Infoteca's E-Journal

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Researchers Correct Sickle Cell Disease in Adult Mice: Protein Could Be a Target for Treating People Who Have the Blood Disorder

Laboratory mouse. (Credit: © Vasiliy Koval / Fotolia)

ScienceDaily (Oct. 13, 2011) — National Institutes of Health-funded scientists have corrected sickle cell disease in adult laboratory mice by activating production of a special blood component normally produced before, but not after, birth.

"This discovery provides an important new target for future therapies in people with sickle cell disease," said Susan B. Shurin, M.D., acting director of the NIH's National Heart, Lung, and Blood Institute, which co-funded the study. "More work is needed before it will be possible to test such therapies in people, but this study demonstrates that the approach works in principle."

Researchers at Harvard Medical School in Boston and the University of Texas at Austin corrected sickle cell disease in mice that had been bred to have the inherited blood disorder. The National Heart, Lung, and Blood Institute, the National Cancer Institute, and the National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) -- all part of the NIH -- funded the research. The results of the study will appear online Oct. 13 in the journal *Science*.

Sickle cell disease results from an abnormality in hemoglobin, the protein found in red blood cells that is responsible for transporting oxygen throughout the body. People living with sickle cell disease have two copies of an altered gene that produces sickle hemoglobin instead of normal adult hemoglobin. Sickle hemoglobin changes shape after releasing its oxygen, causing the red blood cell to become stiff, misshapen and sticky, and slowing blood flow to tissues. This process damages organs and causes pain.

The study tested a new approach to increasing the production of a third form of hemoglobin -- fetal hemoglobin. Production of fetal hemoglobin predominates before birth, but turns off thereafter as adult hemoglobin production takes over. People with sickle cell disease are unable to make normal adult hemoglobin, and instead make sickle hemoglobin starting in infancy.

An elevated level of fetal hemoglobin within the red blood cell reduces the tendency of sickle hemoglobin to change the shape of red blood cells. Considerable NIH- supported research has shown that the drug hydroxyurea increases production of fetal hemoglobin and reduces the number of pain crises and other complications of sickle cell disease in adults and children. However, not all patients respond well to hydroxyurea, and adverse side effects are a concern.

The current study explores a more targeted approach to increasing fetal hemoglobin production. It builds upon earlier studies by Stuart Orkin, M.D., and his team at Harvard Medical School, Children's Hospital of Boston, and the Howard Hughes Medical Institute, Boston, which discovered that a protein called BCL11A normally suppresses the production of fetal hemoglobin soon after birth. The researchers viewed the BCL11A protein as a target for therapy and decided to see what would happen if they blocked production of the protein.

"This important advance in the battle against sickle cell disease is another outstanding example of how great things can happen when work proceeds from bench to bedside, and back to the bench," said Griffin P. Rodgers, M.D., M.A.C.P., director of NIDDK. "We hope that one day, this discovery and any that build upon it will translate into a viable treatment option for those suffering from this devastating illness."

The current paper details how the research team silenced the mouse gene that produces the BCL11A protein in mice with sickle cell disease. Silencing the gene turned off production of the BCL11A protein and allowed the adult mice to continue to produce fetal hemoglobin. It appears to have eliminated disease symptoms without affecting other aspects of blood production.

Approximately 100,000 Americans live with sickle cell disease. It is most prevalent in people of African, Hispanic, Mediterranean, and Middle Eastern descent. There is no widely available cure for sickle cell disease. Bone marrow transplants have cured some patients, but the treatment is not without risk and most patients do not have relatives who can donate compatible and healthy bone marrow to them.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **NIH/National Heart, Lung and Blood Institute**, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2011/10/111013141822.htm

Baby repair kit found inside the womb

- 15 October 2011 by **Andy Coghlan**
- Magazine issue 2834.

Bathed in spare parts *(Image: James Cotier/Photodisc/Getty)*

BABIES with holes in their diaphragms could soon become the first humans treated with "spare parts" built from their own stem cells. The cells, taken from amniotic fluid, would be grown in the lab ready to be implanted when the baby is born.

If the trial goes ahead, it could be the start of an entirely new approach to treating congenital defects. What's more, gene such as the one causing haemophilia could actually be treated while the baby is still inside the womb (see "Gene upgrade before birth").

Common diaphragm defects such as Bochdalek hernia, where a hole in the diaphragm allows the stomach and intestines to protrude into the thorax, can cause lifelong breathing difficulties and are potentially fatal. At present, they are repaired with patches of Teflon, but these can detach as the baby grows, requiring repeat operations. The hope is that patches made from a baby's own tissue will become a permanent part of the diaphragm, growing alongside it.

Researchers pioneering the treatment intend to apply to the US Food and Drug Administration (FDA) before the end of the year for permission to treat 20 babies soon after birth with custom-built patches.

Fetuses normally shed numerous cells into the surrounding amniotic fluid. Of these about 1 per cent are amniotic stem cells, which can be extracted by amniocentesis in the first weeks of pregnancy.

Early ultrasound tests identify fetuses in need of diaphragm repair. A patch can then be fashioned from the extracted cells during pregnancy.

Because the cells and any spare parts made from them originate with the fetus, they would hopefully not be rejected. And the only invasive procedure needed before birth would be amniocentesis. The stem cells used, called amniotic mesenchymal stem cells (aMSCs), multiply twice as fast as any other known type of stem cell, so once collected they can generate enough material to build spare tissue before the baby is born.

If the FDA grants permission, the trial would take place at the Children's Hospital Boston, in Massachusetts, where the procedure has been developed and tested in animals over the past decade. "We're just waiting for the green light," says team leader Dario Fauza. "If approved, it will be the first trial of this strategy, and the first based on amniotic fetal stem cells," says Fauza.

Working mainly in sheep and rabbits, Fauza's team has successfully developed tissue to repair a range of congenital defects in the diaphragm, the sternum, the chest wall, facial bones and the trachea. They have also been making identical parts from aMSCs, so that if permission for trials is given, the researchers already know how to extract, grow and fashion the requisite human parts. The FDA has already had input into the process, and the human cells are harvested, multiplied and grown according to strict safety and purity criteria.

The submission will include data from a trial in 27 sheep, comparing the performance of diaphragm patches made with and without amniotic stem cells, plus patches made from Teflon.

At the end of the 14-month trial, the equivalent for sheep of reaching adulthood, only three of nine stem cell grafts had failed, compared with five made from Teflon and all nine grafts made identically to the stem cell graft, minus the actual cells (*Journal of Pediatric Surgery*, DOI: 10.1016/j.jpedsurg.2010.09.063). "The message is that having cells in the graft makes a significant difference," says Fauza.

The comparison also showed that the cell-based grafts are as good as or better than existing treatments, which should hopefully clear the way for trial approval, he says. The sheep given the grafts suffered no ill effects, and no graft in any of Fauza's experiments has shown any sign of turning cancerous.

The grafts are made by sandwiching together a gel containing the amniotic cells with an elastic layer made from an artificial skin-like product and a porous layer made from pig intestinal tissue stripped of all cells. Such tissue is often used in hernia operations.

If the trial goes ahead and is successful, Fauza's team plans to apply for permission to try another type of graft made from aMSCs, this time as an emergency procedure. Some babies are born with potentially fatal congenital airway blockages, where the trachea is fused, for example. Fauza and his team believe they can repair these by replacing fused trachea with tubes of tissue grown from the baby's cells.

Other researchers in the field expressed hope that the trial would go ahead. "Fauza has been doing a lot on the tissue manufacturing side, and his work is fantastic," says Anna David of University College London, who is co-leader of a team developing potential treatments for blood disorders based on amniotic fetal stem cells.

In one final development, Fauza and his colleagues have begun work that could be of medical benefit to everyone.

They have demonstrated in sheep that fetal amniotic stem cells may be one of the key factors explaining why wounds heal faster and better inside than outside the womb.

Fauza's team applied a gauze to exclude amniotic cells from one wound but not another in the same sheep fetus, and found that the uncovered wound healed several days faster, and more thoroughly, than the masked wound inaccessible to the stem cells.

"It's biological validation that these cells are already being used by nature to repair things, in this case, fetal wounds," says Fauza (*Stem Cells and Development*, DOI: 10.1089/scd.2010.0379).

He says that if the human equivalent match their promised potential, it may become routine for every fetus's amniotic stem cells to be stored and used to accelerate wound healing or make spare tissue later in life.

Gene upgrade before birth

While Dario Fauza's team has been busy making spare parts for babies (see "Baby repair kit found inside the womb"), a group at University College London has been looking at the possibility of using amniotic stem cells to correct genetic defects.

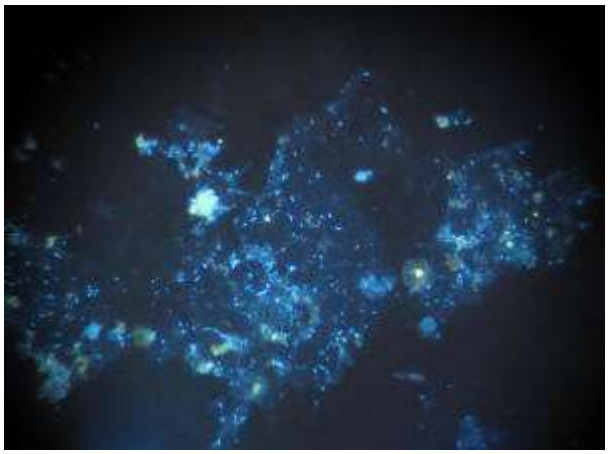
One objective is to see whether they can correct hereditary blood disorders such as haemophilia before babies are born. The idea is to extract amniotic stem cells, convert them into blood-making, or haematopoietic, stem cells (HSCs) normally found in the bone marrow, then repair the gene defect and return the cells to the fetus. If the researchers graft them into the bone marrow, the corrected cells could take over the blood system once the baby is born.

So far, Paolo De Coppi's group at UCL has shown it is possible to turn mouse amniotic fetal stem cells into HSCs. These cells formed a complete blood system when implanted into other mice lacking an immune system (*Blood*, vol 113, p 3953).

De Coppi has also demonstrated that genetically manipulated cells survive and grow in the fetus. His team took amniotic stem cells from sheep, inserted a gene that glows green under ultraviolet light, then returned them to the fetus by injecting through the mother's belly. Fetal post-mortems showed that the glowing cells had reached numerous tissues, including the liver, heart and muscle (*Cell Transplantation*, DOI: 10.3727/096368910X543402).

http://www.newscientist.com/article/mg21228344.400-baby-repair-kit-found-inside-the-womb.html

Bacterial Communication Could Affect Earth's Climate, Researchers Discover



Tiny marine plants (phytoplankton) die or are eaten by tiny marine animals (zooplankton) which defecate into the water. All this detritus is sticky and agglomerates into heavier particles that sink. This epifluorescence micrograph of a stained gelatinous particle (about 200 microns in size) was harvested from a particle trap set 60 meters deep in Clayoquot Sound, British Columbia, Canada, in 2009. Note individual microbial cells (about 0.5 to 2 microns in length) embedded in gelatinous material together with other plankton "hard parts." (Credit: Photo by Tracy Mincer, Woods Hole Oceanographic Institution)

ScienceDaily (Oct. 13, 2011) — Woods Hole Oceanographic Institution (WHOI) scientists have discovered that bacterial communication could have a significant impact on the planet's climate.

In the ocean, bacteria coalesce on tiny particles of carbon-rich detritus sinking through the depths. WHOI marine biogeochemists Laura Hmelo, Benjamin Van Mooy, and Tracy Mincer found that these bacteria send out chemical signals to discern if other bacteria are in the neighborhood. If enough of their cohorts are nearby, then bacteria en masse commence secreting enzymes that break up the carbon-containing molecules within the particles into more digestible bits. It has been suggested that coordinated expression of enzymes is very advantageous for bacteria on sinking particles, and Hmelo and her colleagues have uncovered the first proof of this in the ocean.

"We don't often think about bacteria making group decisions, but that is exactly what our data suggest is happening," said Hmelo, now at the University of Washington.

The paper is published in the current online, "early view," issue of *Environmental Microbiology Reports.*

The source of carbon in the particles is atmospheric carbon dioxide, a heat-trapping greenhouse gas. Bacterial communication could lead to the release of carbon from the particles at shallower depths, rather than sinking to the ocean's depths. According to the WHOI scientists, this means that bacterial communication results in less carbon dioxide being drawn out of the air and transferred to the bottom of the ocean from where it cannot easily return to the atmosphere. This represents the first evidence that bacterial communication plays a crucial role in Earth's carbon cycle.

"So microscopic bacteria buffer the amount of carbon dioxide in the atmosphere through their 'conversations,' " Van Mooy said. "I think it's amazing that there are a near- infinite number of these conversations going on in the ocean right now, and they are affecting Earth's carbon cycle."

The work was funded by the National Science Foundation and the Office of Naval Research.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Woods Hole Oceanographic Institution**.

Journal Reference:

1. Laura R. Hmelo, Tracy J. Mincer, Benjamin A. S. Van Mooy. **Possible influence of bacterial quorum sensing on the hydrolysis of sinking particulate organic carbon in marine environments**. *Environmental Microbiology Reports*, 2011; DOI: 10.1111/j.1758-2229.2011.00281.x

http://www.sciencedaily.com/releases/2011/10/111012151718.htm

Improve miscarriage guidelines to prevent misdiagnosis

- 12:48 14 October 2011 by **Linda Geddes**

A number of miscarriages may be being misdiagnosed, resulting in the termination of otherwise viable pregnancies.

The finding follows several recent reports of women being told that they had miscarried only to go on to have healthy babies. It suggests that existing guidelines on diagnosing miscarriage need to be updated.

Around 20 per cent of pregnancies end in miscarriage, the majority occurring within the first five to six weeks of pregnancy. In many cases the embryo spontaneously aborts, resulting in heavy bleeding.

In other cases women may experience some cramping or mild bleeding and an ultrasound will be performed to detect whether the embryo is still alive.

Current criteria to diagnose miscarriage by ultrasound vary around the world. In the UK, an empty gestational sac – the structure in which an embryo usually grows – with a diameter greater than 20 millimetres is classified as a miscarriage, while in the US a diameter of 16 millimetres is used.

If a smaller sac is detected which appears empty, the woman will usually be advised to have a second scan seven to 10 days later. If the sac has not grown in that time it is assumed that the woman has miscarried.

Once miscarriage has been diagnosed, many women are offered surgery or drugs to remove the contents of their uterus.

Unreliable cut-offs

Now Tom Bourne of Imperial College London and his colleagues have published results suggesting that these common cut-offs to diagnose miscarriage may be unreliable, and that healthy pregnancies may show no measurable growth of the gestational sac over this time period.

Bourne's team looked at 183 women presenting symptoms of possible miscarriage, in which ultrasound was used to determine whether or not miscarriage had occurred. The scan was repeated seven to 14 days later.

All of these women had gestational sacs that did not appear to contain an embryo. None of the women underwent surgery or drug treatment regardless of diagnosis. Several of these women went on to have a miscarriage, while others gave birth to a healthy baby.

When the team analysed the data, they found that if the 16 millimetre cut-off had been used to diagnose miscarriage, 175 of these women would have been correctly diagnosed as having had a miscarriage or not, with eight incorrectly told they had miscarried when they had not. If the 20 millimetre cut-off had been used, 182 would have been correctly diagnosed either way, with one misdiagnosis. When a cut-off of 21 millimetres was used no misdiagnosis occurred.

"There's no doubt that on the basis of one scan, the potential for misdiagnosis exists," says Bourne. "Some women seeking reassurance with pain or bleeding in early pregnancy may be told that they have had a miscarriage, and choose to undergo surgical or medical treatment when the pregnancy is in fact healthy."

Without more research it is difficult to know exactly how many women are affected, Bourne adds. Even when a 20 millimetre cut-off was used, the true misdiagnosis figure could lie anywhere between 0.1 and 3 per cent, due to confidence intervals.

Bourne also emphasises that the findings are only relevant to a subset of miscarriages. "What I'm absolutely not saying is that it is likely that if someone has had surgery for miscarriage, they have had a misdiagnosis," he says. "The majority of women come in with bleeding, where the miscarriage is actually declaring itself. We're looking at patients with a diagnosis based on ultrasound, which is a subset of women, and we're only talking about the ones who are near these cut-off levels."

Updating guidelines

Even so, Bourne believes that there is an urgent need to update current guidelines in the light of this new evidence. "If you have a diagnosis of miscarriage based on a scan, I would say repeat the scan in all cases," he says. "While there's always pressure to make a diagnosis, there is no harm in saying 'look we don't know, come back in a week and let's have another look'."

However, he cautions that a balance must be struck between ensuring a correct diagnosis, and the mental stress caused to women by the continued uncertainty of knowing whether they remain pregnant or not.

A recent review published by the Irish government identified at least 18 cases of women who had been incorrectly diagnosed as having miscarried between 2005 and 2010, and of these 75 per cent were advised to undergo surgery to remove the remains of their embryo.

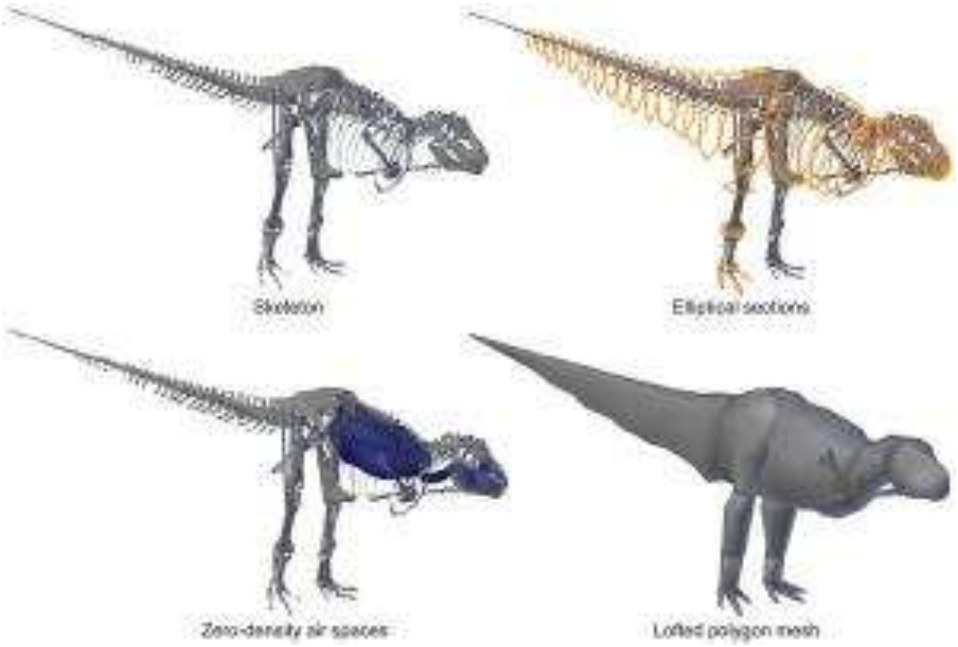
A similar case of a British woman who was told she had miscarried only to request a second scan two weeks later revealing that she was still pregnant was reported in August.

"Healthcare professionals must receive the best training possible to ensure that they are competent in antenatal screening and diagnoses so that mistakes are avoided," says Tony Falconer, president of the UK's Royal College of Obstetricians and Gynaecologists. "The findings from these papers add to our knowledge of clinical practice and will be considered when we update our guidelines."

Journal reference: *Ultrasound Obstetrics and Gynecology*, DOI: 10.1002/uog.10109

http://www.newscientist.com/article/dn21048-improve-miscarriage-guidelines-to-prevent-misdiagnosis.html

T. Rex Was Bigger and Grew Faster Than Previously Thought, Computational Analysis Reveals



Modelling procedure, showing the Carnegie specimen: From left to right, top to bottom these show the scanned, reconstructed, and straightened skeleton; the skeleton with elliptical hoops that define fleshy boundaries; the air spaces representing pharynx, sinuses, lungs and other airways including air sacs; and the final meshed reconstruction used for mass and COM estimates. (Credit: John R. Hutchinson, Karl T. Bates, Julia Molnar, Vivian Allen, Peter J. Makovicky. A Computational Analysis of Limb and Body Dimensions in Tyrannosaurus rex with Implications for Locomotion, Ontogeny, and Growth. PLoS ONE, 2011; 6 (10): e26037 DOI: 10.1371/journal.pone.0026037)

ScienceDaily (Oct. 13, 2011) — A new study reveals that *T. rex* grew more quickly and reached significantly greater masses than previously estimated. In a departure from earlier methods, the new study uses mounted skeletons to generate body mass estimates.

In a new study just published in the online journal *PLoS ONE*, a team of scientists led by Professor John R. Hutchinson of The Royal Veterinary College, London, and Peter Makovicky, PhD, curator of dinosaurs at The Field Museum of Natural History in Chicago applied cutting edge technology and computer modeling to "weigh" five *Tyrannosaurus rex* specimens, including The Field Museum's iconic SUE skeleton. Their results reveal that *T. rex* grew more quickly and reached significantly greater masses than previously estimated.

In a departure from earlier methods, the new study uses mounted skeletons to generate body mass estimates. Makovicky notes, "Previous methods for calculating mass relied on scale models, which can magnify even minor errors, or on extrapolations from living animals with very different body plans from dinosaurs. We overcame such problems by using the actual skeletons as a starting point for our study."

