complement of dogs, Shirase was ready for a second attempt on Antarctica. He no longer aimed to reach the pole, he told reporters, but would confine himself to surveying and science. The Kainan Maru sailed on 19 November and this time the weather was good. On 21 December the ship crossed the Antarctic Circle and two weeks later they were again in sight of the Admiralty mountains. The ship continued eastwards, past McMurdo Sound where Scott had his base, and across the Ross Sea to the far side of the Ross ice shelf, close to Amundsen's winter base (see map).

After a first failed attempt to land, Shirase decided to try again in the Bay of Whales, a natural harbour formed by a dent in the ice shelf. As the Kainan Maru neared the bay, the crew were startled to see another ship. It was the Fram, waiting for Amundsen's return. There was still no news of either the Norwegian or the British teams.

Now, a year later than planned, Shirase and six men scaled the immense glassy face of the Ross ice shelf, and stood on an icy wasteland the size of France. What now? He was too late to catch Scott or Amundsen and he had said he would stick to science.

Yet Shirase still felt the pull of the pole. He had planned for this moment for so long - how could he come so close and stay so far? He might be out of the race, but he would still make a southward dash, experiencing the thrills and hardships of polar exploration he had always dreamed of. With provisions for 20 days, he and four men would see how far they could get with their dogs and "toy" sledges.

According to Shirase's account published in Japan in 1913, the "dash patrol" set off on 20 January 1912, leaving two men at the edge of the ice shelf to make meteorological measurements. The patrol included the expedition's scientist Terutaro Takeda and two expert dog handlers, Ainu men from Japan's far north. For a week they struggled through one blizzard after another, holing up in their tents during the worst of the weather. The temperature fell to -25°C, and frostbite claimed some of the dogs. On 26 January, Shirase estimated there were enough provisions to continue for two more days.

Two days later, Shirase called a halt. Takeda calculated they had reached 80° 5 south and had travelled 250 kilometres. The men hoisted the Japanese flag, saluted the emperor and buried a can containing a list of their names. The return journey took three days.

While Shirase was away, the Kainan Maru dropped seven men on Edward VII Peninsula and then sailed eastward to survey the coastline. The exploring parties set out to investigate what they believed was virgin territory. Four men headed south, but were soon defeated by a wall of ice. The other three had more success. Marching south-west, they encountered "a flock of emperor penguins showing no signs of fear" (prompting one of the party to shake hands with one of them), and scaled several ice walls in an attempt to reach the nearby Alexandra mountains. After 14 hours, a blizzard and a narrow escape from an avalanche, they were thwarted by an unbridgeable crevasse. The men erected a sign to say they had been there and, after a quick detour for a glimpse beyond the mountains, returned to the coast.

On 3 February, all the men were back aboard the Kainan Maru and headed for home. The ship reached Tokyo in June 1912 - and Shirase was greeted like a hero. Yet his fame was short-lived and the expedition was more or less forgotten. Why?

Shirase was the victim of bad timing, says Ben McInnes, a Japanologist at the University of New England in Armidale, New South Wales, Australia. "If Shirase had won government support, he would have reached Antarctica at the same time or perhaps earlier than Scott and Amundsen," he says. In the event, his efforts were eclipsed by those of his rivals.

Wrong sort of hero

Even in Japan, Shirase's fame soon evaporated. It was his misfortune to be the wrong sort of hero. In the new, modern Japan action men had been supplanted by tortured existentialist types. It was a change that left Shirase facing far worse than fading celebrity. The expedition had saddled him with huge debts. His patron Okuma had lost interest and his only hope of settling his debts was by selling his expedition memoirs and film footage from Antarctica. "But stories of the *Boy's Own* genre were no longer popular and theatre-goers preferred the new 'magical ninja' movies to documentaries," says McInnes. Shirase died in 1946, poverty-stricken and forgotten.

Outside Japan, little was heard of the expedition until 1933, when the first English-language version of events appeared in *The Geographical Journal*. By this time, the Scott-Amundsen story was legendary and Shirase was little more than a footnote. Things might have been different if his expedition had made its mark in the rapidly expanding field of Antarctic science. "But the scientific results were minimal," says historian William Stevenson, currently based at Doshisha University in Kyoto, Japan.

Unknown to Shirase, Amundsen's men had already visited the "unexplored" part of Edward VII Peninsula. Takeda hadn't enhanced the expedition's reputation either. Delving among the archives, Stevenson has discovered Takeda's scientific credentials consisted of a brief stint as a professor's assistant followed by a rapid succession of school teaching posts. At 24, he dropped off the radar and only reappeared to sign up for Shirase's expedition. Takeda returned from Antarctica with strong views on how ice shelves formed and convinced that Edward VII Peninsula was an island - two hot topics at the time. He was wrong about both (*Endeavour*, DOI: 10.1016/j.endeavour.2010.11.002).

Shirase never reached the pole. Nor did he contribute much to science - but then nor did Amundsen, whose only interest was in being first to the pole. Yet Shirase's expedition was heroic. He and his men were the first non-Europeans to explore Antarctica. They travelled beyond 80° south, one of only four teams to have gone so far south at the time. What's more, they did it all on a shoestring and with no previous experience - and no one died.

Today, Shirase's hometown of Nikaho has a museum celebrating his pioneering expedition. Japan's Antarctic research vessel is called Shirase, and there are several features of the once mysterious continent that bear his name.

"Even though they were never the first to see an uncharted stretch of coast or a new peak, they were nevertheless among the earliest explorers to visit that part of the Antarctic," says Stevenson. "The expedition was clearly a pioneering effort in terms of Japanese history and for that matter non-European history. It was also a great adventure."

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