The team used 3-D laser scans of mounted skeletons as a template for generating fleshed-out digital models whose masses could then be computed. The laser scans are accurate to less than half an inch for skeletons that are up to 40 feet long. Digital body cross-sections were reconstructed along the length of each skeleton using the relationships of the soft tissues to skeletons in birds and crocodiles as a guide. A digital skin was then overlaid to generate a body volume, whose mass was calculated after empty spaces such as lungs and the mouth cavity were modeled and subtracted.

In order to appreciate the uncertainty involved in estimating how much flesh would wrap the skeleton of an extinct animal, body sections (e.g. head, neck, torso, legs, tail) were modeled individually at three levels of "fleshiness." The three versions of each body segment were combined in different ways to generate a range of whole body models with varying masses.

"These models range from the severely undernourished through the overly obese, but they are purposely chosen extremes that bound biologically realistic values" says study co-author Dr. Vivian Allen of the Royal Veterinary College. "The real advantage to our method is that the models can be adjusted to accommodate the variation that is inherent in nature, so we don't have to pick an arbitrary result, but rather deal with more meaningful ranges of results," adds co-author Dr. Karl T. Bates of the University of Liverpool.

Calculating the masses of the resulting virtual *T. rex* herd yielded some exciting surprises. For instance, *T. rex* appears to have been significantly heavier than previously believed. The Field Museum's SUE skeleton, which is the largest and most complete *T. rex* skeleton known, weighed in at over nine tons. "We knew she was big but the 30 percent increase in her weight was unexpected." says Makovicky.

The fleshier models for SUE range even higher in body mass, though this is likely an effect of how the skeleton was reconstructed. "SUE's vertebrae were compressed by 65 million years of fossilization, which forced a more barrel-chested reconstruction" says Makovicky. But he thinks that the new weight estimates will not be affected much by correcting for this. "Nine tons is the minimum estimate we arrived at using a very skinny body form, so even if we made the chest smaller, adding a more realistic amount of flesh would make up for the weight," he explains.

SUE was also larger than the other specimens when individual body segments were compared, but Makovicky is not surprised by that result. "We often hear about new *T. rex* discoveries that rival SUE in some select measurement, but body size is a three-dimensional parameter and SUE is much more robust than other known skeletons," he says.

The new mass estimates also alter understanding of *T. rex* biology. The higher mass estimates for the larger specimens and a lower one for the smallest individual indicate even faster growth than was proposed in a landmark study just five years ago.

According to lead author Hutchinson, "We estimate they grew as fast as 3,950 pounds per year (1790 kg) during the teenage period of growth, which is more than twice the previous estimate."

Although a staggering number, it is in keeping with growth rate calculations for other dinosaurs. "Our new growth rate value actually erases a deficit between the previous growth rate estimate and what is expected for a dinosaur of this size," adds Makovicky.

The rapid growth to gargantuan size came at the cost of speed and agility, according to the study, which concluded that the locomotion of this giant biped slowed as the animal grew. This is because its torso became longer and heavier while its limbs grew relatively shorter and lighter, shifting its center of balance forward.

Hutchinson adds, "The total limb musculature of an adult *T. rex* probably was relatively larger than that of a living elephant, rhinoceros, or giraffe, partly because of its giant tail and hip muscles. Yet the muscles of the lower leg were not as proportionately large as those of living birds, and those muscles seem to limit the speed at which living animals can run. Our study supports the relative consensus among scientists that peak speeds around 10-25 miles per hour (17-40 kph) were possible for big tyrannosaurs."

These locomotory insights come from detailed modelling of some of the major hindlimb muscles and estimates of total muscle mass in the legs calculated by subtracting the volume of bones from the modelled leg volumes.

"Such analytical details underscore the value of working with complete specimens," says Makovicky. "*T. rex* represents a biological extreme because it's one of the largest bipeds that ever lived. Putting numbers on that requires access to the dimensions of whole skeletons and their individual parts. For completeness and abundance, no other large predatory dinosaur can match *T. rex*."

Acquiring data for these specimens was a challenging task, and in the case of SUE, required four instruments that use light or X-ray technology, and the generosity and collaboration of some unlikely partners. The forensics unit of the Chicago Police Department provided laser surface scans of SUE, which were supplemented with scans of individual bones generated at the Loyola University Medical Center outpatient CT facility at Maywood, Illinois. Parts that were too large to fit in a medical scanner were scanned by Ford Motor Co. in Livonia, Michigan, and Cubic-Vision in Deerfield, Illinois. Scan coordination and data processing was handled by Ralph Chapman and Linda Deck at New Mexico Virtualization, LLC, Los Alamos and Art Andersen, president of Virtual Surfaces Inc, based in Glenview, Illinois.

Makovicky was thrilled to see how Chicago-area institutions came together around the project. "SUE has become an icon of our city and it was fantastic to work with so many organizations and people as part of this process. The enthusiasm and generosity of everyone involved was incredible," he says.

Further scan data was generated using a portable laser scanner by study co-author Karl Bates, with specimen access kindly provided by the Museum of the Rockies, the University of Leicester Geology Department, and the Carnegie Museum of Natural History. Funding for this study came from the National Environment Research Council (UK) and The Field Museum.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Field Museum**, via EurekAlert!, a service of AAAS.

Journal Reference:

1. John R. Hutchinson, Karl T. Bates, Julia Molnar, Vivian Allen, Peter J. Makovicky. **A Computational Analysis of Limb and Body Dimensions in Tyrannosaurus rex with Implications for Locomotion, Ontogeny, and Growth**. *PLoS ONE*, 2011; 6 (10): e26037 DOI: 10.1371/journal.pone.0026037

http://www.sciencedaily.com/releases/2011/10/111012185634.htm

Prostate screening does more harm than good in US

- 11:05 14 October 2011 by **Andy Coghlan**

Doctors should stop screening for prostate cancer because it does more harm than good. This advice comes more than a decade after the prostate-specific antigen (PSA) test was introduced in the US.

"PSA-based screening for prostate cancer has no net benefit," concludes the US Preventive Services Task Force, which evaluates screening services. The dangers of PSA-based screening include a high rate of false positives, negative psychological effects, and complications associated with diagnostic biopsy and treatment, the task force says.

Between 1986 and 2005, 1 million men in the US had surgery and radiotherapy for prostate cancer after a PSA test, but the panel found no evidence this prevented more deaths than "watching and waiting". However, between 200 and 300 men in every thousand treated developed incontinence or erectile dysfunction.

"It's encouraging to see a real debate on the impact of the PSA test on patient outcome," says John Semmes of Eastern Virginia Medical School in Norfolk.

"I think their decision is premature because there's more data coming in on whether screening is beneficial or not," says Freddie Hamdy of the University of Oxford, chief investigator of the UK ProtecT study, which is investigating the issue.

William Catalona, director of the clinical prostate cancer programme at Northwestern University in Chicago, agrees: "PSA is the best screening test we have for prostate cancer, and until there is a replacement, it would be unconscionable to stop it," he says.

http://www.newscientist.com/article/dn21041-prostate-screening-does-more-harm-than-good-in-us.html

Erasing History? Temporal Cloaks Adjust Light's Throttle to Hide an Event in Time

By sending a beam of light down an optical fiber and through a pair of "time lenses", researchers have demonstrated for the first time that it's possible to cloak a singular event in time. (Credit: © 555images / Fotolia)

ScienceDaily (Oct. 13, 2011) — Researchers from Cornell University in Ithaca, N.Y., have demonstrated for the first time that it's possible to cloak a singular event in time, creating what has been described as a "history editor." In a feat of Einstein-inspired physics, Moti Fridman and his colleagues sent a beam of light traveling down an optical fiber and through a pair of so-called "time lenses." Between these two lenses, the researchers were able to briefly create a small bubble, or gap, in the flow of light. During that fleetingly brief moment, lasting only the tiniest fraction of a second, the gap functioned like a temporal hole, concealing the fact that a brief burst of light ever occurred.

The team is presenting their findings at the Optical Society's (OSA) Annual Meeting, Frontiers in Optics (FiO) 2011 (http://www.frontiersinoptics.com/), taking place in San Jose, Calif. next week.

Their ingenious system, which is the first physical demonstration of a phenomenon originally described theoretically a year ago by Martin McCall and his colleagues at Imperial College London in the Journal of Optics, relies on the ability to use short intense pulses of light to alter the speed of light as it travels through optical materials, in this case an optical fiber. (In a vacuum, light maintains its predetermined speed limit of 180,000 miles per second.) As the beam passes through a split-time lens (a silicon device originally designed to speed up data transfer), it accelerates near the center and slows down along the edges, causing it to balloon out toward the edges, leaving a dead zone around which the light waves curve. A similar lens a little farther along the path produces the exact but opposite velocity adjustments, resetting the speeds and reproducing the original shape and appearance of the light rays.

To test the performance of their temporal cloak, the researchers created pulses of light directly between the two lenses. The pulses repeated like clockwork at a rate of 41 kilohertz. When the cloak was off, the researchers were able to detect a steady beat. By switching on the temporal cloak, which was synchronized with the light pulses, all signs that these events ever took place were erased from the data stream.

Unlike spatial optical cloaking, which typically requires the use of metamaterials (specially created materials engineered to have specific optical properties), the temporal cloak designed by the researchers relies more on the fundamental properties of light and how it behaves under highly constrained space and time conditions. The area affected by the temporal cloak is a mere 6 millimeters long and can last only 20 trillionths of a second. The length of the cloaked area and the length of time it is able to function are tightly constrained -- primarily by the extreme velocity of light. Cloaking for a longer duration would create turbulence in the system, essentially pulling back the curtain and hinting that an event had occurred. Also, to achieve any measurable macroscopic effects, an experiment of planetary and even interplanetary scales would be necessary.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Optical Society of America**, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2011/10/111012113554.htm

Sickle cell disease cured by gene knock-out

- 19:00 13 October 2011 by **Charlie Harvey**

Switching off a single gene can help treat sickle cell disease by keeping the blood forever young. The illness is caused by a mutant form of adult haemoglobin, but not by fetal haemoglobin. Targeting *BCL11A*, the gene responsible for the body's switch-over from fetal to adult haemoglobin, effectively eliminates the condition in mice.

The mutant form of adult haemoglobin forms long sticky chains inside red blood cells. The cells containing these chains can clog small blood vessels, depriving organs of oxygen and causing pain. In severe cases, sickle cell disease can be fatal. Tricking the body into make fetal haemoglobin again can alleviate symptoms, though.

That's because fetal haemoglobin does not form sticky chains. However, it is produced in the body only during development in the womb and in the six months following birth. It has a higher affinity for oxygen than adult haemoglobin, vital in allowing the developing fetus to "steal" oxygen from its mother's blood.

Stuart Orkin of Harvard Medical School in Boston, and colleagues, knocked out the *BCL11A* gene from mice belonging to a strain that normally develops a sickle cell-like condition. As adults, the mice produced over 20 times more fetal haemoglobin than normal and their blood contained almost no sickle-shaped cells. Their spleen and kidneys – organs easily damaged by the effects of the disease – were almost completely healthy.

Bound and gagged

Gene therapy to block the action of *BCL11A* in humans could in theory provide similar benefits. Specially designed lengths of RNA, injected into the bloodstream, could bind with the *BCL11A* gene and silence it. This approach, however, would be expensive and impractical on a large scale. "The long-term goal is to have a drug that can effectively block the function of *BCL11A*," says Orkin. "It's a more challenging approach, but one that could be applied to large populations."

Other treatments designed to encourage the production of fetal haemoglobin have been suggested over the years. One drug in particular – hydroxyurea – is widely used but has many side effects including reducing the levels of white blood cells.

Orkin's main concern with hydroxyurea, however, is that its effect on the body is not fully understood. "We have no idea how it really works. In some patients it's good, in others it doesn't work at all. It's unpredictable," he says. "Our approach gets to the real mechanism. It actually silences the gene that leads to fetal haemoglobin being suppressed."

Journal reference: *Science*, DOI: 10.1126/science.1211053

http://www.newscientist.com/article/dn21044-sickle-cell-disease-cured-by-gene-knockout.html

Wet and Mild: Researchers Take the Temperature of Mars' Past

This photograph shows globules of orange-colored carbonate minerals found in the Martian meteorite dubbed ALH84001. The origin of the carbonate minerals has long puzzled scientists, but by determining that the carbonate formed at about 18 degrees Celsius, Caltech researchers say they might have an answer. The mild temperature is also consistent with the theory that Mars was once warmer and wetter than it is today. (Credit: NASA)

ScienceDaily (Oct. 13, 2011) — Researchers at the California Institute of Technology (Caltech) have directly determined the surface temperature of early Mars for the first time, providing evidence that's consistent with a warmer and wetter Martian past.

By analyzing carbonate minerals in a four-billion-year-old meteorite that originated near the surface of Mars, the scientists determined that the minerals formed at about 18 degrees Celsius (64 degrees Fahrenheit). "The thing that's really cool is that 18 degrees is not particularly cold nor particularly hot," says Woody Fischer, assistant professor of geobiology and coauthor of the paper, published online in the *Proceedings of the National Academy of Sciences* (*PNAS*) on October 3. "It's kind of a remarkable result."

Knowing the temperature of Mars is crucial to understanding the planet's history -- its past climate and whether it once had liquid water. The Mars rovers and orbiting spacecraft have found ancient deltas, rivers, lakebeds, and mineral deposits, suggesting that water did indeed flow. Because Mars now has an average temperature of -63 degrees Celsius, the existence of liquid water in the past means that the climate was much warmer then. But what's been lacking is data that directly points to such a history. "There are all these ideas that have been developed about a warmer, wetter early Mars," Fischer says. "But there's precious little data that actually bears on it." That is, until now.

The finding is just one data point -- but it's the first and only one to date. "It's proof that early in the history of Mars, at least one place on the planet was capable of keeping an Earthlike climate for at least a few hours to a few days," says John Eiler, the Robert P. Sharp Professor of Geology and professor of geochemistry, and a

coauthor of the paper. The first author is Itay Halevy, a former postdoctoral scholar who's now at the Weizmann Institute of Science in Israel.

To make their measurement, the researchers analyzed one of the oldest known rocks in the world: ALH84001, a Martian meteorite discovered in 1984 in the Allan Hills of Antarctica. The meteorite likely started out tens of meters below the Martian surface and was blown off when another meteorite struck the area, blasting the piece of Mars toward Earth. The potato-shaped rock made headlines in 1996 when scientists discovered tiny globules in it that looked like fossilized bacteria. But the claim that it was extraterrestrial life didn't hold up upon closer scrutiny. The origin of the globules, which contain carbonate minerals, remained a mystery.

"It's been devilishly difficult to work out the process that generated the carbonate minerals in the first place," Eiler says. But there have been countless hypotheses, he adds, and they all depend on the temperature in which the carbonates formed. Some scientists say the minerals formed when carbonate-rich magma cooled and crystallized. Others have suggested that the carbonates grew from chemical reactions in hydrothermal processes. Another idea is that the carbonates precipitated out of saline solutions. The temperatures required for all these processes range from above 700 degrees Celsius in the first case to below freezing in the last. "All of these ideas have merit," Eiler says.

Finding the temperature through independent means would therefore help narrow down just how the carbonate might have been formed. The researchers turned to clumped-isotope thermometry, a technique developed by Eiler and his colleagues that has been used for a variety of applications, including measuring the body temperatures of dinosaurs and determining Earth's climate history.

In this case, the team measured concentrations of the rare isotopes oxygen-18 and carbon-13 contained in the carbonate samples. Carbonate is made out of carbon and oxygen, and as it forms, the two rare isotopes may bond to each other -- clumping together, as Eiler calls it. The lower the temperature, the more the isotopes tend to clump. As a result, determining the amount of clumping allows for a direct measurement of temperature.

The temperature the researchers measured -- 18 ± 4 degrees Celsius -- rules out many carbonate-formation hypotheses. "A lot of ideas that were out there are gone," Eiler says. For one, the mild temperature means that the carbonate must have formed in liquid water. "You can't grow carbonate minerals at 18 degrees other than from an aqueous solution," he explains. The new data also suggests a scenario in which the minerals formed from water that filled the tiny cracks and pores inside rock just below the surface. As the water evaporated, the rock outgassed carbon dioxide, and the solutes in the water became more concentrated. The minerals then combined with dissolved carbonate ions to produce carbonate minerals, which were left behind as the water continued to evaporate.

Could this wet and warm environment have been a habitat for life? Most likely not, the researchers say. These conditions wouldn't have existed long enough for life to grow or evolve -- it would have taken only hours to days for the water to dry up. Still, these results are proof that an Earthlike environment once existed in at least one particular spot on Mars for a short time, the researchers say. What that implies for the global geology of Mars -- whether this rock is representative of Martian history or is just an isolated artifact -- is an open question.

The research described in the *PNAS* paper, "Carbonates in the Martian meteorite Allan Hills 84001 formed at 18 ± 4 °C in a near-surface aqueous environment," was supported by a Texaco Postdoctoral Fellowship, NASA, and the National Science Foundation.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **California Institute of Technology**.

Journal Reference:

1. I. Halevy, W. W. Fischer, J. M. Eiler. **Carbonates in the Martian meteorite Allan Hills 84001 formed at 18 4 C in a near-surface aqueous environment**. *Proceedings of the National Academy of Sciences*, 2011; 108 (41): 16895 DOI: 10.1073/pnas.1109444108

http://www.sciencedaily.com/releases/2011/10/111012132701.htm

Don't believe everything you think

- 12 October 2011 by **Graham Lawton**
- Magazine issue 2833.

Tell me the truth, lizard – am I deceiving myself?

*The human capacity for self-deception knows no bounds, but why do we do it? According to biologist **Robert Trivers** the simple answer is that it helps us have more children. He told **Graham Lawton** about the evolutionary benefits of lying*

Psychologists been interested in self-deception for years, but you say we need a new science of self-deception?
Yes. Because the psychologists have not produced a theory. Self-deception lies at the heart of psychology, but if you read only psychology you will go blind and probably crazy before you discern the underlying principles. A functional view of self-deception has to come out of evolutionary logic. It has to be a pay-off in terms of reproductive success.

You argue that we deceive ourselves all the time, but why do we do it?
One reason is to better deceive others. Deceiving consciously is cognitively demanding. I've got to invent a false story while being aware of the truth, it's got to be plausible, it cannot contradict anything you already know or are going to find out and I've got to be able to remember it so that I don't contradict myself.

This takes concentration and I may give off cues that I'm lying. If I try to slip something by you I may not be able to meet your gaze. For linguistic cues, there are more pauses and fillers while I try to come up with my story. I'll choose simple action words and avoid qualifiers. Another thing that gives us away us is the effort to

control ourselves. Let's say I'm coming to a key word in a lie. I tense up, but tensing up automatically raises my voice. That's a very hard thing to fight.

So believing the lie yourself can help with this cognitive burden?
Yes. If I can render all or part of the lie unconscious I can remove the cues that I'm deceiving you. So that's one kind of general reason to practice self-deception: to render the lie unconscious, the better to hide it.

What other types of self-deception are there?
Another broad category is that there is a general tendency to self-inflation. If you ask high school students are they in the top half of their class for leadership ability, 80 per cent will say yes; 70 per cent say they're in the top half for good looks. It ain't possible! And you cannot beat academics for self-deception. If you ask professors whether they're in the top half of their profession, 94 per cent say they are.

So we self-deceive in order to give ourselves an ego boost?
The ego boost, again, is in order to deceive others. There is little intrinsic value in deceiving yourself without deceiving others.

What are the benefits of deceiving other people?
There are many, many situations in which you gain personal benefit. If you're going to steal, you've got to lie to cover it up. If you're having an affair you lie to protect the relationship Now, what do we mean by personal benefit? Ultimately it is measured in terms of reproductive success. But there isn't a straightforward relationship between deception and reproductive success. For example, if I lie and I rise in the corporation, does this result in extra children? So we have to make a separate argument about why rising in the profession gives you benefits that translate into more surviving offspring.

There must be costs too?
Yes. The cost takes various forms. One is that you are more likely to be manipulated by others. A self-deceived person may be the only one in the room that doesn't know what the hell is going on. Con artists use tricks to get your machinery of self-deception going, and then they control you. The general cost is you risk being out of touch with reality.

But still the benefits outweigh these costs?
Sometimes yes, sometimes no. Self-deception would not have evolved if the costs always outweighed the benefits.

What is going on in our brains when we deceive ourselves?
At the moment, not a lot is known about the neurophysiology. Much more is known about the immunology of self-deception. Here's a vivid example of the cost of self-deception. Because of HIV, various aspects of homosexuality have been studied very intensely. It turns out the more you're out of the closet, the better for you. If you're HIV positive, you transit into AIDS much quicker if you're in the closet about being homosexual.

Let's return to evolution. Are humans the only species with the capacity for self-deception?
No, I do not think so. Lying is widespread throughout the animal kingdom, both between species and also within species. One example is mimics, species that are harmless and tasty but gain protection by resembling a poisonous or distasteful one. Psychologists are getting close to showing that monkeys practice self-deception.

Like humans, monkeys naturally associate members of their "in-group" with positive stimuli such as fruits, and out-group members with negative stimuli such as spiders.

Do children come into the world as self-deceivers or does it take a while to develop?
That is very tough to say. There's evidence that deception in children starts at six months of age. By eight or nine months they have developed the ability to deny that they care about something that they do care about. But demonstrating self-deception is tricky.

Is it right that self-deception is correlated with intelligence?
Yes, at least for deception. The smarter your child is, the more he or she lies. In monkeys, the bigger the neocortex is, the more often they're seen lying in nature.

In your new book you get into some quite serious stuff about how self-deception fuels warfare and other evils...
Regarding warfare, if you can get the group believing the same deception, you have a powerful force to impose group unity. And if you've sold the population a false historical narrative, say "the German people need room in which to live", then it's relatively easy to couple marching orders to the delusion.

Tell me about the relationship between self-deception and religion.
It's complex. At one extreme you could say religion is complete nonsense, so the whole thing is an exercise in self-deception. I was raised as a Presbyterian and I occasionally attend. I stand back and I read the creed that I was taught as a child and it's utter, utter nonsense. But could it have spread so far by self-deception alone? Religion has been selected for. It has given many benefits to people - health benefits, cooperative benefits. So I take an intermediate position.

Are you a self-deceiver?
I end the book with a chapter on fighting our own self-deception. I've been remarkably unsuccessful in my own case. I just repeat the same kinds of mistakes over and over. If you ask me about my self-deception, I can give you stories, chapter and verse, in the past. But can I prevent myself doing the same damn thing again tomorrow? Usually not, though in my professional life as a scientist, I feel that I probably practice less self-deception, I'm more critical of evidence, a little bit harder nosed.

You could be deceiving yourself about that.
Absolutely.

Profile

Robert Trivers is one of the world's best-known evolutionary biologists. His work influenced sociobiology, evolutionary psychology, behavioural ecology and Richard Dawkins's concept of the selfish gene. He is professor of anthropology and biological sciences at Rutgers University in New Brunswick, New Jersey. His latest book, titled *The Folly Of Fools* in the US and *Deceit And Self-Deception* in the UK, is out this month

http://www.newscientist.com/article/mg21128335.300-evolutionary-guru-dont-believe-everything-you-think.html?full=true&print=true

How Life Might Have Survived 'Snowball Earth'

This November 2010 image of the Harding Ice Field on Alaska's Kenai Peninsula provides an idea of what much of the planet might have looked like during a 'snowball Earth' event 600 million years ago. (Credit: U.S. Fish and Wildlife Service)

ScienceDaily (Oct. 13, 2011) — Global glaciation likely put a chill on life on Earth hundreds of millions of years ago, but new research indicates that simple life in the form of photosynthetic algae could have survived in a narrow body of water with characteristics similar to today's Red Sea.

"Under those frigid conditions, there are not a lot of places where you would expect liquid water and light to occur in the same area, and you need both of those things for photosynthetic algae to survive," said Adam Campbell, a University of Washington doctoral student in Earth and space sciences.

A long, narrow body of water such as the Red Sea, about 6.5 times longer than it is wide, would create enough physical resistance to advancing glacial ice that the ice sheet likely could not make it all the way to the end of the sea before conditions cause the ice to turn to vapor. That would leave a small expanse of open water where the algae could survive.

"The initial results have shown pretty well that these kinds of channels could remain relatively free of thick glacial ice during a 'snowball Earth' event," Campbell said.

He examined the issue using an analytical model that applied basic principles of physics to a simple set of atmospheric conditions believed to have existed at the time. The results were published Oct. 8 in *Geophysical Research Letters*. Co-authors are Edwin Waddington and Stephen Warren, UW professors of Earth and space sciences.

Many scientists believe Earth became a giant snowball two or three times between 800 million and 550 million years ago, with each episode lasting about 10 million years. These all preceded the Cambrian explosion about 530 million years ago, when life on Earth rapidly expanded, diversified and became more complex.

But simple photosynthetic plankton turn up in the fossil record before and after the "snowball Earth" events, leading scientists to wonder how that could happen if Earth's oceans were completely encased in ice.

Campbell said it is assumed the algae survived these episodes, "unless they re-evolved each time, which creates a whole different problem for evolutionary biology."

He chose the Red Sea as an example because it is formed from a tectonic process called continental rifting, a process known to have existed at the time of the snowball Earth events, and it lies in an arid region between Egypt and the Arabian Peninsula.

Campbell noted that in a snowball Earth event, the open water in such a sea wouldn't have lasted long if it didn't have a way of being replenished -- if, for example, the glacial ice acted as a dam and cut off the influx of additional sea water. The open water had to exist on the order of 10 million years for the algae to survive.

"Over 10 million years, you could evaporate the deepest lake in the world," Campbell said. "If you're in a desert, you'd have to have a supply of sea water."

The work was supported by a grant from the National Science Foundation.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Washington**. The original article was written by Vince Stricherz.

Journal Reference:

1. Adam J. Campbell, Edwin D. Waddington, Stephen G. Warren. **Refugium for surface life on Snowball Earth in a nearly-enclosed sea? A first simple model for sea-glacier invasion**. *Geophysical Research Letters*, 2011; 38 (19) DOI: 10.1029/2011GL048846

http://www.sciencedaily.com/releases/2011/10/111011102001.htm

About time: Is time travel possible?

- 13 October 2011 by **Marcus Chown**
- Magazine issue 2833

Time after time *(Image: Warner Bros. Entertainment)*

IT IS easy to dismiss time travel as nothing more than science fiction. After all, H. G. Wells wrote *The Time Machine* in the late 1800s, but still no one has built one that works. Don't give up yet, though: we are continuing to make discoveries that may show us the way forward - or back.

Time travel is inherent in the basics of general relativity. Einstein's theory predicts that time runs more slowly in strong gravity, so you grow old more slowly living in a bungalow than in a skyscraper: being closer to the ground, you are in marginally stronger gravity (see "Personal time warps"). So to make a time machine, you simply have to connect two regions where time flows at different rates.

Take, for instance, the Earth and the immediate vicinity of a black hole, where strong gravity makes time flow extremely slowly. Say you start two clocks ticking on Monday at the two locations. When Friday comes around on Earth, it will still be only Wednesday by the black hole. So if you could travel instantaneously from Earth to near the black hole, you could travel from Friday back to Wednesday. Hey presto: time travel.

The question is, can you? Yes - in principle. According to quantum theory, the fabric of space-time is a tangle of sub-microscopic shortcuts through space and time known as wormholes. A few steps along such a tunnel and you might emerge light years away on the other side of the galaxy, or years in the past or future. It is possible that ghostly particles called neutrinos might already be performing such a feat (*New Scientist*, 1 October, p 6).

For the rest of us, however, there are a few practical problems to sort out first. To use a wormhole for time travel, it has to link the times and places you want to travel between: that might mean somehow towing one end to the nearest black hole.

Manage that and you've still got issues: you would need to inflate the quantum-scale wormhole to macroscopic size and find a way to keep its entrance and exit open. Quite some challenge, because wormholes are terminally unstable and snap shut in the blink of an eye. To prop them open, you will need a hypothetical type of matter with repulsive gravity. We do not know whether such exotic matter with sufficient strength exists. But what we do know is that to create a tunnel with a mouth about a metre across - wide enough for someone to crawl through - you would have to use the total energy pumped out by a large fraction of the stars in our Milky Way in a year.

For all that effort, such a time machine will never take us back to great moments in history. If we find a wormhole, it is by definition the first moment that time travellers to the past will be able to reach. So if you want to go on a dinosaur safari, you have only one option: find a time machine abandoned on Earth by extraterrestrials at least 65 million years ago.

Nonetheless, we could do some interesting things with our own time machine. As soon as we have made one, for instance, future civilisations will be able to come back and visit us. That opens up an interesting possibility: could someone come back and kill a direct ancestor, making their own existence impossible? This is time travel's most famous conceptual puzzle, the "grandfather paradox". And it turns out that quantum physics may have an answer.

For years now, quantum physicists have been "teleporting" particles by copying the information that describes a particle and pasting it onto another, distant one. In January, Seth Lloyd of the Massachusetts Institute of Technology and Aephraim Steinberg of the University of Toronto, Canada, showed that quantum rules allow this kind of teleportation to be done in time as well as space. Because the quantum states of particles such as photons and electrons can be affected by measurements that will be done in their futures, time travel comes naturally to the quantum world.

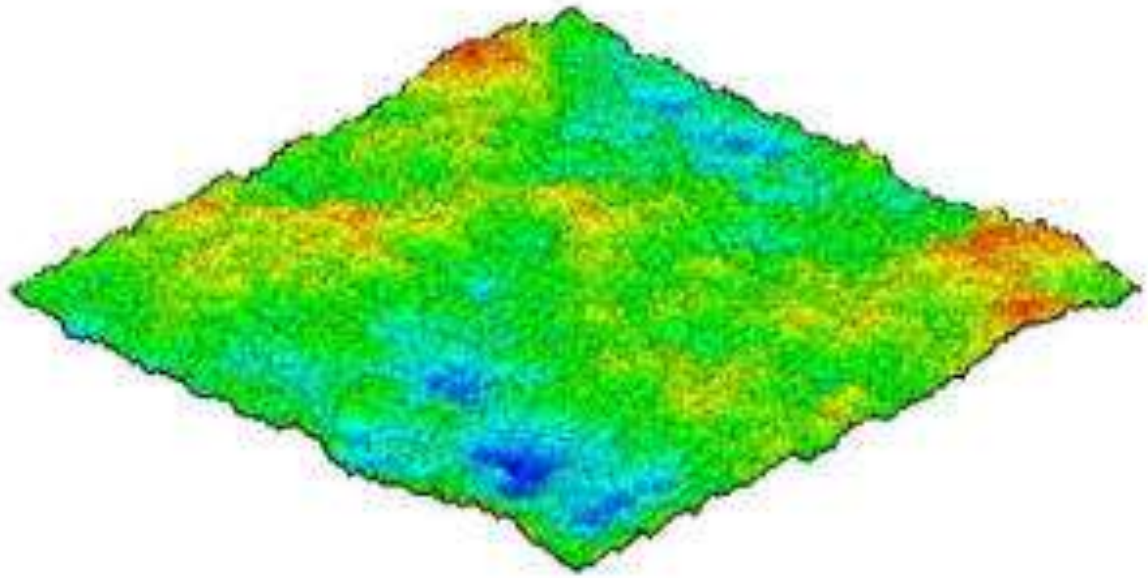
Lloyd and Steinberg's experiments showed that, with photons at least, the mechanics of time travel conspire to uphold familiar notions of cause and effect. They set up photons to travel backwards in time and then flip their polarisation state. This flip corresponded to the photon entering a state that meant it could not have travelled back in time in the first place; the new state "kills" the earlier one.

Because of the probabilities involved in quantum measurements there was always a chance of either process failing to happen. Lloyd and Steinberg found that when they set up the photon to kill its "grandfather", either the time travel or the polarisation flip always failed.

It's an example of what Stephen Hawking at the University of Cambridge calls chronology protection. As the difficulty of creating a wormhole time-machine also shows, the laws of physics seem determined to maintain common-sense rules of cause and effect. Nonetheless, the door to time travel is still firmly open.

http://www.newscientist.com/article/mg21128331.300-about-time-is-time-travel-possible.html

Earthquakes Generate Big Heat in Super-Small Areas



Hitting the high pointsComputer-simulated topography shows high points — asperities (in red) — on the rock surface. When in contact with asperties on the adjacent surface, these asperities may undergo intense flash heating in an earthquake.Credit: Mark Robbins and Sangil Hyun, Johns Hopkins UniversityHitting the high points Computer-simulated topography shows high points — asperities (in red) — on the rock surface. When in contact with asperties on the adjacent surface, these asperities may undergo intense flash heating in an earthquake. (Credit: Mark Robbins and Sangil Hyun, Johns Hopkins University)

ScienceDaily (Oct. 13, 2011) — In experiments mimicking the speed of earthquakes, geophysicists at Brown University detail a phenomenon known as flash heating. They report in a paper published in *Science* that because fault surfaces touch only at microscopic, scattered spots, these contacts are subject to intense stress and extreme heating during earthquakes, lowering their friction and thus the friction of the fault. The localized, intense heating can occur even while the temperature of the rest of the fault remains largely unaffected.

Most earthquakes that are seen, heard, and felt around the world are caused by fast slip on faults. While the earthquake rupture itself can travel on a fault as fast as the speed of sound or better, the fault surfaces behind the rupture are sliding against each other at about a meter per second.

But the mechanics that underlie fast slip during earthquakes have eluded scientists, because it's difficult to replicate those conditions in the laboratory. "We still largely don't understand what is going at earthquake slip speeds," said David Goldsby, a geophysicist at Brown, "because it's difficult to do experiments at these speeds."

Now, in experiments mimicking earthquake slip rates, Goldsby and Brown geophysicist Terry Tullis show that fault surfaces in earthquake zones come into contact only at microscopic points between scattered bumps, called asperities, on the fault. These tiny contacts support all the force across the fault. The experiments show that when two fault surfaces slide against other at fast slip rates, the asperities may reach temperatures in excess of 2,700 degrees Fahrenheit, lowering their friction, the scientists write in a paper published in *Science*. The localized, intense heating can occur even while the temperature of the rest of the fault remains largely unaffected, a phenomenon known as flash heating.

"This study could explain a lot of the questions about the mechanics of the San Andreas Fault and other earthquakes," said Tullis, professor *emeritus* of geological sciences, who has studied earthquakes for more than three decades.

The experiments simulated earthquake speeds of close to half a meter per second. The rock surfaces touched only at the asperities, each with a surface area of less than 10 microns -- a tiny fraction of the total surface area. When the surfaces move against each other at high slip rates, the experiments revealed, heat is generated so quickly at the contacts that temperatures can spike enough to melt most rock types associated with earthquakes. Yet the intense heat is confined to the contact flashpoints; the temperature of the surrounding rock remained largely unaffected by these microscopic hot spots, maintaining a "room temperature" of around 77 degrees Fahrenheit, the researchers write.

"You're dumping in heat extremely quickly into the contacts at high slip rates, and there's simply no time for the heat to get away, which causes the dramatic spike in temperature and decrease in friction," Goldsby said.

"The friction stays low so long as the slip rate remains fast," said Goldsby, associate professor of geological sciences (research). "As slip slows, the friction immediately increases. It doesn't take a long time for the fault to restrengthen after you weaken it. The reason is the population of asperities is short-lived and continually being renewed, and therefore at any given slip rate, the asperities have a temperature and therefore friction appropriate for that slip rate. As the slip rate decreases, there is more time for heat to diffuse away from the asperities, and they therefore have lower temperature and higher friction."

Flash heating and other weakening processes that lead to low friction during earthquakes may explain the lack of significant measured heat flows along some active faults like the San Andreas Fault, which might be expected if friction was high on faults during earthquakes. Flash heating in particular may also explain how faults rupture as "slip pulses," wrinkle-like zones of slip on faults, which would also decrease the amount of heat generated.

If that is the case, then many earthquakes have been misunderstood as high-friction events. "It's a new view with low dynamic friction. How can it be compatible with what we know?" asked Tullis, who chairs the National Earthquake Prediction Evaluation Council, an advisory body for the U.S. Geological Survey.

"Flash heating may explain it," Goldsby replied.

The U.S. Geological Survey funded the research.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Brown University**.

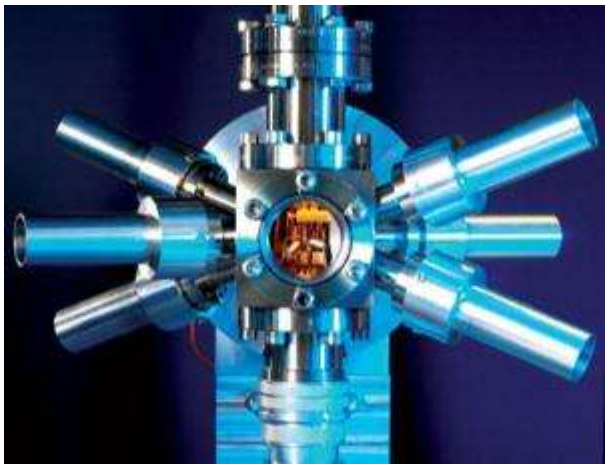
Journal Reference:

1. D. L. Goldsby, T. E. Tullis. **Flash Heating Leads to Low Frictional Strength of Crustal Rocks at Earthquake Slip Rates**. *Science*, 2011; 334 (6053): 216 DOI: 10.1126/science.1207902

http://www.sciencedaily.com/releases/2011/10/111013153947.htm

The world's most accurate clock

- 13 October 2011 by **Richard Webb**
- Magazine issue 2833



Strontium mean time *(Image: Andrea Brookes/NPL/SPL)*

Read more: "About time: Adventures in the fourth dimension"

SINCE 1955, when Louis Essen and Jack Parry of the UK's National Physical Laboratory (NPL) in Teddington demonstrated the first atomic clock - capable of keeping time to an accuracy of 0.0001 seconds per day (*Nature*, vol 176, p 280) - clocks precise to even more trifling fractions of a second have brought the world ever more in sync.

Today, the second is defined by a number - 9,192,631,770 to be exact - of atomic transitions in caesium.

The record for the most accurate timepiece swings back and forth between the world's national standards labs, but since August it has rested again at the NPL. The NPL-CsF2 clock works by tossing a fountain of caesium atoms upwards and measuring their transitions on the way up and down, to counterbalance the effects of gravity (*Metrologia*, vol 48, p 283). Had it been ticking since the dinosaurs died out, 65 million years ago, this clock would have lost or gained only about half a second.

A new generation of devices, like NPL's strontium-ion clock (right), is claimed to be even more accurate. Meanwhile an aluminium-ion clock at the US National Institute of Standards and Technology in Boulder, Colorado, would have gone only 4 seconds out of sync since the big bang.

http://www.newscientist.com/article/mg21128331.400-about-time-the-worlds-most-accurate-clock.html

100,000-Year-Old Ochre Toolkit and Workshop Discovered in South Africa

An ochre-rich mixture, possibly used for decoration, painting and skin protection 100,000 years ago, and stored in two abalone shells, was discovered at Blombos Cave in Cape Town, South Africa. (Credit: Prof. Chris Henshilwood, University of the Witwatersrand, Johannesburg)

ScienceDaily (Oct. 13, 2011) — An ochre-rich mixture, possibly used for decoration, painting and skin protection 100,000 years ago, and stored in two abalone shells, was discovered at Blombos Cave in Cape Town, South Africa.

"Ochre may have been applied with symbolic intent as decoration on bodies and clothing during the Middle Stone Age," says Professor Christopher Henshilwood from the Institute for Human Evolution at the University of the Witwatersrand, Johannesburg, who together with his international team discovered a processing workshop in 2008 where a liquefied ochre-rich mixture was produced.

The findings will be published in the journal *Science*, on Friday, 14 October 2011.

The two coeval, spatially associated toolkits were discovered in situ (not been moved from its original place of deposition) and the kits included ochre, bone, charcoal, grindstones and hammerstones. The grinding and scraping of ochre to produce a powder for use as a pigment was common practice in Africa and the Near East only after about 100,000 years ago.

"This discovery represents an important benchmark in the evolution of complex human cognition (mental processes) in that it shows that humans had the conceptual ability to source, combine and store substances that were then possibly used to enhance their social practices," explains Henshilwood.

"We believe that the manufacturing process involved the rubbing of pieces of ochre on quartzite slabs to produce a fine red powder. Ochre chips were crushed with quartz, quartzite and silcrete hammerstones/grinders and combined with heated crushed, mammal-bone, charcoal, stone chips and a liquid,

which was then introduced to the abalone shells and gently stirred. A bone was probably used to stir the mixture and to transfer some of the mixture out of the shell."

The quartz sediments in which the ochre containers were buried were dated to about 100,000 years using Optically Stimulated Luminescence (OSL) dating. This is consistent with the thermoluminescence dating of burnt lithics and the dating of calcium carbonate concretions using uranium-series dating methods.

"The recovery of these toolkits adds evidence for early technological and behavioural developments associated with humans and documents their deliberate planning, production and curation of pigmented compound and the use of containers. It also demonstrates that humans had an elementary knowledge of chemistry and the ability for long-term planning 100,000 years ago," concludes Henshilwood.

The two specimens will be on display at the Iziko Museum in Cape Town from Friday, 14 October 2011.

*Ochre is the colloquial term used by archaeologists to describe an earth or rock containing red or yellow oxides or hydroxides of iron

*The Blombos Cave is situated on the southern Cape Coast, 300km east of Cape Town, South Africa

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Story Source:

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http://www.sciencedaily.com/releases/2011/10/111013141807.htm

Children in the Roman Empire
Peter Thonemann

Christian Laes
CHILDREN IN THE ROMAN EMPIRE
Outsiders within
350pp. Cambridge University Press. £65.
978 0 521 89746 4

Véronique Dasen and Thomas Späth, editors
CHILDREN, MEMORY, AND FAMILY IDENTITY IN ROMAN CULTURE
392pp. Oxford University Press. £70 (US $125).
978 0 19 958257 0

Published: 12 October 2011

A Roman relief, second century AD; Ostia, Italy Photograph: The Art Archive

T here is remarkably little good poetry about very small children. Maybe it's the lack of sleep that does it; for the first few months it's hard to remember to put out the bins, let alone write poems. Perhaps the first writer to make a serious attempt to evoke the world of earliest childhood was the Latin poet Statius, a contemporary of the Roman emperor Domitian (ad 81–96). In one of his most remarkable poems, Statius describes taking a newborn baby boy in his arms, "as he demanded the novel air with trembling wails". Bit by bit, he learned to interpret the child's inarticulate complaints and to soothe his "hidden wounds" (vulnera caeca). Later still, once the baby had learned to crawl, Statius would pick him up and kiss him, until bit by bit, cradled in the poet's arms, he would drop off to sleep. Statius's name was the toddler's first word, and Statius's face served as "his first plaything". How many other poets, in any language, have described the experience of having their face yanked around by a fascinated baby?

It comes, then, as a rude shock to discover that the baby was not Statius's son, but his slave. "He was not of my stock, nor did he carry my name or features; I was not his father . . . . I was not one to love some

chatterbox plaything bought from an Egyptian slave-ship – no, he was mine, my own." This little boy was a verna, "house-reared", the child of two of Statius's own household slaves. He was Statius's property, to be trained up or sold on as he wished. To judge from Statius's other poems for deliciae, beloved slave-boys in elite Roman households, the boy's early adolescence would probably have been spent ministering to his owner's sexual desires.

Adult–child relationships in past societies present painful and delicate problems for the historian. Were Statius's feelings for this child "natural"? Did he have "paternal instincts" towards him? By the standards of contemporary Roman society, Statius's relationship with his verna was clearly quite normal, and there is no reason to doubt the sincerity of his feelings for the child. House-reared slaves, as Beryl Rawson shows in Children, Memory, and Family Identity in Roman Culture, could play a variety of roles in the Roman elite family, from surrogate son to erotic plaything. What is difficult for us to deal with is the notion that, as in the case of Statius's beloved boy, they might have played both roles simultaneously.

The Romans were simply not interested in what we would now call child development In his superb Children in the Roman Empire, first published in Dutch in 2006, Christian Laes argues that we have a lot of modern baggage to chuck overboard. For one thing, the Romans were simply not interested in what we would now call child development. To all intents and purposes, Roman childhood was treated as a single undifferentiated life stage. Laes notes the absence in both Greek and Latin of words corresponding to the modern subdivisions of childhood, "baby", "infant", "toddler", "schoolchild", "adolescent". At most, a Roman might distinguish a young child (infans) from an older one (puer), but the line between the two was "crude and schematic at best".

Instead, Laes suggests, Roman childhood should be understood as a social category. Whether or not a twelve-year-old child was regarded as an acceptable sexual partner was determined not by biology, but by the child's status, slave or free. No Roman saw anything problematic about setting slaves and lowstatus children to work as soon as they were physically capable of doing so. For many, adult labour began painfully early. The tombstone of Quintus Artulus, who died at the age of four at the silver mines of Baños de la Encina in Andalusia, depicts the child in a short tunic, barefoot, carrying the tools of his trade, a miner's axe and basket.

By contrast, the adolescent sons and daughters of wealthy Roman citizens were at least as segregated from adult society as any modern Oliver or Olivia. Sexual advances towards a freeborn Roman child of any age, male or female, were punishable by death. Premarital purity was obsessively guarded; obscene language was known in Latin as nupta verba, "married words". Physical labour was unheard of: the sons of the Roman elite could expect to stay in full-time formal education well into their mid-teens, studying the civil arts of grammar and rhetoric. "If you don't enjoy reading Cicero", reads a graffito in a schoolroom at Pompeii, "you'll get a hiding". The ability to read Cicero with pleasure, then as now, demanded leisure that only a very few could afford.

For Laes, then, the Romans' radically different views on child sexuality, child labour and so forth are a product of the stark inequalities within Roman society. It was their intense consciousness of status, and in particular the distinction between slave and free, that generated what seem to us to be ugly and repellent patterns of behaviour towards some of the most vulnerable members of their community. Thus far, Laes's argument is entirely convincing. Where things get difficult is when we try to determine the consequences of this for emotional relations between Roman adults and children. Take the notion of parental love. Is love for one's children a human universal? Or, as with the concept of child development, are we dealing with a culture-bound category which simply has no meaning in a Roman context? As Laes points out, the chilly tone of most Roman writers on childhood (Statius excepted) proves nothing either way: "Contemporary moral concepts such as sincerity, spontaneity and emotionality were entirely alien to ancient writers".

The editors of Children, Memory, and Family Identity reckon that Roman emotions had very little in common with our own. Fuzzy old notions like paternal "instincts" or "natural" feelings are briskly pinioned in inverted commas. When Roman children died young, their parents sometimes had cheap wax or plaster portraits made

of them. Indications of love and grief? Not a bit of it: for Véronique Dasen, these portraits were "the means for constructing the memory of families who invested their ambitions in their descendants and substituted their children for illustrious ancestors". Even so apparently innocuous a metaphor as "to follow in the footsteps" of one's parents or ancestors (in Latin, vestigia sequi) is subjected to six pages of earnest contextualization: might it refer to elite children literally trailing after their fathers in order to learn the rules of public life? Or do we have an allusion to the routes taken by Roman generals on campaign? The naive idea that this might just be a "natural" way of speaking about heredity is not even considered.

Fuzzy old notions like paternal instincts or natural feelings are briskly pinioned in inverted commas An extreme form of this "culturalist" position is adopted by Thomas Späth in his account of Cicero's relationship with his two children, Tullia and Quintus. Thanks to the survival of so much of Cicero's correspondence, his day-to-day relations with Tullia and Quintus are better known to us than any other parent–child relationship in the Roman world. To the innocent reader, Cicero's love for his children might seem rather sweetly unselfconscious: "I miss my daughter Tullia, the most loving, modest, and clever daughter a man ever had, the image of my face and speech and mind". But Späth insists that we recognize "the historical and cultural contingency of this particular 'love'". Cicero's apparent affection for his children "has nothing to do with their individual personality but instead with conforming to overarching social norms and values . . . in Cicero's case, the essential condition of Roman 'paternal love'" – those scare quotes again! – "is the successful adoption of a family tradition and its continuation". If Cicero gives the impression of loving his children, that is only because he expected them to carry on his name and advance his family's political and social status at Rome. What about the particular warmth with which he always speaks of his little Tullia (Tulliola mea)? "The gender-specific difference in his affection lies simply in the distinction between socially determined male and female careers."

These questions are well worth asking, and it is certainly true that Cicero, like all Roman aristocrats, worried his head off about his family's reputation. But I do wonder whether, in their eagerness to avoid importing modern preconceptions, Dasen and Späth might have swung too far in the opposite direction. Is Cicero's behaviour towards his children really best explained in these bleak utilitarian terms? As Laes shows all too well, the Roman upper classes were capable of startling cruelty towards low-status children in order to uphold what they saw as important social hierarchies. But just because people behave according to an instrumental logic in one context need not mean that all parents treated their own children "as an instrument for the construction of social identities within the family".

In their remarkable The Lore and Language of Schoolchildren (1959), Iona and Peter Opie remarked that part of the fun of childhood "is the thought, usually correct, that adults know nothing about them . . . the folklorist and anthropologist can, without travelling a mile from his door, examine a thriving unselfconscious culture which is as unnoticed by the sophisticated world, and quite as little affected by it, as is the culture of some dwindling aboriginal tribe living out its helpless existence in the hinterland of a native reserve". Needless to say, both of the books under review see Roman children through the eyes of their parents and owners. How could it be otherwise? Aside from the odd cheeky remark about enjoying Cicero, the voices of ancient children are lost for good. A rare exception comes from the temple of Sarapis at Memphis in Egypt, where, in the mid-second century BC, an eccentric recluse called Ptolemaios faithfully recorded the dreams of two little Egyptian twin girls, Thaues and Taous: "The dream that the girl Thaues saw on the 17th of the month Pachon. I seemed in my dream to be walking down the street, counting nine houses. I wanted to turn back. I said, 'All this is at most nine.' They say, 'Well, you are free to go.' I said, 'It is too late for me'." It is salutary to be reminded quite how little we really know or understand about the experience of childhood in antiquity.

Still, not everything is quite so impenetrable as the counting-dreams of Thaues. My own favourite vignette of Roman childhood comes from the third-century author Minucius Felix, who describes walking along the seashore at Ostia with two friends, Octavius and Caecilius. As they passed along the rows of little boats drawn up on their blocks, We saw some small boys fiercely competing at a game of throwing shells into the sea. The game is to pick a shell from the shore which has been rubbed smooth by the beating of the waves.

You hold the shell flat with your fingers, and stooping at an angle and low to the ground, you spin it over the waves as hard as possible, so that it may either swim and glide smoothly across the sea's surface, or flash and leap as it skips again and again along the tips of the waves. The winner is the boy whose shell travels furthest, and skips the most times. Some things, at least, do not change.

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http://www.the-tls.co.uk/tls/public/article796886.ece

Severe Drought, Other Changes Can Cause Permanent Ecosystem Disruption

This giant waterbug, once the top insect predator in a stream in Arizona's French Joe Canyon, has now disappeared in some places due to severe drought. (Credit: Photo by Michael Bogan)

ScienceDaily (Oct. 13, 2011) — An eight-year study has concluded that increasingly frequent and severe drought, dropping water tables and dried-up springs have pushed some aquatic desert ecosystems into "catastrophic regime change," from which many species will not recover.

The findings, just published in the journal *Freshwater Biology*, raise concerns that climate change, over-pumping of aquifers for urban water use, and land management may permanently affect which species can survive.

"Populations that have persisted for hundreds or thousands of years are now dying out," said David Lytle, an associate professor of zoology at Oregon State University. "Springs that used to be permanent are drying up. Streams that used to be perennial are now intermittent. And species that used to rise and fall in their populations are now disappearing."

The research, done by Lytle and doctoral candidate Michael Bogan, examined the effect of complete water loss and its subsequent impact on aquatic insect communities in a formerly perennial desert stream in Arizona's French Joe Canyon, before and after severe droughts in the early 2000s.

The stream completely dried up for a period in 2005, and again in 2008 and 2009, leading to what researchers called a rapid "regime shift" in which some species went locally extinct and others took their place. The ecosystem dynamics are now different and show no sign of returning to their former state. Six species were eliminated when the stream dried up, and 40 others became more abundant. Large-bodied "top predators" like the giant waterbug disappeared and were replaced by smaller "mesopredators" such as aquatic beetles.

"Before 2004, this area was like a beautiful oasis, with lots of vegetation, birds and rare species," Lytle said. "The spring has lost a number of key insect species, has a lot less water, and now has very different characteristics."

The phenomena, the researchers say, does not so much indicate the disappearance of life -- there is about as much abundance as before. It's just not the same.

"Our study focused on a single stream in isolation, but this process of drying and local extinction is happening across the desert Southwest," Bogan said. "Eventually this could lead to the loss of species from the entire region, or the complete extinction of species that rely on these desert oases."

Small streams such as this are of particular interest because they can be more easily observed and studied than larger rivers and streams, and may represent a microcosm of similar effects that are taking place across much of the American West, the researchers said. The speed and suddenness of some changes give species inadequate time to adapt.

"It's like comparing old-growth forests to second-growth forests," Lytle said. "There are still trees, but it's not the same ecosystem it used to be. These desert streams can be a window to help us see forces that are at work all around us, whether it's due to climate change, land management or other factors."

The researchers noted in their report that the last 30 years have been marked by a significant increase in drought severity in the Southwest. The drought that helped dry up French Joe Canyon in 2005 resulted in the lowest flow in Arizona streams in 60 years, and in many cases the lowest on record. At French Joe Canyon, the stream channel was completely dry to bedrock, leaving many aquatic invertebrates dead in the sediments.

That was probably "an unprecedented disturbance," the researchers said in their report. Community composition shifted dramatically, with longer-lived insects dying out and smaller, shorter-lived ones taking their places.

Conceptually similar events have taken place in the past in plant communities in the Florida Everglades, floodplains in Australia, and boreal forests following fire disturbance, other researchers have found. In the Southwest, climate change models predict longer, more frequent and more intense droughts in the coming century, the scientists noted in their study.

The research was supported by the National Science Foundation.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Oregon State University**.

Journal Reference:

1. Michael T. Bogan, David A. Lytle. **Severe drought drives novel community trajectories in desert stream pools**. *Freshwater Biology*, 2011; 56 (10): 2070 DOI: 10.1111/j.1365-2427.2011.02638.x

http://www.sciencedaily.com/releases/2011/10/111013135252.htm

Discussing the marriage plot

Edmund Gordon

Jeffrey Eugenides
THE MARRIAGE PLOT
406pp. Fourth Estate. £20.
978 0 00 744129 7

Published: 12 October 2011

Brown University, Providence, Rhode Island, 1994. Photograph: © Corbis. All Rights Reserved.

S even years ago, during a short but rambling exchange with the writer Jim Lewis on "the legacy of Joyce", Jeffrey Eugenides took a swipe at "the multicultural novel". A reproving email from a reader of Slate – the online journal where the exchange appeared – forced him subsequently to define his terms: he meant fiction written in English, but dealing with communities that are isolated from the anglophone mainstream (whether by language and geography or simply by aversion). The example he gives is Waiting by Ha Jin. His gripe was that, all too often, such fiction uses eye-catching imported parts to disguise the obsolescence of its design:

"What the multicultural novel has going for it is the marriage plot. They can still use it! The societies under examination are conservative, religious, still bound by custom and tradition.And so – voilà – you can be an Indian novelist or a Jordanian novelist and still avail yourself of the greatest subject the novel has ever had . . . . But using it in the way they do has consequences.
Though these books are coming out now, they're already at least a hundred years old . . . . The 19th-century subject matter begins to infect the prose. It makes the characterization creaky. There are cobwebs between the sentences. Entire paragraphs smell like mothballs".

At the time of writing those words, Eugenides was the author of two novels, each of which treats a romantic theme in its own unconventional manner, without a whiff of mothballs. The Virgin Suicides (1993) is the luminous, graceful, tragicomic story of the five death-besotted Lisbon sisters, as narrated by a chorus of lovestruck teenage boys; Middlesex (2002), a much roomier and rowdier novel, traces through three

generations of a Greek-American family (and two fateful occurrences of inbreeding) the progress of a gene that causes hermaphroditism, to its final flowering in the narrator, Cal. The contrast between Eugenides's first two novels has been frequently remarked – but their similarities may come into sharper focus now that they can be viewed together with his third.

Writers don't have a duty to create a coherent body of work If The Marriage Plot comes as quite a surprise from the author of Middlesex and The Virgin Suicides, it is an outright conundrum from the author of that attack on "the multicultural novel". But that is not necessarily a criticism. Writers don't have a duty to create a coherent body of work – or even to maintain the same beliefs between books – and perhaps it is better if they reinvent themselves with each new undertaking; it certainly beats getting stale. Eugenides has returned with a novel in which the machinery of the oldfashioned marriage plot is disguised neither by foreign customs nor exotic locations, but rather held up to the light, naked and prone. Either he wants to offer us a demonstration of its datedness (but what a cranky and masochistic exercise that would be), or else he is trying – with rather charming bullishness – to see if, in spite of his earlier scepticism, there isn't a burst of life in the old dog yet.

The novel traces the romantic and intellectual coming-of-age of Madeleine Hanna – a beautiful, intelligent, but emotionally guileless English major at Brown University – and of her friend Mitchell Grammaticus – a studious, gauche Greek-American who is entranced by the mystical thinking he encounters in Theology classes – against a backdrop of the intellectual and sociocultural revolutions of the early 1980s. Mitchell is not so secretly in love with Madeleine, but although (or quite possibly because) she recognizes that he is "just the kind of smart, sane, parent-pleasing boy she should fall in love with", she finds it impossible fully to return his feelings, and their relationship ("aspirational, sporadically promising yet frustrating" on his part; "confusing" on hers) shambles along, to their mutual dissatisfaction.

Their friendship is further complicated when Madeleine begins dating Leonard Bankhead, a charismatic but troubled Natural Sciences major. Leonard, who suffers from bipolar disorder (this affliction, combined with his relentless intelligence and his penchant for wearing bandanas and chewing tobacco, suggests a portrait of Eugenides's late contemporary David Foster Wallace), is the least focal of the three main characters, but the most engaging: the sections that adopt his high-strung perspective burn much brighter than any of the others. After graduation, Madeleine moves with him to Pilgrim Lake, a famous research facility in Massachusetts. But when it becomes clear that his condition is only getting worse, she must choose between the exacting emotional intensity he can offer, and a duller, safer life with Mitchell.

Eugenides tells this story in a voice of careful anonymity and untroubled omniscience, moving between the perspectives of several of his characters and sometimes getting away from all of them together. The opening paragraph takes the form of an impersonal inventory of Madeleine's bookshelves; later, we are told (though he himself is apparently unaware of the fact) that Mitchell's letters to his parents are "documents of utter strangeness", and (while Madeleine is lying hungover in bed one morning "with a pillow over her head") that the sun is "shining on every brass doorknob, insect wing, and blade of grass" outside. For a work that employs such a majestic narrative standpoint, though, the touch is light, the tone unusually sweet. Here, for example, is Mitchell, remembering the occasion – as they were taking refuge from a toga party in the laundry room of her dorm – on which he caught a lucky, life-haunting glimpse of Madeleine's half-exposed nipple:

"It was amazing how an image like that – of nothing, really, just a few inches of epidermis – could persist in the mind with undiminished clarity. The moment had lasted no more than three seconds. Mitchell hadn't been entirely sober at the time. And yet now, almost four years later, he could return to the moment at will (and it was surprising how often he wanted to do this), summoning all of its sensory details, the rumbling of the dryers, the pounding music next door, the linty smell of the dank basement laundry room. He remembered exactly where he'd been standing and how Madeleine had stooped forward, tucking a strand of hair behind her ear, as the sheet slipped and, for a few exhilarating moments, her pale, quiet, Episcopalian breast exposed itself to his sight".

The prose here is relaxed – almost indecently so in comparison to Eugenides's first two books The prose here is relaxed – almost indecently so in comparison to Eugenides's first two books, and sometimes by any standards to the point of laziness ("the rumbling of the dryers, the pounding music") – but fuelled by just enough hard-working detail to keep it buoyant; take the brilliance of that "pale, quiet, Episcopalian breast", the last two adjectives of which are so unexpected, yet which fit so intimately to religious, callow Mitchell's perspective.

There are various gently metafictional touches to buffer the conventionality of the book's design. Madeleine wrote her thesis on the marriage plot, and the question of whether it can survive into an age in which not marrying – or making a bad marriage – doesn't necessarily wreck a woman's life is explicitly posed: "How would Isabel Archer's marriage to Gilbert Osmond have been affected by the existence of a prenup?" Madeleine thinks that the tradition comes to full maturity in the Victorian era – when novelists began to see past the altar and followed their heroines into unhappy unions – and that The Portrait of a Lady and Middlemarch represent its twin peaks; and it is the latter that Eugenides seems to have taken as his model.

Like George Eliot (and presumably in homage to her), Eugenides makes a meal out of the ways in which his characters have been affected by their educations. Literary works are mentioned and discussed so frequently, and at such length, that at times Madeleine, Mitchell and Leonard seem like purely intellectual beings, with no mental space left for psychology or sentiment; indeed, their emotional lives are presented in two main ways, and both of them are more or less cerebral. Either they seek guidance and solace from the books they are reading – thus Madeleine processes her feelings for Leonard by reference to A Lover's Discourse by Roland Barthes, and Mitchell makes sense of his own "neurotic temperament" with the help of a passage from William James – or they construct personal metaphors to gain some purchase on their situations – as when Madeleine, reflecting on how the move to Pilgrim Lake has failed to improve Leonard's outlook, feels that he has "brought his hot, stuffy little studio apartment with him, as though that was where he lived, emotionally, and anyone who wanted to be with him had to squeeze into that hot psychic space too".

Sometimes these two ways of addressing character come together, as when Mitchell finds in Interior Castle by St Teresa of Avila the image of the soul as a series of mansions that must be progressed through towards God. Mitchell thinks that this sounds "authentic": "It sounded like something that Saint Teresa . . . had experienced, as real as the garden outside her convent window in Avila. You could tell the difference between someone just making things up and someone using metaphorical language to describe an ineffable, but real, experience". It is perhaps significant (though Eugenides doesn't help us towards the connection) that while Mitchell is finding an image for his own spiritual journey in Interior Castle, Madeleine will have come across these lines in the preface to Middlemarch:

"[St Teresa] was certainly not the last of her kind. Many Teresas have been born who found for themselves no epic life wherein there was a constant unfolding of far-resonant action; perhaps only a life of mistakes, the offspring of a certain spiritual grandeur ill-matched with the meanness of opportunity . . . for these later-born Teresas were helped by no coherent social faith and order which could perform the function of knowledge for the ardently willing soul."

We can assume that (since she takes a writer as icily theoretical as Barthes to be commenting directly on her life) Madeleine will see in this passage a reflection of her own situation as a young woman of "spiritual grandeur" in the culturally fragmented 1980s. That she and Mitchell should, without realizing it, be taking succour from the same historical figure is oddly touching, and points us towards one of the novel's themes: the shared consolatory power of literature and religion.

One of the best and funniest evocations of clever immaturity to appear since The Rachel Papers This is a nostalgic work in its detail as much as its form. The funky, slightly acerbic flavour of the early 1980s is transmitted via the intellectual climate the characters inhabit: the films they watch, the books they read, the dogmas they adhere to. As a portrait both of a specific generation and of youth in general, The Marriage Plot

transcends its eponymous tradition; it must be one of the best and funniest evocations of clever immaturity to appear since The Rachel Papers. Indeed, the consistent cleverness of the characters – even of the bit players who serve mainly as comic foils – is one of the most admirable things about it. It must have been tempting to make some of them stupid. Instead, Eugenides makes them all intelligent, but often deliriously pretentious. So here is Thurston Meems, a classmate of Madeleine's and Leonard's, who introduces himself by wondering out loud whether knowing his name will give them any handle on who he is: "the whole idea of social introductions is so problematized . . .". Or Madeleine's ex-boyfriend Billy, who takes Women's Studies classes and describes himself as a feminist:

"On the wall of his living room Billy had painted the words Kill the Father. Killing the father was what, in Billy's opinion, college was all about.
'Who's your father?' He asked Madeleine. 'Is it Virginia Woolf? Is it Sontag?'
'In my case my father really is my father.'
'Then you have to kill him.'
'Who's your father?'
'Godard.'"

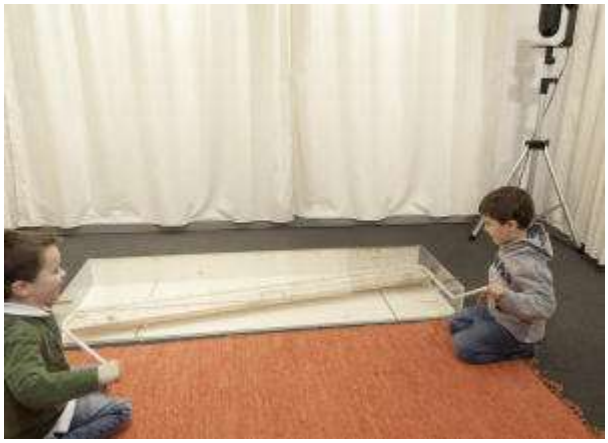
Madeleine tends to be cast, as in this exchange, as the straight woman – passive, pedantic, poker-faced – to the fashionable silliness of her contemporaries. Her character is thus elided – and the elision should, really, deprive her fate of any power to move us. That it doesn't is perhaps testament to how universal her mistakes are made to feel. She is not so much a character as a cipher; but a cipher constructed out of the kinds of hopes and fancies that most of us might at her age have entertained. Though she can't quite reinvigorate the marriage plot with the tragic power brought to it by the likes of Isabel Archer and Dorothea Brooke, she makes a fair go of rescuing it from full retirement.

Except that, in an important sense, Eugenides cheats: his apparent bravery in acknowledging the anachronistic nature of his project is undermined by the very fact of that acknowledgement. Such a closely controlled experiment stands no real risk of failure. Whether a genuine attempt to haul the marriage plot out of the nineteenth century (one that neither disguised nor advertised its machinery) could be at all moving or dynamic – that remains to be seen.

Edmund Gordon teaches creative writing at King's College London. He is writing a biography of Angela Carter.

http://www.the-tls.co.uk/tls/public/article796831.ece

Children, Not Chimps, Prefer Collaboration: Humans Like to Work Together in Solving Tasks Chimps Don't



Cooperation is child´s play: children that are presented with a task that they could perform on their own or with a partner show a preference to cooperate. (Credit: © MPI for Evolutionary Anthropology)

ScienceDaily (Oct. 13, 2011) — Recent studies have shown that chimpanzees possess many of the cognitive prerequisites necessary for humanlike collaboration. Cognitive abilities, however, might not be all that differs between chimpanzees and humans when it comes to cooperation. Researchers from the MPI for Evolutionary Anthropology in Leipzig and the MPI for Psycholinguistics in Nijmegen have now discovered that when all else is equal, human children prefer to work together in solving a problem, rather than solve it on their own. Chimpanzees, on the other hand, show no such preference according to a study of 3-year-old German kindergarteners and semi-free ranging chimpanzees, in which the children and chimps could choose between a collaborative and a non-collaboration problem-solving approach.

Human societies are built on collaboration. From a young age, children will recognize the need for help, actively recruit collaborators, make agreements on how to proceed, and recognize the roles of their peers to ensure success. Chimpanzees are cooperative too, working together in border patrols and group hunting, for instance. Still, humans might have greater motivation to cooperate than chimpanzees do." A preference for doing things together instead of alone differentiates humans from one of our closely related primate cousins," says Daniel Haun of the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany and the Max Planck Institute for Psycholinguistics in Nijmegen, The Netherlands. "We expected to find differences between human and chimpanzee cooperation, because humans cooperate in a larger variety of contexts and in more complex forms than chimpanzees."

The research team presented 3-year-old German children and chimpanzees living in a Congo Republic sanctuary with a task that they could perform on their own or with a partner. Specifically, they could either pull two ends of a rope themselves in order to get a food reward or they could pull one end while a companion pulled the other. The task was carefully controlled to ensure there were no obvious incentives for the children or chimpanzees to choose one strategy over the other. "In such a highly controlled situation, children showed a preference to cooperate; chimpanzees did not," Haun points out.

The children cooperated more than 78 percent of the time compared to about 58 percent for the chimpanzees. These statistics show that the children actively chose to work together, while chimps appeared to choose between their two options randomly. "Our findings suggest that behavioral differences between humans and other species might be rooted in apparently small motivational differences," says Haun.

Future work should compare cooperative motivation across primate species in an effort to reconstruct the evolutionary history of the trait, the researchers say. "Especially interesting would be other cooperative-breeding primates, or our other close relatives, the bonobos, who have both previously been argued to closely match some of the human pro-social motivations," says Yvonne Rekers of the Max Planck Institute for Evolutionary Anthropology and first author of the study.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Max-Planck-Gesellschaft**.

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1. Yvonne Rekers, Daniel B.M. Haun and Michael Tomasello. **Children, but Not Chimpanzees, Prefer to Collaborate**. *Current Biology*, 2011 DOI: 10.1016/j.cub.2011.08.066

http://www.sciencedaily.com/releases/2011/10/111013121519.htm

Women's lives at war
Norma Clarke

Virginia Nicholson
MILLIONS LIKE US
Women's lives in war and peace, 1939–1949
508pp. Viking. £25.
978 0 670 91778 5
Published: 12 October 2011

A recruitment poster for the Auxiliary Territorial Service from the 1940s Photograph: The Advertising Archives

C orporal "Mike" Morris of the Women's Auxiliary Air Force had spent two years studying in Germany before war broke out, charmed by Luftwaffe officers but disgusted by Hitler's regime. In 1940, as the German army advanced towards the Channel, German-speakers were needed to intercept and translate voice transmissions that could be picked up on VHF. Mike Morris was equipped with headphones and installed in a caravan on the edge of a cliff near Hastings. With other WAAF operators, and later at Hawkinge, near Folkestone, otherwise known as "Hellfire Corner", she tracked messages from German pilots and arranged air cover for food and fuel convoys. Protecting supplies, even under the relentless bombing and shelling of the Battle of Britain, was properly womanly. Perhaps it was also womanly to begin recognizing some of the voices of the German pilots, and, since these pilots knew very well they were being listened to, enjoying some flirtatious banter. When the Spitfire pilots shot down one of their favourites, whose position they had reported, the WAAFs listened to him screaming for his mother and cursing the Führer. Later Morris wrote, "I found myself praying: 'Get out, bale out – oh, please dear God, get him out.' But it was no use, he could not make it. We heard him the whole way down until he fell below reception range. I went outside and was sick". Women were not allowed to be active combatants, but she had been his executioner: "We missed him sadly, for we had known him as such a happy young man".

If the war against Hitler is the overt theme, sex war, or the sexual contract, is the underlying object of inquiry Did women respond differently from men to the challenges of war? Virginia Nicholson draws on memoirs, diaries and some live interviews with doughty nonagenarians, including her own mother, to tell the story of British women's contribution to the Second World War, what they did for it and what it did to and for them. Chronologically organized, Millions Like Us begins with the "phoney war" of 1939 when it was easy for ignorant teenagers to mix Hitler up with Charlie Chaplin, and it extends beyond the horrors of Belsen and atomic warfare to the aftermath. We hear from pacifists and nurses, welders and land girls, office workers and teachers, wives and girlfriends, and some mothers – though not many. Throughout, the emphasis is on what it felt like to be young, preoccupied with dating and mating and its associated rituals. If the war against Hitler is the overt theme, sex war, or the sexual contract, is the underlying object of inquiry.

All women, by virtue of being women, symbolized what men were fighting for: home, family, love, life. Most accepted that women's role was to be, literally, auxiliary: they drove, cooked, typed, queued, made tea and offered sympathy, waited, watched and worried. After December 1941, when the National Service (No 2) Act was passed introducing conscription for women, they did all these things and worked in factories, on the land, on buses and trams, covering for men in "essential" industries, or like Mike Morris joined one of the services. They learned new skills; they discovered self-worth; almost universally, no matter how hard and grinding the work, they recalled a sense of freedom. Sharing a common cause was exhilarating. The myth of domesticity had for centuries told women that their first duty lay at home, in nurturing husband and children, but now the nation needed them more. Often they were thrown into intense working conditions with other men or dangerous situations which heightened feelings. Sheltering with a stranger from the bombing might end in a kiss; joining the WAAF and qualifying as a filter room plotter might involve being sent to Inverness where Bomber Command had their HQ, the Cameron Highlanders were the local regiment, Canadians were based in the area and the Norwegian navy came regularly: "gorgeous, sexy and very, very funny . . . they drink like fishes and take over the whole town". Joan Wyndham, for one, was "happy as hell".

Bletchley Park was full of manicured debutantes whose daddies had pulled strings for them War brought the different classes together, but it did little to eradicate class distinctions: posh girls joined the Wrens (Women's Royal Naval Service – it had the nicest uniform); while the intelligence centre at Bletchley Park "was full of manicured debutantes whose daddies had pulled strings for them". Officer rank was conferred only on bona fide "ladies", women with clean nails who didn't say "toilet" and whose mothers had not worked as chars. The ATS (Auxiliary Territorial Service) almost broke Doffy Brewer's spirit. She was being trained to be a kinetheodolite operator, but first came basic training, beginning with latrine parade: twenty-four girls in groups of six were quick-marched over and given exactly one minute each. Sanitary towels were issued with kit and bedding, one packet per month. That was bad enough, but the foul mouths and malignity of her fellow rookies, mostly skivvies and housemaids, were no less challenging. Doffy Brewer observed, "If you survive it, nothing in the way of discomfort, humiliation, culture shock or fatigue that life can bring afterwards can be as bad". No qualifications were required to join the FANYs (First Aid Nursing Yeomanry) except being able to drive. Trained nurses joined the QAs (Queen Alexandra's Imperial Military Nursing Service).

During the war, some 8 million women were drafted into war work and services. By 1946, that number was down to 2 million. Demobilized men could request return to their old jobs. Many women, too, longed to go back: a happy, stable family life, in a house, with a man presiding who earned the income, came to seem what everyone had been fighting for. So much loss of life made it precious. The film Brief Encounter in 1945 encapsulated the mood. Its message was: don't throw up a settled home, even for love. Sexual licence, jokes about utility knickers ("one Yank and they're off") belonged in the past.

Nicholson finds plenty of stoical dissatisfaction, some refusals, but no rebellion. Nella Last, whose Mass Observation diaries have been well used by historians, recorded the unexpected loss of purpose she felt. She missed "the laughter and fellowship of the war years" when she worked for the Women's Voluntary Service (WVS). A dutiful housewife with a grumpy husband, she puzzled over the strange emptiness in her life and the paradox that during the war she felt hope, and once it had ended she felt none. It was to be some years

before Betty Friedan's The Feminine Mystique (1963) diagnosed a "problem that has no name" among 1950s American housewives and kick-started second-wave feminism. Nicholson doesn't mention this, but she does seem to concur with Virginia Woolf's conclusion in Three Guineas (1938) that there was an innate "Hitlerism" in men, a propensity to violence and need for control, which manifested itself in personal relations with women as well as in the larger public dramas of war and politics. In expanding women's supporting role the war expanded their horizons, but the structures had not changed. The sexual status quo remained: women were encouraged to remain feminine (they were paid less) and take orders from men. The vocabulary of feminism was conspicuous by its absence.

Women have always been among the trophies of war Millions Like Us is a curious mixture of tribute and bafflement. Determined not to deal in heroines – no stories of women agents parachuted behind enemy lines – Nicholson offers a collage of voices celebrating ordinariness, often from the heart of the extraordinary. The generation of "unselfish, practical and uncomplaining women" who endured the war found themselves in a changed world at the end of it, but at a fundamental level British women had not been active agents in that change. Nicholson's decision to include accounts from post-war Berlin provides a sombre commentary on this. With the defeat of Nazism, some German women felt "transformed", "emboldened", they saw in it "the defeat of the male sex". However, the woman journalist who wrote those words in her diary, later published as A Woman in Berlin, was the very next day raped by Russian soldiers. The atrocities committed by the victorious Russian army on German women were a taboo subject for many decades, yet it is well known that women have always been among the trophies of war. This is, after all, just another way of saying that men defend the homeland.

It is easy to be nostalgic about our mothers and grandmothers in their patched and worn clothing, descending into air raid shelters or handling ack-ack guns, managing ration cards and cooking with powdered eggs, getting up at 4.30 am to work on the buses or out in the fields thinning neeps and lifting tatties. Their matter-of-factness is remarkable. Those working in munitions wore no protective masks and were frequently burned: hot steel in the eyes would stick, we're told, but the people up in first aid had a magnet to deal with that. The voices are vivid, some of the themes – the importance of lipstick, dancing, alcohol – familiar, the stories compelling.

Nicholson is a wary chronicler, keen to give a rounded picture of what women felt. The trouble is, she shows us that what women felt didn't matter; and, for the most part, didn't do them much good. Every woman Nicholson spoke to who lived through the war told her, "We just got on with it". Viewed in one light this is commendable; in another it's the philosophy of the slave. Something disheartening hangs over the last third of this book and it isn't just that rationing continued and there were housing shortages and unemployment, nor that GI brides ("Pilgrim Mothers") fed on steaks in the land of the free while back at home in the frozen winter of 1947 women were still making do and mending. War had opened up avenues that peace closed off.

Virginia Nicholson finds herself again and again noting the "contradictory impulses that swayed women in the 1940s", registering and sometimes sharing the perplexity. It would have been a far less pleasurable book to read had she been less empathetic, but by responding more in sorrow than in anger to these "ordinary" women's acceptance of their narrowed futures, she helps sustain mythologies she clearly doesn't admire. The ordinary elides into the universal, and we come perilously close to Alexander Pope's "Woman's at best a contradiction still".

Norma Clarke is Professor of English Literature at Kingston University and the author of The Rise and Fall of the Woman of Letters, 2004, and Queen of the Wits: A Life of Laetitia Pilkington, 2008.

http://www.the-tls.co.uk/tls/public/article796873.ece

Possible Trigger for Volcanic 'Super-Eruptions' Discovered

Volcano. (Credit: © Beboy / Fotolia)

ScienceDaily (Oct. 12, 2011) — The "super-eruption" of a major volcanic system occurs about every 100,000 years and is considered one of the most catastrophic natural events on Earth, yet scientists have long been unsure about what triggers these violent explosions.

However, a new model presented this week by researchers at Oregon State University points to a combination of temperature influence and the geometrical configuration of the magma chamber as a potential cause for these super-eruptions.

Results of the research, which was funded by the National Science Foundation, were presented at the annual meeting of the Geological Society of America in Minneapolis, Minn.

Patricia "Trish" Gregg, a post-doctoral researcher at OSU and lead author on the modeling study, says the creation of a ductile halo of rock around the magma chamber allows the pressure to build over tens of thousands of years, resulting in extensive uplifting in the roof above the magma chamber. Eventually, faults from above trigger a collapse of the caldera and subsequent eruption.

"You can compare it to cracks forming on the top of baking bread as it expands," said Gregg, a researcher in OSU's College of Oceanic and Atmospheric Sciences. "As the magma chamber pressurizes at depth, cracks form at the surface to accommodate the doming and expansion. Eventually, the cracks grow in size and propagate downward toward the magma chamber.

"In the case of very large volcanoes, when the cracks penetrate deep enough, they can rupture the magma chamber wall and trigger roof collapse and eruption," Gregg added.

The eruption of super-volcanoes dwarfs the eruptions of recent volcanoes and can trigger planetary climate change by inducing Ice Ages and other impacts. One such event was the Huckleberry Ridge eruption of present-day Yellowstone Park about two million years ago, which was more than 2,000 times larger than the 1980 eruption of Mount St. Helens in Washington.

"Short of a meteor impact, these super-eruptions are the worst environmental hazards our planet can face," Gregg said. "Huge amounts of material are expelled, devastating the environment and creating a gas cloud that covers the globe for years."

Previous modeling efforts have focused on an eruption trigger from within the magma chamber, which scientists thought would leave a visible trace in the form of a precursor eruption deposits, according to Shanaka "Shan" de Silva, an OSU geologist and co-author on the study. Yet there has been a distinct lack of physical evidence for a pre-cursor eruption at the site of these super-volcanoes.

The model suggests the reason there may be no precursor eruption is that the trigger comes from above, not from within, de Silva pointed out.

"Instead of taking the evidence in these eruptions at face value, most models have simply taken small historic eruptions and tried to scale the process up to super-volcanic proportions," de Silva said. "Those of us who actually study these phenomena have known for a long time that these eruptions are not simply scaled-up Mt. Mazamas or Krakataus -- the scaling is non-linear. The evidence is clear."

It takes a "perfect storm" of conditions to grow an eruptible magma chamber of this size, Gregg says, which is one reason super-volcano eruptions have occurred infrequently throughout history. The magma reservoirs feeding the eruptions could be as large as 10,000- to 15,000-square cubic kilometers, and the chamber requires repeated intrusions of magma from below to heat the surrounding rock and make it malleable. It is that increase in ductility that allows the chamber to grow without magma evacuation in a more conventional manner.

When magma chambers are smaller, they may expel magma before maximum pressure is reached through frequent small eruptions.

The Yellowstone eruption is one of the largest super-volcano events in history and it has happened several times. Other super-volcano sites include Lake Toba in Sumatra, the central Andes Mountains, New Zealand and Japan.

Gregg said that despite its explosive history, it doesn't appear that Yellowstone is primed for another super-eruption anytime soon, though the slow process of volcanic uplift is taking place every day.

"The uplift of the surface at Yellowstone right now is on the order of millimeters," she explained. "When the Huckleberry Ridge eruption took place, the uplift of the whole Yellowstone region would have been hundreds of meters high, and perhaps as much as a kilometer."

Other authors on the investigation include Erik Grosfils, of Pomona College, and John Parmigiani, an OSU engineer.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Oregon State University**.

http://www.sciencedaily.com/releases/2011/10/111012124139.htm

1967–1971

by Michael Hofmann; introduced by Andrew McCulloch

Published: 11 October 2011

Photograph: MOURIER NINA/(c) MOURIER NINA

M ichael Hofmann once said that he began "by despising most poetry for being archaic and mindless and ornamental and unnecessary", a view with which, it seems, many readers must have agreed, if the popularity of his work is anything to go by: Stephen Knight said in a review of his Selected Poems (2008), that in the early 1980s Hofmann's "unmistakable poems were everywhere". This was especially true of the TLS, which printed thirty-four in the decade following the publication of "1967–1971". Thatcherite politics and the society they produced were one of two main themes in Hofmann's collection Acrimony (1986), but it is the second of these – his difficult relationship

with his father – that comes to the fore in this poem.

Ages and dates are important in what Hofmann has called the "errancy" of his formative years: the distance and detachment that came from moving to England from Germany at the age of four and going to board at Winchester at fourteen when his parents moved to Austria created a sense in him of identity as "a kind of ingrown rucksack-cum-carapace". And yet not only are the consolations of autobiography and self-definition held at arm's length in this poem – the speaker "never finished" David Copperfield – but even the ability of poetry to shape experience is called into question. Hofmann seems to turn his back on what he once referred to, disparagingly, as the "patterning and arrival" of most 1980s British poetry, creating instead poems that "fight the understanding" and that are unhampered – since he writes in what is effectively a foreign language – by what he calls "'inherited' connections and registers and expectations". There is certainly nothing generic in this poem in which the voices of a precocious teenager and a reflective adult leach into each other and become equally untrustworthy. The irony is twofold, directed at the self-aggrandizement of the boy and the literary conventions in which both he and his adult self think about themselves. These are conventions with which, as a boy, he was already becoming impatient: "it was somehow understood / that this would be the last

time". (It was also to be the last time for Hofmann's use of lowercase letters to begin new sentences, an experimental style which he quickly left behind.)

1967–1971

For R. H.

I lived in an L-shaped room. my chair was
almost directly behind the door, so that,
when I was sitting in it, I was virtually
the last thing in the whole room to be seen.
visitors would have to describe a small
circle in order to face me, crouching
on my chair with a book. early one evening
I read most of *David Copperfield*, put it
down for supper, and never finished it.
sometimes, out of nostalgia, I would read
the stories in a children's encyclopaedia,
flicking past the hundreds of pages of
science and travel and other matters
that separated these islands of fiction.
it was the time I was interested in art,
even in abstract painting. my red jumper
and my blue trousers were my favourite
clothes; and least my brown trousers and
lemon-yellow pullover. my last beating
took place then as well. just before lunch.
I had no thoughts of resistance, but decided
to let it go; it was somehow understood
that this would be the last time.

MICHAEL HOFMANN (1980)

Two translations by Michael Hofmann of poems by Gottfried Benn were published in last week's issue of the TLS (October 7).

http://www.the-tls.co.uk/tls/public/article795991.ece

Researchers Reconstruct Genome of the Black Death; Bacteria Found to Be Ancestor of All Modern Plagues

A skull from the East Smithfield plague pits in London, located under what is now the Royal Mint. (Credit: Photo by Museum of London)

ScienceDaily (Oct. 12, 2011) — An international team -- led by researchers at McMaster University and the University of Tubingen in Germany -- has sequenced the entire genome of the Black Death, one of the most devastating epidemics in human history.

This marks the first time scientists have been able to draft a reconstructed genome of any ancient pathogen, which will allow researchers to track changes in the pathogen's evolution and virulence over time. This work -- currently published online in the journal *Nature* -- could lead to a better understanding of modern infectious diseases.

Geneticists Hendrik Poinar and Kirsten Bos of McMaster University and Johannes Krause and Verena Schuenemann of the University of Tubingen collaborated with Brian Golding and David Earn of McMaster University, Hernán A. Burbano and Matthias Meyer of the Max Planck Institute for Evolutionary Anthropology and Sharon DeWitte of the University of South Carolina, among others.

In a separate study published recently, the team described a novel methodological approach to pull out tiny degraded DNA fragments of the causative agent of the Black Death, and showed that a specific variant of the Yersinia pestis bacterium, was responsible for the plague that killed 50 million Europeans between 1347 and 1351.

After this success, the next major step was to attempt to "capture" and sequence the entire genome, explains Poinar, associate professor and director of the McMaster Ancient DNA Centre and an investigator with the Michael G. DeGroote Institute of Infectious Disease Research, also at McMaster University.

"The genomic data show that this bacterial strain, or variant, is the ancestor of all modern plagues we have today worldwide. Every outbreak across the globe today stems from a descendant of the medieval plague," he says. "With a better understanding of the evolution of this deadly pathogen, we are entering a new era of research into infectious disease."

"Using the same methodology, it should now be possible to study the genomes of all sorts of historic pathogens," adds Krause, one of the lead authors of the study. "This will provide us with direct insights into the evolution of human pathogens and historical pandemics."

The direct descendants of the same bubonic plague continue to exist today, killing some 2,000 people each year.

"We found that in 660 years of evolution as a human pathogen, there have been relatively few changes in the genome of the ancient organism, but those changes, however small, may or may not account for the noted increased virulence of the bug that ravaged Europe," says Poinar. "The next step is to determine why this was so deadly."

Major technical advances in DNA recovery and sequencing have dramatically expanded the scope of genetic analysis of ancient specimens, opening new horizons in the understanding of emerging and re-emerging infections.

DeWitte, Bos and Schuenemann analyzed skeletal remains from victims buried in the East Smithfield "plague pits" in London, located under what is now the Royal Mint. By targeting promising specimens -- which had been pre-screened for the presence of Y. pestis -- from the dental pulp of five bodies, they were able to extract, purify and enrich specifically for the pathogen's DNA, thereby decreasing the background DNA consisting of human, fungal and other non-plague DNA.

Linking the 1349-1350 dates of the skeletal remains to the genomic data allowed the researchers to calculate the age of the ancestor of the Yersinia pestis that caused the medieval plague. This date coalesced sometime between the 12th and 13th centuries, indicating that earlier plagues such as the Justinian plague of the 6th Century -- once thought to have been caused by the same pathogen -- was likely caused by another, yet to be determined. The Justinian plague spread across the Eastern Roman Empire, killing an estimated 100 million people worldwide.

The research was funded by the Canadian Institutes for Health Research, the Social Sciences and Humanities Research Council, Canada Research Chairs, an Early Researcher Award from the Ontario Government, the Michael G. DeGroote Institute of Infectious Disease Research, the Wenner Gren foundation, and the Medical Faculty at University of Tubingen.

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **McMaster University**.

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http://www.sciencedaily.com/releases/2011/10/111012132653.htm

Then and Now, 1992

Mark Sanderson

We look back to a review of Sacred Hunger by Barry Unsworth

Published: 13 October 2011

Photograph: Peter Macdiarmid/2007 Getty Images

This article first appeared in the TLS of February 28, 1992.

Sugar and Rum, Barry Unsworth's last novel, got off to a flying start: blocked author Clive Benson is strolling through the mean streets of Toxteth when a black man jumps to his death from the top of a tower-block. Benson is supposed to be at work on a "complex and ambitious new novel set against the backdrop of the Liverpool slave trade", but the suicide – "the leap, the cry, that carpet-like sidling, the gathering fall, the peculiar crash of impact" – haunts him and he cannot stop talking about it. The "crude act of self-extinction became in his stammering mouth a paradigm of human life".

Sacred Hunger may be seen as the realization of Benson's ambition. It spans the years 1752–65, the heyday of the "Triangular Trade", when sea-borne slaves take every opportunity to jump overboard even though, with their hand and feet in chains, this means certain death. Others have no choice. There is no market for sick slaves and so they are dumped – without their expensive fetters – over the side. This enables the slaver to save precious stores and claim compensation of 30 per cent a head. The turning-point of this hulking novel occurs when Matthew Paris, surgeon of the Liverpool Merchant, realizes that Captain Thurso – "a simpleman, being an incarnation, really, of the profit motive" – is jettisoning part of his human cargo: "'No!' he shouted . . . . With all the strength of his lungs, aiming his voice at the sky, he shouted again: 'No!'"

But it is not just the black characters in Unsworth's novels who do the falling: white ones come a cropper too. In Mooncranker's Gift (1973), the priapic James Farnaby confesses that "all the different persons I have been merge into an awful perception of what I am I fall backwards, flat on my back, in a dead faint . . .". In The

Rage of the Vulture (1982) Henry Markham literally falls for a young singer, his comic collapse anticipating his father's near-fatal descent into the dungeons of the Ottoman Empire. Basil Pascali, in Pascali's Island (1980), is shattered when the Greek statue with which he has become obsessed falls to the ground at the climax of the novel; and, as thirty-three-year-old Simon Raikes in Stone Virgin (1985) struggles to bring the 540-year-old Madonna back to her former glory, he is in perpetual danger of swooning and tumbling from the scaffolding. Raikes is also faced with the problem of whether the defunct Litsov fell or was pushed into the Venetian waters. Unsworth is concerned with nothing less than the fall of man.

This is made explicit in Sacred Hunger. During the construction of the Liverpool Merchant, a man falls to his death and another is badly injured, but Thurso's "small eyes contained a look of satisfaction, as at some promise fulfilled". The sadistic captain, in the same way that Benson sees "clues everywhere", believes "a reason there must always be", and yet he fails to read the signs. Paris's intervention provokes the mutiny that has long been festering and Thurso is killed. The mutineers and liberated slaves succeed in establishing a community in the backwoods of the new colony of Florida. It eventually enters folklore as "a place of eternal sunshine . . . where white and black lived together in perfect accord". But this paradise is lost because the desire for money and the appetite for power – the "sacred hunger" that caused them to be wrenched from their homes in the beginning – reasserts itself. The downfall of Paris is precipitated by Erasmus Kemp, his cousin. Following the disappearance of the Liverpool Merchant, Kemp, "farouche" and "intractable", blames Paris for his father's death and the bankruptcy of the family business. He swears revenge. His enmity stems from a childhood incident in which Paris, ten years older than his young cousin, picked him up as he strove to strengthen a dam that he had made against the rising tide. It takes twelve years and an expedition half-way round the world before they can reach a kind of understanding.

Unsworth intertwines the histories of these two polarized men as each struggles to come to terms with a terrible loss. Kemp, fatherless and penniless, is forced to break off his engagement to Darah Wolpert, the daughter of a wealthy merchant. Paris, a proto-Darwinian imprisoned for sedition blames himself for the death of his pregnant wife. The scene in which he is pilloried alongside a sodomite – who attracts most of the public's vicious attention – is just one of the many vivid set-pieces in which one's distress at the sheer cruelty of human beings is mixed with admiration at Unsworth's skill in depicting it. Slaves are branded, seamen are flogged. The novel contains dozens of characters – landlubbers, sailors, colonists and African tribesmen – that are differentiated with economy and wit. It is not just the slaves who are prisoners. All of them, from Sir William Templeton, His Majesty's Principal Secretary to the West India Office, to Calley, the simple-minded porter press-ganged along with Deakin the deserter, are seen to be trapped – shackled to a money-spinning treadmill from which the only escape is death.

Erasmus woos Sarah by agreeing to take part in an amateur production of The Tempest, a bastardized version with a happy ending, courtesy of William Davenant and Dryden. Unsworth exploits many correspondences with the play and explores such age-old Shakespearian antitheses as Nature versus Nurture – as his name suggests, the mooncalf Calley is cast as Caliban – but the writer who exerts the greatest influence on the narrative is undoubtedly Conrad.

Like his mentor and William Golding before him, Unsworth uses the vehicle of the traditional sea-story to steer a course through deep waters. The concepts of justice, liberty and duty are debated through the medium of genuinely exciting historical adventure. Paris, staggering under the white man's burden, penetrates the heart of darkness; Kemp has his own secret-sharer; the visionary Delblanc's "sacred hunger" has the same force as Mrs Gould's utterance at the end of Chapter Eleven of Nostromo: "Material interest". Although set much earlier than Conrad's stories, Unsworth's is without flummery or fustian. The sea-speak is convincing but not intrusive. His descriptions of the multifarious states of ocean and sky are worthy of the master. Unsworth shifts with ease from the abstract to the concrete, from the cosmic to the comic. His tenth novel is his best.

http://www.the-tls.co.uk/tls/public/article797275.ece

Astrophysicists Find Evidence of Black Holes' Destruction of Stars

Illustration of the catastrophic destruction of a star by a black hole. (Credit: NASA)

ScienceDaily (Oct. 12, 2011) — Astrophysicists have found evidence of black holes destroying stars, a long-sought phenomenon that provides a new window into general relativity. The research, reported in the latest issue of the *Astrophysical Journal*, also opens up a method to search for the possible existence of a large population of presently undetectable "intermediate mass" black holes which are hypothesized to be precursors to the super-massive black holes at the centers of most large galaxies.

The study was carried out primarily by Glennys Farrar and Sjoert van Velzen at New York University's Center for Cosmology and Particle Physics, and also included the following researchers: Suvi Gezari of Johns Hopkins University's Department of Physics and Astronomy; Linda Ostman of Spain's Universitat Autònoma de Barcelona; Nidia Morrell of the Las Campanas Observatory in Chile; Dennis Zaritsky of the University of Arizona; Matthew Smith of South Africa's University of Cape Town; Joseph Gelfand of NYU-Abu Dhabi; and Andrew Drake of Caltech. Van Velzen is currently a doctoral candidate at Radboud University in the Netherlands.

Cosmologists have calculated that, on occasion, a star's orbit will be disturbed in such a way that it passes very near the super-massive black hole at the center of its galaxy -- but not so close that it is captured whole. Such a star will be torn apart by the extreme tidal forces it experiences: the force of gravity on the near side of the star is so much stronger than that on the far side that the gravitational force holding the star together is overwhelmed, causing the star to simply come apart. While some of the star's matter falls into the black hole, much of it continues in chaotic orbits, crashing into itself and producing intense radiation lasting days to months. These phenomena are called stellar tidal disruption flares, or TDFs.

Although discovering evidence of TDFs has been a high priority of astrophysicists for many years, and several possible examples have been found using X-ray and UV satellites, discovering TDFs in a large-scale,

systematic survey using ground-based optical telescopes as has now been achieved, is critical to controlling bias and avoiding misidentifications.

The difficulty in detecting TDFs is largely due to the challenge of distinguishing them from more common types of flares such as supernovae. (For every TDF there are about 1000 supernovae.) In addition, some super-massive black holes have an "accretion disk" surrounding them -- gas and dust, often left from an earlier merger with another galaxy -- which is continuously feeding the hole. Such accreting black holes are usually evident from the bright emission they produce and are known as quasars or Active Galactic Nuclei (AGN). However, a hiccup in the accretion of an undetected active black hole could produce a flare that might be mistakenly identified as a TDF.

The researchers on the *Astrophysical Journal* study uncovered sound evidence for the presence of two TDFs through a rigorous analysis of archival data from the Sloan Digital Sky Survey (SDSS).

To do so, they sifted through voluminous SDSS data, in which more than 2 million galaxies were repeatedly observed over 10 years. By very carefully registering the images and looking at differences between consecutive images, they obtained a sample of 342 intense and well-measured flares.

Of these, almost all could be classified into supernovae and AGN flares. However, two cases were left that did not fit either classification. By relying on multi-year observations, the researchers could see that the two flares' host galaxies showed no other flaring activity, as would be the case if the flares came from a hidden variable AGN. This means the possibility these two flares were produced by undetected AGNs is extremely small.

In addition, the researchers located these flares at the nucleus of their galaxy with high precision, which reduces the likelihood that they are supernovae to less than 1 percent since supernovae are randomly distributed through galaxies.

Finally, the properties of these flares are very different from flares of AGNs and supernovae -- and their spectra are unlike any supernovae observed to date. Supernovae flares are characteristically very blue at first but become red as they cool and rapidly decay, whereas the TDF flares are very blue throughout -- slowly decaying without changing color. This behavior is consistent with expectations for a TDF -- the debris from the star should rapidly form an accretion disk and look like a short-lived AGN.

Sjoert van Velzen, the study's lead author, was a Dutch first-year graduate student who came to NYU to work under the direction of Glennys Farrar, a Professor of Physics at NYU and senior scientist of the project. Van Velzen is now completing his Ph. D. in Holland.

About his first encounter with real scientific work, van Velzen says, "Searching through 2.6 million galaxies was actually a lot of fun -- there is so much to discover! Based on our search criteria and observing two TDFs that met those criteria, the rate of TDFs is about once per 100,000 years, per galaxy. It's quite thrilling to have been able to make such a measurement."

"The next step is to develop models to explain in detail the flares' properties and duration, and address the question of whether TDFs could be responsible for producing Ultrahigh Energy Cosmic Rays, whose sources have been elusive up to now," says Farrar. "It is very exciting that we are on the verge of obtaining a large and better-observed sample of TDFs to study -- though a more sensitive search of SDSS archival data and the new generation of transient surveys which will observe more flares in real-time and with multi-wavelength follow-up. A large sample will be invaluable to understanding many outstanding questions in astrophl

Story Source:

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Journal Reference:

1. Sjoert van Velzen, Glennys R. Farrar, Suvi Gezari, Nidia Morrell, Dennis Zaritsky, Linda Ostman, Mathew Smith, Joseph Gelfand, Andrew J. Drake. **Optical discovery of probable stellar tidal disruption flares**. *Astrophysical Journal*, 2011 (in press) [link]

http://www.sciencedaily.com/releases/2011/10/111011102010.htm

Who will get legal aid now?

Joanna Biggs

Legal aid isn't the sort of thing people worry much about losing. Unlike schools or the NHS, it's not a part of the welfare state many of us have had dealings with. The sort of people who use legal aid aren't always very sympathetic: they've often done something wrong or foolish or both. The lawyers who represent them seem to be looking after number one. The system isn't very old, but insiders talk about it in a combination of ancient-sounding phrases and arcane technical language. Yet legal aid deserves attention, not least because it's one of the fastest growing areas of government expenditure, and so an irresistible target for deficit reduction.

The state spends £2.2 billion a year on lawyers to give advice to and represent people in legal cases: the coalition's aim is to save £350 million of this, which will reduce the £163 billion deficit by 0.2 per cent. But even though the budget seems so big, cutting it isn't straightforward: the European Convention on Human Rights contains a commitment to a fair trial, which means the criminal legal aid budget can't easily be cut. The government's solution – detailed in the Legal Aid, Sentencing and Punishment of Offenders Bill currently going through Parliament – is, first, to remove whole areas of civil law, like employment, immigration and welfare benefits. A 17-year-old mechanic paid £150, at 70p an hour, for his first month's work on the pretence that those 50-hour weeks count as 'training' won't be able to claim legal aid to challenge his employer. An eight-year-old orphan trafficked to the UK on a fake Congolese passport won't receive public funds to help establish his immigration status. A 27-year-old soldier who lost a leg in Afghanistan won't get help to claim back disability benefit wrongly reduced when he admitted he could stagger 400 metres. The current system allows claims for legal aid in most sorts of case, excluding a few areas such as conveyancing; the new plan is to disallow claims across the board, but make a few exceptions. Funding will disappear for divorces unless there is domestic violence, housing and debt unless you are about to become homeless, adoption, clinical negligence, immigration unless the person is being held by the state, consumer cases and compensation claims when you've been a victim of crime. For aid that is still allowed, including criminal cases, the government has already cut fees by an arbitrary 10 per cent, with the result that many small law firms, which run on margins tighter than that, will have to close.

The coalition has also found another way to reduce costs in criminal cases: people will no longer necessarily get face to face legal advice at the police station when they are arrested. More offences will qualify only for phone advice – and the phones aren't always manned by solicitors. So someone accused of pushing an ex-girlfriend during an argument (common assault, carrying a maximum punishment of six months in prison) would only be allowed to speak over the phone to some sort of legal adviser.

The government also plans to move the financial goalposts: at the moment, legal aid is means-tested and available only to people who are on benefits or who earn less than around £17,000 a year: i.e. the very poorest. The government wants to raise the financial bar and stop people on benefits from qualifying automatically. As a result of all this, 550,000 people will lose out on legal advice, according to the government: instead they are supposed to go to Citizens' Advice Bureaux, charities, trade unions and law centres, mostly places that are already disappearing following local authority funding cuts (Avon and Bristol Law Centre is under threat, Grahame Park CAB in Barnet closed on 28 September, and so on). If you can't get any help, you can always represent yourself or – and this is what the government is hoping for – you could just drop your case.

The coalition defends itself: we have a deficit to reduce, its members say (or, rather, the 'principal driver for reform is financial'), and besides, our system is much more expensive than others around the world and was expanded far beyond what was intended by the 1949 Legal Aid and Advice Act. More important, we are an excessively litigious and irresponsible nation: we don't want to sort out our problems ourselves. The justice minister, Ken Clarke, says that from now on 'people will instead use alternative, less adversarial means of resolving their problems.' The legal aid minister, Jonathan Djanogly, a former City lawyer, is willing an

'ambitious culture change'. Perhaps they imagine that if we all sit in a circle and share our grievances, without lawyers ruining it all, everything will be fine.

The government insists that the cuts are OK because people should be able to 'present their own case', yet its own study shows that those who represent themselves are younger and less well educated than those who get a lawyer, that they annoy the court staff and judges more, that their cases take at least twice as long, and that they generally lose. The lord chief justice has said that the changes will lead to 'a huge increase in the incidence of unrepresented litigants'; one legal aid barrister told me that judges feel 'sheer terror' at the prospect. When I spent a day at City of Westminster Magistrates' Court last month, a man classed as unfit to plead was told he was going to be sent to a mental hospital in Cardiff. There was no one to explain on his behalf, in measured tones and lawyerly phrases, why he wanted to stay in London, so he shouted: 'I do not want to go to Cardiff! I live in London. I want to be treated as a human being.' He was sent back down to the cells pretty quickly. A man who'd punched a woman and her husband in the face as he was stealing their taxi outside the Ritz – a criminal offence – had a legally aided lawyer. The prosecutor gave the facts briefly, then the man's lawyer presented his defence to the court for 20 minutes, pausing between sentences for effect, telling us about his recovery from a steroid addiction and the baby he and his girlfriend were expecting. The magistrates sent him to prison, but he'd be out in time for the birth.

When Kevin Collins was brought up from the cells, it was already two hours after the court's official closing time. The G4S security officers settled him into the front chair of the defendants' booth and the usher announced that he was representing himself. The first thing Collins said wasn't his name, date of birth and address but, to a guard: 'Have they got microphones in here?' The clerk started to address him – 'I really can't hear what you're saying,' Collins replied – and then went up to the booth, asking him to confirm his name, date of birth and address. He was charged with being drunk and disorderly. Guilty or not guilty? 'I don't know,' he said. 'Drunk but not disorderly.' The clerk couldn't accept that as a plea so she tried again: 'Do you think you might have been a bit disorderly?' He didn't think so but perhaps. 'Do you want to enter a guilty plea?' she asked finally, exasperated. 'If it means I can get out of here and have a cigarette, yes.'

The idea of legal aid, if not the system, is ancient. It's there in Magna Carta: 'To no one will we sell, to no one deny or delay right or justice.' Since the 17th century lawyers have been encouraged to give a tithe of their time to working for free 'in the public good', which in practice meant that young lawyers took on poor people's cases. Late Victorian philanthropists set up Poor Man's Lawyer services in places like the East End, where you could get free advice, though not someone to represent you in court.

The First and Second World Wars produced the legal aid system more or less as we know it now. Overwhelming numbers of people wanted to get divorced after 1918, largely because the way women thought about themselves had changed so much during the war: they had earned a living and finally won the right to vote if they were over 30. At that time it cost £45 to get divorced in the High Court in London, where all divorce cases were heard, when the average wage was £50 a year (a Poor Person's Procedure had been brought in in 1914 – volunteer solicitors manned a department in the Royal Courts of Justice – but it still cost £10). In 1939 Citizens' Advice Bureaux were established to help both civilians and members of the armed forces with legal problems. The Law Society even set up a Service Divorce Department to help soldiers, sailors and pilots during the war. Divorce cost three guineas, and the government paid.

When Henry Betterton, a barrister who had been the Conservative MP for Rushcliffe in Nottinghamshire since 1918, was appointed chair of the special committee on legal aid and legal advice in 1944, the argument for legal aid had virtually been won. A compassionate Conservative, Betterton had been an enthusiastic member of committees which had done much to improve unemployment benefit and nurses' pay. 'The great increase in legislation and the growing complexity of modern life have created a situation in which increasing numbers of people must have recourse to professional legal assistance,' his 1945 report concluded. The already existing free legal help had been 'at best somewhat patchy' and was now 'totally inadequate'. From here on, legal aid would be available not just for poor people but also for those of 'small or moderate means':

you would contribute if you were able but if not the state would step in; barristers and solicitors would be paid 'adequately' for their work and there would be legal aid centres across the country. The legal aid system wouldn't be publicly owned; it would be a public-private partnership. Taxpayers' money would be paid to small solicitors' firms in order to provide a public service, the better to preserve lawyers' independence from the state and to get small businesses back on their feet after the war.

Since the 1949 Legal Aid and Advice Act passed into law, there have been several expansions: in 1973 you could get free advice on any legal issue, so that problems could be solved before the courts got involved; in 1984 duty solicitors were provided in magistrates' courts; and in 1986 everyone was given the right to speak to a lawyer if they were being held in a police station, no matter what they had done and regardless of their means. That was the high point: in 1979, 79 per cent of the population qualified for legal aid.

Since then, even though the entire legal aid budget would only fund the NHS for two weeks and hasn't had a rise for inflation in four years, it has been thought unsustainable. The current government's line is the usual one: Labour was so profligate, letting people sue one another left, right and centre, that we have to step in and get things back to sensible levels. But it was Blair's Lord Chancellor, Lord Irvine, who capped the legal aid budget, moved to fixed instead of hourly fees and let some areas of law, like personal injury, fall out of legal aid to be replaced with 'no win no fee' deals: little snips that have caused hundreds of firms to drop out of the legal aid system (around 400 last year). But there was also an attempt finally to establish a network of legal aid centres under a Community Legal Service, which would provide advice from high street Community Legal Advice Centres (CLACs), supplemented by a CLA telephone helpline. The CLA revolution, drastically underfunded, never quite came to pass. New Labour, so many of whose front bench were lawyers, consistently attacked solicitors and barristers. Tony Blair (called to the Bar 1976) wanted to 'derail the gravy train of legal aid' and Jack Straw (called to the Bar 1972) complained of 'BMW-driving civil liberties lawyers'. But New Labour's attack wasn't on the gravy train: it was on the 'good' lawyers, the ones who earn £25,000 a year helping the poorest, and the ones who spend their time trying to get people out of Guantánamo. The atmosphere had changed and the postwar ideal of cheap, decent legal advice had receded. As Steve Hynes and Jon Robins put it in *The Justice Gap: Whatever Happened to Legal Aid?*, 'it has never been a universal service available to all who needed it, a legal services equivalent of the National Health Service.' And it isn't likely to be now.

Mitcham Citizens' Advice Bureau was one of the first in the country, opening on 4 September 1939, the day after Chamberlain announced we were at war with Germany. When I visited, on a cloudy Tuesday in August, the chairs were set in a semi-circle following the bay window of the grey brick villa, set back from the green. Propped against the bottom pane was a circular sign that looked as if it used to hang outside: on a blue background there was an owl in white paint, around the edge the words 'Citizens' Advice Bureau'. It seemed like a remnant of wartime benevolence.

Some people think the CABs are an arm of government, but they're individual charities, and each one is funded differently. Most of the money comes from local authorities and between 15 and 20 per cent from legal aid. Mitcham employs 20 full-time staff and 120 volunteers; people can drop in and see a volunteer on Mondays, Tuesdays and Wednesdays from 10 a.m. until 2 p.m. I sat with Olaide Osewa: she's 24 and works part-time at a local solicitors'. There was a litre bottle of Coke by her side on the desk, placed among the rings left by countless mugs of tea. A woman with a heavy Chinese or Vietnamese accent came in for help with a name change on a lease and was sent to a solicitor; a young woman arrived in her lunch hour to find out whether her landlord was within his rights to waive her flatmate's notice period and leave her having to pay the rent. Olaide can't tell them what to do – volunteers train for a year and learn the boundaries – but she can tell them what the law is, and so what rights and responsibilities they have. (The young woman didn't go away very happy: her landlord can do as he pleases.) It's a triage service; about 50 per cent of people are sent elsewhere, to local solicitors' firms or law centres; some are given appointments with the CAB's two legally aided caseworkers, who take on problems concerning debt. Or they are told their problem can't be taken further and they need to find another way of sorting it out. I wanted to say that the young woman should tell

her landlord she would leave unless he enforced the notice period for her flatmate, but I kept quiet and stared at the filing cabinet in front of me (2000 A-H).

The last person to come in had had an injury at work, which caused a bit of excitement. Books came down off the shelf: there are 51 different state benefits and we went to meet him, books in hand, hoping we'd find one for him. He was Eastern European, dressed all in black, with a cutglass English accent: he pronounced 'centre' particularly nicely. He leaned forward, elbows on knees, and told his story. A steel beam got dropped on his knee and when he came back to work limping he was 'politely' sacked. He and his workmates had been carrying the beam, which was usually moved, rather more expensively, by a crane, as a favour to the boss; he'd promised them McDonald's and Cokes on top of their £40 a day. The job centre had told him he wasn't eligible for benefit as he'd only been in the UK for a year or so, but was that right? Could we help him to get some sort of benefit? He'd worked from the age of ten and had been in the police for seven years. 'I'm a machine,' he said, 'but now I need repair.' He was advised to put in an appeal at the job centre.

There seem to be so many legal issues tangled up here. The legal aid system treats a person not as a person but as a problem in a particular area of law. Are you a welfare benefits problem or an employment law problem? Once the problems have been identified and separated out you can be sent to a specialist, if there is one near you. (Because the legal aid budget is capped, the money is rationed: once every few years the Legal Services Commission, a government quango, invites bids and hands out contracts which specify how many legal problems a Citizens' Advice Bureau or law centre or solicitors' firm can take on. The LSC will be abolished by the new bill; it costs £120 million a year to run.) If you can find someone interested enough in your problem, they can give you legal help: explaining the law, writing letters, helping you with an appeal or putting in a few phone calls. For this the adviser will be paid a fixed rate according to the type of problem, but not its complexity: £207 for an employment problem, £150 for a welfare benefits problem. This is the sort of early advice that can head off a court case altogether, something you can't usually manage on your own. If you try it the DWP or your employer won't listen: volunteers at Mitcham talked of the magic properties of CAB-headed paper in summoning attention. For the government this type of help is cheap in itself and also saves money across departments by stopping the costs of problems mounting up: if you've lost your job how are you supposed to pay the rent or the council tax or the electricity bill? It can cost the council £3500 to evict someone. But there is a moral imperative too: we help people who've had a bad time because it's more sensible and cheaper, yes, but also because we would expect help ourselves if something went wrong. I wondered what Tories might think of the builder with the busted knee: would they care very much if someone who wasn't from the UK couldn't access the benefits system very easily?

It is harder to save money on criminal legal aid because basic rights have to be protected. If you are arrested, you are entitled to see a lawyer. It doesn't matter if you are a billionaire or homeless, you can have free independent advice before and during police questioning. The state is holding you and you are entitled to have someone to defend you. We are so used to having someone pout at the DCIs in *The Bill* and refuse to talk unless their lawyer is present that it can seem like the playing out of an ancient ritual. In fact the right was introduced in 1986 in response to miscarriages of justice in the 1970s. Gerry Conlon, for example, one of the Guildford Four, was deprived of food, clothes and sleep, and was beaten by the police until he signed statements confessing to bombing the Horse and Groom and the Seven Stars: 'When I signed them, I believed I would later be able to retract them. I believed they could never be shown to hold water. I didn't realise I was signing away my liberty for the next 15 years.' It's a practice that protects the police too: if a lawyer can confirm that the Police and Criminal Evidence Act Code C provisions have been followed, then the police evidence will stand up better in court.

The police would prefer to interview suspects without a lawyer. They tell people they don't need a lawyer to sit in because it's a straightforward case and once they've sent the file to the Crown Prosecution Service the charges won't go any further; or they tell the accused that if they admit the charge they'll just get a caution; or they claim it will take a solicitor ages to get to the station, when the legal aid contract says they have to be there within 45 minutes, no matter the time of day or night. Solicitors get a £150 flat fee for coming to the

station and giving advice: they hear the accused's story, they get a copy of the charge, they help him draft a statement or guide him through the police interview, they liaise with the custody sergeant. It's arduous work, which as often as not takes place in the middle of the night with a drunk client, but it keeps small firms going. This is where they find their clients in the first place.

The new bill proposes more modifications to the right to see a solicitor at the police station. Since 2006 suspects have been allowed only telephone advice if they're charged with something you can't go to prison for and this has seemed to work fairly well, but the government may now extend the policy to crimes you could go to prison for. The government also proposes to introduce means testing: this seems like a good idea – why shouldn't someone like Andy Coulson pay for his own lawyer? – but it has been shown to be impractical. Before 2006 everyone who came before the magistrates' court without a lawyer used to be able to see a duty solicitor, paid an hourly rate from the legal aid budget for being there, but now you can get help only if you pass a means and merits test. You can skip the means test if you are a child or are on benefits; there's also a much simpler version for people who earn under £12,475 a year. Introducing the test has had strange consequences: the nine-page form that asks about everything from your food bill to your investments has made it impossible for self-employed people like builders and plumbers to get legal aid; it has meant that a girl who was thought too dangerous to be given a pen was held for two weeks because she couldn't sign the form; and it has made things more difficult for people who haven't brought their National Insurance number and gas bills with them. It hasn't produced much of a saving either. Jonathan Djanogly has said on the record that the government won't get rid of police station advice but neither will it drop the clause that will make it possible for that advice to be restricted and means-tested. This comes at a time when the EU is trying to extend UK-like rights to free independent legal advice to police stations across Europe. Instead of backing the directive, Britain's opted out.

The proportion of the legal aid budget spent on this sort of advice is pretty small: £228,412,000 on initial help for civil problems and £187,275,000 to give people advice in the police station last year. (The communities and local government minister, Eric Pickles, managed to find £250 million to ensure that everyone in the country had weekly rubbish collections 48 hours before the Tory Party Conference.) So how do we get to a legal aid budget of £2.2 billion? The most important driver of the legal aid budget is the structure of our legal system, in which two lawyers fight it out before a neutral judge. It's the lawyers that are expensive, whereas in Continental legal systems the judges are more expensive because they do more of the lawyers' work. But there are other factors too. The UK is a world leader in legal services: there are hundreds of lawyers in the City, creating a market in every branch of the law. The Crown Prosecution Service is far from perfect: legal aid costs mount up when the Crown has to be chased for documents, or when the defence turns up at court only for the Crown to adjourn the case to read the file. And we are a crime-obsessed society: we report more crime, we arrest more people, we interview and charge more, we bring more defendants before the courts and we lock up more than any other European country.

The largest proportion of the legal aid budget is spent on representation in the higher courts. Barristers conducting a case on legal aid are paid a fixed fee for basic casework and then by the hour, and cases can last for years. QCs can claim up to £4500 for basic work on a criminal case, and the most earned by a criminal barrister from legal aid last year was £841,960. It's hard to defend this – and the Law Society doesn't try, proposing that the government cap individual legal aid earnings at £250,000 – but the principle that produces these huge sums is a good one: the state wouldn't employ an inexperienced lawyer to put its case across, so why should the person whose liberty and livelihood are at stake have a second-rate defence lawyer?

Jeremy Rosenblatt was paid £470,530 last year for legal aid work – the second highest earning barrister on the civil side. The *Daily Mail* illustrated its report on the government's release of this year's list of the 'big wigs' with a picture of Rosenblatt smiling and holding out a bottle of champagne, ready to pop the cork. He has risen from fourth in 2008-09, when he was told off by the Bar Standards Board for claiming a fee uplift for dealing with the Spanish legal system when he wasn't.

Rosenblatt agreed to meet me for coffee on his day off at a café on Westbourne Grove, round the corner from his house. I was 20 minutes early but he was even earlier, sitting at a table that overlooked the hearses drawing up at the back gate of an undertaker's – 'it's part of life' – reading the *Times* with a cup of coffee. He urged me to try a pain au chocolat and checked whether the *LRB* had given me an 'allowance' before he let me get him another. He had wanted to be an architect but his father wouldn't let him so he trained as a barrister instead, settling into the niche of international family law (dealing with what happens when one or other parent takes a child overseas), an area that opened up considerably when the Hague Convention on Protection of Children entered into force in the 1990s. (This sort of case will continue to be funded.) But he found the Bar a 'deeply conservative institution' that was 'still indulged' by the government. 'Don't attack me for earning,' he said, and pointed out that he's a 'poor relation' to both the 'criminal boys' and commercial barristers like Jonathan Sumption who can earn £5 million a year. He talked of calling the Legal Services Commission complaints line repeatedly until they told him what was going on with his cases (there is a four-month backlog at the moment) but also of being 'dispassionate' about his work. He whispered things to me while cupping both hands around his mouth in a loudhailer gesture. When I asked him how the annual figures get to be so high, he told me he took on a 'massive number of cases'. Some areas of law will always attract legal aid: it's not fair to leave a British child in Pakistan because the child can't act for himself. And these areas are usually complicated and thus expensive.

Opposition to the government's proposals has been strong: the green paper received 5000 responses from organisations ranging from the Derbyshire Asbestos Support Team, the Welsh Health Legal Services and the Spinal Injuries Association to Matrix Chambers, the Bar Council and Liberty. But proposed amendments to the bill drafted over the summer with the aid of the Justice for All campaign – a broad coalition against the changes – were rejected by the Legal Aid Bill's public committee, whose purpose is to analyse it line by line. The proposed amendments were sensible and principled: domestic violence should be defined less narrowly, criteria for exceptional funding should be more generous, people fighting against the state should have a lawyer when the state has one, the phoneline should make provisions for people who aren't as articulate as the state expects them to be. But since Ken Clarke had to make a U-turn on the proposals for sentencing in the other half of the bill, little could be given away on the legal aid side.

Since that defeat, the forces have begun to rally: there have been well-attended fringe events at the party conferences (the Lib Dem lawyers seemed particularly fired up, passing a motion to call for the reversal of cuts to social welfare law) and three legal challenges have been launched in an effort to stop the phoneline gateway for civil legal problems and the withdrawal of legal aid for clinical negligence cases as well as to minimise the bill's impact on disabled people. The best hope is that the legally literate lords will amend the worst parts of the bill when it is sent there on 13 October. But the rest will pass as is. Clarke, the current MP for Rushcliffe, is looking on the bright side: 'The changes we are making are, of course, financially necessary, but they will also make the system more sensible and civilised.'

http://www.lrb.co.uk/v33/n20/joanna-biggs/who-will-get-legal-aid-now

Eating Your Greens Can Change the Effect of Your Genes On Heart Disease

Researchers have discovered the gene that is the strongest marker for heart disease can actually be modified by generous amounts of fruit and raw vegetables. (Credit: © Denis Pepin / Fotolia)

ScienceDaily (Oct. 12, 2011) — A long-held mantra suggests that you can't change your family, the genes they pass on, or the effect of these genes. Now, an international team of scientists, led by researchers at McMaster and McGill universities, is attacking that belief.

The researchers discovered the gene that is the strongest marker for heart disease can actually be modified by generous amounts of fruit and raw vegetables. The results of their study are published in the current issue of the journal *PLoS Medicine*.

"We know that 9p21 genetic variants increase the risk of heart disease for those that carry it," said Dr. Jamie Engert, joint principal investigator of the study, who is a researcher in cardiovascular diseases at the Research Institute of the McGill University Health Centre (RI-MUHC) and associate member in the Department of Human Genetics at McGill University. "But it was a surprise to find that a healthy diet could significantly weaken its effect."

The research, which represents one of the largest gene-diet interaction studies ever conducted on cardiovascular disease, involved the analysis of more than 27,000 individuals from five ethnicities -- European, South Asian, Chinese, Latin American and Arab -- and the effect that their diets had on the effect of the 9p21 gene. The results suggest that individuals with the high risk genotype who consumed a prudent diet, composed mainly of raw vegetables, fruits and berries, had a similar risk of heart attack to those with the low risk genotype.

"We observed that the effect of a high-risk genotype can be mitigated by consuming a diet high in fruits and vegetables," said Sonia Anand, joint principal investigator of the study, and a researcher at the Population Health Research Institute and a professor of medicine and epidemiology at the Michael G. DeGroote School of Medicine at McMaster University. "Our results support the public health recommendation to consume more than five servings of fruits or vegetables as a way to promote good health."

"Our research suggests there may be an important interplay between genes and diet in cardiovascular disease," says the study's lead author Dr. Ron Do, who conducted this research as part of his PhD at McGill and is now based at the Center for Human Genetics Research at the Massachusetts General Hospital, Boston, Massachusetts. "Future research is necessary to understand the mechanism of this interaction, which will shed light on the underlying metabolic processes that the 9p21 gene is involved in."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **McMaster University**.

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Transtromer squabbles

Published: 6 October 2011

The Nobel Prize winner, poet Tomas Transtromer

R *eviewing Robin Robertson's versions of Tomas Transtromer's poems, The Deleted World, on January 26, 2007, Alan Brownjohn wrote:*

"Robertson's book, a bilingual edition, is an inspired sampling of key poems from seven of Transtromer's eleven volumes, in effect a tribute for the Swede's seventy-fifth birthday from a poet whose own landscapes approach those of Transtromer's in their bleakness; appropriately this small selection follows Robertson's recent publication of Swithering, his own third volume. That shows affinities with the Transtromer poems (see his "Entry", or "Sea-Fret") without betraying any debt to them."

Two weeks later, on February 9, Robin Fulton accused Robert Robinson of borrowing "excessively" from Fulton's own translations of Transtromer:

Sir, - Alan Brownjohn's diplomatic review (January 26) of Robin Robertson's versions of Tomas Transtromer's The Deleted World (Enitharmon, Brownjohn's own publisher) tiptoes round some of the problems of Robertson's enterprise. An excessively large number of Robertson's lines are identical to mine in my Transtromer translations (as published by Bloodaxe, and New Directions): elsewhere, wittingly or unwittingly, Robertson makes arbitrary changes to the Swedish, a language he does not seem to understand. His versions are neither dependable translations nor independent imitations: they show a cavalier disregard for Transtromer's texts and I have yet to see a reviewer able or willing to say so.
ROBIN FULTON.
Mjughaug terasse 8, N4048 Hafrsfjord, Norway.

On February 16:

Sir, - Robin Robertson is hardly the first poet to make "arbitrary changes" in his versions from a foreign language (Letters, February 7). The most famous (or perhaps notorious?) case is that of Robert Lowell in his Imitations of 1961. In his introduction to that volume, Lowell quotes Boris Pasternak as saying "that the usual reliable translation gets the literal meaning but misses the tone". Lowell goes on to argue the case for licence in poetry translation, or in the making of versions "to write alive English". This is surely what Robertson has done in his Transtromer versions. Lowell knew no Russian but still translated Pasternak; Geoffrey Hill has no Norwegian but still managed to give us a first-class poetic version of Ibsen's Brand. Lowell's "cavalier disregard" for his archetypes extended as far, he freely admitted, to cutting the original poems in half, adding

stanzas to them, dropping lines, moving lines, moving stanzas, changing images and altering metre and intent. In relying too on lines from Robin Fulton's translations of Transtromer, Robertson can perhaps take heart again from Lowell's example of lifting whole passages from other writers, such as Thoreau and Melville, in his "original" poem, "The Quaker Graveyard in Nantucket". The crux surely is in getting the tone of Transtromer right, and in making his work come alive on the page for a British audience as poetry, which tasks both Robertson and Fulton, in their different ways, have fully done.
W. S. MILNE.
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March 2:

Sir, - I wonder if W. S. Milne took the time to compare Robin Robertson's versions of Tomas Transtromer both with the Swedish originals and with the available English versions (Letters, February 16) ? If only Robertson had vandalized Transtromer in the way Lowell vandalized his originals the results might have been interesting, but a version which tinkers with only a word or phrase here and there hardly begins to be an imitation -it reads only like a translation with hiccups. As for the "tone" of Robertson's versions mentioned by Mr Milne, that is indistinguishable from the tone of the other English versions of Transtromer. Mr Milne's letter also inspires me with curiosity about the origins of the strange current fashion whereby a "translation" is liable to be praised in inverse proportion to the "translator's" knowledge of the original language. Perhaps you could offer a little prize to the reader who comes up with the most appropriate quotation from Pope's Dunciad or Swift's A Tale of a Tub.
ROBIN FULTON.
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On April 20, JC weighed-in:

Readers who followed the exchange on our Letters pages in February and March on the subject of poetry translation and its close cousins the "version" and the "imitation", might have asked when the translator at the centre of the controversy would speak up for himself. In making his translations of the poetry of the Swedish poet Tomas Transtromer, Robin Robertson had been accused by Robin Fulton of borrowing "excessively" from Fulton's own Transtromer versions. Fulton reads Swedish; Robertson does not, but works from a crib provided by a native speaker. However, in a letter to the TLS of February 9, Fulton complained that a "large number" of Robertson's lines "are identical to mine"; elsewhere, Robertson "makes arbitrary changes to the Swedish, a language he does not seem to understand".

The process of translating poetry from a language of which the poet has skimpy knowledge has a respectable history The process of translating poetry from a language of which the poet has skimpy knowledge has a respectable history. Correspondents in the TLS exchange have mentioned Ezra Pound and Robert Lowell; Christopher Logue, whose accounts of the Iliad have enthralled readers for over forty years, knows no Greek. Still, the subject continues to vex some people. The April issue of the Chicago magazine Poetry is dedicated to translation. It offers versions of a variety of works by twenty-five modern poets, together with an explanation of the translator's approach. Of the twenty-five, more than half have acquaintance with the original language, including J. M. Coetzee from Afrikaans, John Peck from Chinese, D. H. Tracy from Swahili, as well as those charged with Russian, French, Serbian and Hebrew. The minority group are quick to admit their shortcomings: "As a lowland Scot, I don't speak Gaelic", Kathleen Jamie writes (a non sequitur, but let it pass), adding that it felt "a bit fraudulent" setting out to "translate" a poem from that language. Being Kathleen Jamie, she comes up with something good in itself -the accepted validation of the poet translating from a language he or she "does not understand". Like Ms Jamie, Franz Wright (Belarusian), Peter Campion (Korean) and Clive Wilmer (Hungarian) work with rough objects which, as practised versifiers, they strive to sand and varnish. Another is Robin Robertson, who attempts an English version of Pablo Neruda's "Oda a un gran atun en el mercado" ("Ode to a Large Tuna in the Market"). Discussing his approach to Neruda's Spanish (with "a good dictionary"), Mr Robertson refers to "a recent collection I made of some free versions

of poems by Tomas Transtromer" which attracted "spluttering fire from certain quarters". As he sees it, "the anxiety seems to centre on the term 'version' . . . and it is baffling that a process that has been going on for over half a century seems to have been overlooked". He then invokes Lowell and Logue. However, in our understanding of Fulton's complaint, his "anxiety" is not over "the term 'version'", but over the resemblances between Robertson's versions -or whichever term you fancy -and his own. It may be an unjust claim; if so, it seems "baffling" to let it go unchallenged.

Back to the Letters page on April 27:

Sir, - Robin Fulton writes (Letters, February 9) that he has "yet to find a reviewer willing or able" to say that Robin Robertson's Tomas Transtromer versions, published by Enitharmon as The Deleted World, "are neither dependable translations nor independent imitations". I wonder if the entirely straightforward reason for this is simply that nobody but Mr Fulton has managed to arrive at such a surprising and oddly narrow-minded distinction. Certainly, the suggestion he goes on to make, that Robertson's versions are "identical" to his own, is difficult to accept: without a doubt, the feel and tenor, if not the literal sense, of their respective English versions is quite different. Indeed, for Fulton's apparent accusation of plagiarism to be worthy of debate, we would have to accept the idea that the value of a poem resides in its literal meaning and not much else.

Now, it is surely obvious, when we say that poetry is what gets lost in translation, that what matters in a poem is not its literal surface (which any crib can convey), but its subtleties, its suggestions, its fabric of music and nuance -in other words, its spirit -and the true test of a translation or version is, or should be, how well it conveys this spirit. So, while it is true that two translators, working from the same originals, could hardly avoid using common phrases or vocabulary in their English versions without going to perverse lengths to avoid doing so, it is also the case that a good version of a poem will take that literal surface of the original only as a point of departure. Beyond that, the fortunate translator may arrive at what J. C. justly calls "something good in itself" (NB, April 20) - that is, a new poem, in a different language, which echoes, or even re-creates, not simply the sense, but the music, the atmosphere, the entire spirit of its original. It seems that the majority of reviewers have agreed that what Robertson arrives at, in his marvellous Transtromer versions, is an honourable, lyrically rich and deeply sympathetic "something good in itself", and the fact that he has chosen not to dignify Fulton's rather disappointing, vague and ill-founded insinuations is most surely the mark, not of a translator with something to hide, but of one who prefers to honour the spirit of Transtromer's work rather than drag it into a muddy, mean-spirited and potentially damaging squabble over nothing.

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Robin Fulton, on May 25:

Sir, - I admire, as many do, John Burnside's poems, and have bought his collections, but I don't for one moment buy his testy and at times disingenuous argumentations in support of the versions of Tomas Transtromer done by his editor and publisher at Cape, Robin Robertson (Letters, April 27). Robertson has not, with dignity or otherwise, abstained from justifying his methods, as Burnside implies he has. He has defended his practice, with a dash of scorn for those of a different mind, not here in the TLS as might have been expected, but across the Atlantic, in the Hudson Review and in Poetry (Chicago). I have expressed my own thoughts very briefly here in the TLS (Letters, February 9 and March 2), and rather less briefly in the current issue of Modern Poetry in Translation.

The current literary fashion tends to demote and even denigrate the idea that a translator must give close attention and respect to the words of his (or her) author, an attention which presupposes a knowledge of the

language in which the words were originally written. According to this fashion, anyone can turn out an inaccurate translation of a work, ancient or modern, written in a language not understood by the translator, who then justifies any inaccuracies by claiming that his production is only a "version" or "imitation". Burnside tells us that "what matters in a poem is not its literal surface" -as if poems were boxes with tops which can be lifted off to reveal the goodies beneath -and that a version should aim to convey a poem's spirit, its "subtleties, its suggestions, its fabric of music and nuance". I agree, unreservedly. But just how is a translator supposed to convey these without a knowledge of the original language? Robertson has not so far told us how much of Transtromer's original Swedish he is able to understand unaided. By the same token, has Burnside based his response to Transtromer's poetry on an unassisted reading of the Swedish texts?

The only note of squabbling I have noticed in this exchange comes from Burnside himself, who fashes himself into a right Fifer's frazzle, and, being in a frazzle, is not altogether accurate. I never said that Robertson's versions were identical to mine, but I did try to specify which proportions of them were. And far from its being the case, as Burnside says it is, that two translators of the same original "could hardly avoid" the same words or phrases in their translations, it is the more remarkable that such coincidences should occur, when one of them does not know the original language.

Inevitably, the term "poetry translation" has to be very elastic. At one end of the scale, the prose crib may be boring but can often tell us more about the original text than detractors would like to admit. At the other end we have more or less wild adaptations (like Ted Hughes's versions from Ovid), which may be entertaining but often tell us little or nothing about the original work. I have nothing against imitations as such -many of the great "translators" of the past (Chaucer, Douglas, Chapman, Dryden) would now in the age of copyright probably be categorized as imitators. But Robertson's versions of fifteen Transtromer poems are neither fish nor fowl. It is true, as Burnside points out, that reviews of Robertson's booklet have been favourable, but the comments I have seen came from reviewers with no knowledge of Swedish. If the booklet had been published only in English, and the poems presented as "new poems, in a different language", that would have been reasonable enough, up to a point. But the poems were published bilingually, thus inviting comparison, and such a publication really ought to be reviewed by someone who can authoritatively compare.

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http://www.the-tls.co.uk/tls/public/article791993.ece

Worms Among First Animals to Surface After K-T Extinction Event, Study Finds

CU-Boulder Associate Professor Karen Chin uses a stereomicroscope to analyze fossil burrows, likely made by worms, which have been discovered just inches above the K-T boundary sediment that has been linked to mass extinctions on Earth some 65.5 million years ago, including the demise of the large dinosaurs. (Credit: University of Colorado)

ScienceDaily (Oct. 12, 2011) — A new study of sediments laid down shortly after an asteroid plowed into the Gulf of Mexico 65.5 million years ago, an event that is linked to widespread global extinctions including the demise of big dinosaurs, suggests that lowly worms may have been the first fauna to show themselves following the global catastrophe.

While the focus on the so-called K-T boundary extinction is often on the survival and proliferation of mammals, paleo-botanical studies show some of the earliest terrestrial ecosystems to emerge were dominated by low-diversity and opportunistic aquatic plants, said University of Colorado Boulder geological sciences Associate Professor Karen Chin. And while sediments laid down immediately following the impact event generally have relatively few animal fossils, new evidence from North Dakota shows networks of crisscrossing burrows less than three inches above the K-T boundary layer.

"Fossil burrows provide direct evidence of animal activity that occurred right at that spot, and these burrows are quite extensive," said Chin, who said their characteristics suggest they were probably produced by worms. "To my knowledge, such burrows haven't been documented in terrestrial environments this close to the K-T boundary. This is a glimpse of a world we don't know very much about yet."

While Chin and her colleagues are still working to understand the timing of the fossil burrows as they relate to the K-T extinction boundary, Chin said she believes that they likely were made within a few thousand years

after the extinction event. Future studies should help narrow that window, said Chin, who also is curator of paleontology at the University of Colorado Museum of Natural History.

Chin gave a presentation on the new findings at the 2011 annual meeting of the Geological Society of America being held this week in Minneapolis. Co-authors on the study were A.A. Ekdale of the University of Utah and Dean Pearson of the Pioneer Trails Regional Museum in Bowman, N.D.

The three-dimensional burrows were found at the interface of a layer of coal and a layer of siltstone in southwestern North Dakota by Pearson, who has spent many years studying K-T boundary sites in the state. The decomposing organic matter in the ancient environment would have provided a food source for the worms. A few of the burrows were topped by a thin layer of coal, suggesting that the underlying coal may contain additional, earlier worm burrows that are not readily apparent, Chin said.

The clay boundary layer laid down at the end of the Cretaceous Period is associated with high levels of iridium, an element rare in Earth's crust but abundant in asteroids. The Manhattan-sized asteroid plowed into Earth at 150 times the speed of a jet airliner and is thought to have released about a billion times more energy than the Hiroshima atomic bomb, triggering tremendous dust and ash storms, wildfires, tsunamis, mega-earthquakes and dark, cold "nuclear winter" conditions for a time.

The North Dakota fossil worm burrows indicate the creatures probably were about the diameter of an average earthworm. The burrows indicate horizontal rather than vertical movement through the substrate, likely reflecting feeding activity, Chin said.

The study indicates the burrows were made in a peat-producing, bog-like environment that eventually was buried by sediment. Chin said the worms must have been capable of withstanding the challenging environmental stresses of flooded habitats, including prolonged inundation, low oxygen and acidic conditions.

Since the ancient burrows were filled by sediment, they actually are "positive casts" of the trails made by the worms. The burrows are examples of "trace fossils," which also include tracks and fossilized feces, or coprolites. "When we reconstruct past environments, soft-bodied animals like worms get short-shrift since they don't stand out in the fossil record like animals with mineralized skeletons," said Chin. Ekdale, an expert on trace fossils, was key in analyzing the worm burrows, Chin said.

Chin said extensive work on plant fossils both before and after the K-T boundary event by Denver Museum of Nature and Science Chief Curator Kirk Johnson and his colleagues helped Chin and her research team to characterize the environment inhabited by the burrowers. Johnson's research helped establish that terrestrial plants suffered heavy losses during the K-T extinction event, as did non-avian dinosaurs and many other terrestrial and marine organisms.

The K-T boundary commonly refers to the dividing line between the Cretaceous and Tertiary periods. Geologists now refer to it as the Cretaceous-Paleogene, or K-Pg boundary event. While a number of vertebrates survived the event -- including birds, snakes, lizards, turtles, fish and small mammals -- fossil burrows provide direct evidence of animal activity that skeletal fossils cannot show, said Chin. "The fact that the burrows are so close to the K-T boundary is one reason they are so exciting."

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Cosmic Neutrality

Fredric Jameson

- Buy*Lucky Per* by Henrik Pontoppidan, translated by Naomi Lebowitz Lang, 558 pp, £44.00, November 2010, ISBN 978 1 4331 1092 4

Once upon a time, when provinces still existed, an ambitious young provincial would now and again attempt to take the capital by storm: Midwesterners arriving in New York; Balzacian youths plotting their onslaught on the metropolis ('à nous deux, maintenant!'); eloquent Irishmen getting a reputation in London; and Scandinavians – Ibsen, Georg Brandes, Strindberg, Munch – descending on Berlin to find a culture missing in the bigoted countryside. So also Henrik Pontoppidan's hero, an unhappy clergyman's son who flees the windswept coasts of Jutland for a capital city which is itself narrow-minded and provincial in comparison with the bustling centres of Europe. Denmark has just lost a war, and an important territory, to Prussia: one in 'a long row of national humiliations' in 'a doomed country that, in the course of one man's life, had fallen into ruin, wasted away to a pale and flabby limb on Europe's body swelling with power'. Denmark itself is to Europe as Jutland is to Copenhagen; and we must never underestimate the degree to which that 'national misery', which is secretly a part of every national history and identity, is also part and parcel of the personal or psychic identity of its inhabitants.

In the Northern or Protestant countries, cultural dissatisfaction is indistinguishable from religious misery as well, and from a dogmatic Christianity whose doctrinal debates set the agenda for most of the cultural and intellectual life of the Danish 19th century, from Kierkegaard's complex and subtle polemics all the way to Brandes's call for a secular national modernity in its closing years. Pontoppidan's 1898 novel (untranslated into English until now, despite his 1917 Nobel Prize) will not exactly tell the story of a moral and sexual revolt against the oppressive institutional power of the Church, but it breathes a properly Nietzschean hatred of Christianity that testifies to the tenacity of the grip of religion on this society, in revolt fully as much as in submission.

Our present-day postmodern religious fundamentalisms are far enough away from these 19th-century clerical struggles for the novel to have little more than historical interest for us, if this were all it registered. The title, however, sends us in another direction, that of the peculiar word 'luck', and of the fairytale to which it alludes (the German translation indeed borrows the Grimms' title, 'Hans im Glück', for the novel itself). Luck, to be sure, plays a fundamental role in the Bildungsroman in general, and it may be worth recalling the paradigmatic ending of the first and most influential of them, Goethe's *Wilhelm Meister's Apprenticeship*, of whose hero it is said: 'You make me think of Saul, son of Kish, who went forth to seek his father's lost asses and found, instead, a kingdom.'

Yet this particular fairytale is perhaps not so affirmative when it comes to the value of chance meetings. It tells of a country boy who seeks, not to make his fortune, but only to return home with it (he has just served an apprenticeship of the traditional seven years and received his accumulated savings in the form of a lump of gold). In the first of many chance meetings, admiring the alacrity of a passing horseman, Hans is offered the horse itself in exchange for the troublesome lump of gold, an offer he is happy to accept. Then, after being thrown by the horse, he is not unwilling to exchange it for a cow, led by a farmer who explains the advantages of its sustenance, in the form of milk, butter and cheese. But it milks poorly, and a passing butcher persuades him of the benefits of a young pig, for which he gladly exchanges it; a bargain then soon enough replaced by the swap of a fat goose; and so on and so forth until he loses the final avatar – a grindstone – in a well and, no longer burdened by that weight either, joyously reaches home with nothing left in his pockets at all. 'There is no man under the sun so fortunate as I,' he cries happily as he greets his mother. We should take into consideration the possibility that this really is a happy ending.

So it is that the naive Hans becomes the very prototype of foolishness and good fortune all at once; and it is a modern and sophisticated version of this paradox that Pontoppidan offers us in this unusual novel. We must remember that, like the German *Glück*, and quite unlike what obtains in most other languages including our own, the Danish *lykke* has the double meaning of 'luck' and 'happiness' – a combination not necessarily obvious, but on which the German fairytale also turns. Presumably, in the rural landscape of the Grimms, the combination implies that you would not be able to get out of the eternity of rural drudgery without some truly remarkable accidental encounter; or perhaps, on the other hand, that you would be very lucky indeed to know happiness in such a setting. At any rate, in modern (industrial) times the two meanings seem to separate from each other and to become relatively autonomous: you can be happy without luck, you can be lucky without necessarily knowing happiness.

And Per is himself lucky both physically and mentally: a robust and attractive physique endowed with an inventive, perhaps even genial mind, capable of imagining his vast Jutland engineering project at an early age and of drawing up its plans even before any formal or professional training. But he also knows that 'you had to hunt down luck as if it were a wild creature, a crooked-fanged beast, the fairytale's golden-brush boar, capture and bind it – booty for the fastest, strongest, bravest.'

This means contacts and even, if possible, a wealthy marriage. Indeed, the bias against this provincial Christianity secures a unique privilege for Pontoppidan (and his hero) – access to the world of Judaism. *Lykke-Per* is one of the few great European novels to make a central place for Jewish life and experience; but unlike *Daniel Deronda* and its abstract discussions of Zionism, it offers a rare portrait of the glittering Jewish high society of Copenhagen, along with a glimpse of the misery of eastern Jewry, driven into exile by the pogroms. Jakobe, a gifted and intelligent young Jewish heiress (but one far less attractive than her younger sister) is Per's first fiancée, and the object of a passionate attraction which never reaches the fulfilment of marriage. Jakobe's life finally makes her into a co-protagonist of the novel, whose unexpected destiny (she founds a school for refugee children in Central Europe) poses the same question as Per's own, a question that at first looks like that of happiness or luck, but which proves to posit yet a third alternative, namely that of success. The originality of the novel lies in its tripartite permutation of these themes, as momentous for the form of the novel as such as it is for the existential fate of individuals themselves in this modernising late 19th century.

The end of feudal society was famously dramatised by 'la carrière ouverte aux talents' – the freedom of youths to follow their ambitions, and to become generals in their twenties or to leave their villages and seek their fortunes in Paris. It is true that literature was most often fairly selective about the content of such careers, and that abandoning the various handicraft skills of the village usually left the novelist with few options: politics, art, marriage into high society, and above all money, about whose source once again a high degree of generality was imperative. Henry James never specified the source of the Newsome fortune in *The Ambassadors*, and the apocryphal story – the production of chamberpots – is perhaps just another fable about form and content. For even if money in general could easily be translated into something more exciting, such as power, the specificities of production – the content of the career – were universally discredited by spreading commodification (itself a kind of generalisation or abstraction). One of the most decisive things that happened to narrative in the 19th century had to do with the problematisation of its formal conclusions, which closed their narrative circuit in earlier and simpler societies either by way of a happy ending (in fairytales, for example, or romances) or a catastrophic defeat. Those older endings had content, as we might put it in philosophical language; in the new world of money and business, the whole social variety of existential outcomes was slowly reduced to a new set of abstract categories: the opposition between success and failure. Winning the girl is success, losing the war is failure: these abstractions do not on the face of it involve earning or losing money, but it is in reality the abstraction of money as such that governs the new system and which begins to impose the new simplified classification in terms of the stark alternatives of winning or losing, success or failure.

The formal result, for the novel, is strange and paradoxical, yet momentous: all successes grow to be alike, they lose their specificity and indeed their interest. Success sinks to the level of emergent mass culture – which is to say, fantasy and wish-fulfilment. Only the failures remain interesting, only the failures offer genuine literary raw material, both in their variety and in the quality of their experience.

It is the spread of commodification into the far corners of society which will come to define the novelist's basic form-problem in the course of the 19th century, making it more and more difficult to write an interesting narrative about success. You would have to arouse the reader's interest in specific production techniques: something even Zola was unable to do without a heavy dose of symbolism, without making them mean something else and something more. And you would have to earn the reader's sympathy for the successful men themselves, with their arrogance and their aggressiveness, their contempt for the rest of us, their supreme self-satisfaction and self-confidence. The last of this species – Zola's Octave (inventor of the first department store) and Maupassant's 'bel ami' – still marry into money, but finally trace a route for their successors that leads out of literature into mass culture and the bestseller, whose fundamental drive is neither pity nor fear, nor comic joy and euphoria either, but rather wish-fulfilment, the fantasy of the lives of the rich and famous.

So little by little serious literature must abandon the story of success; nor is Per Sidonius successful in that sense. But the male novel had one last trick up its sleeve: the theme of renunciation, a world-weary gesture that runs all the way through the century from the aged Goethe to Henry James, and which offers the further advantage of a distant kinship with sainthood. Whether *Lykke-Per* has any relationship to this particular motif will bear heavily on our judgment of the originality of the novel.

As for failure, in a situation in which everyone agrees that tragedy as such has become problematical, it is scarcely sustainable either for male protagonists in the long run, tending to degenerate into self-pity or impotence, as in its classic embodiment in Flaubert's *Sentimental Education*. At best it could recover a more eccentric or pathological interest with the identification of the will to failure and the satisfactions of inferiority as passions in their own right.

After that the novel belongs to women, along with the opera and the ballet: marriage will then almost by definition constitute their failure, with the novel of adultery virtually the only form that can lay some claim to being a modern tragedy. This is why, after the end of the marriage comedy, which became so remarkable a vehicle in Jane Austen's hands, the stories and destinies of women come to offer the richest raw material for literature: they are stories of failure, epitomised in the novel of adultery.

It is women's compensation for their exclusion from the Bildungsroman as such, and it is questionable whether the latter has itself been able to survive the catastrophe of 19th-century 'success', save perhaps for that one variant which does not depend on business society: the novel of the artist.

The problem is that the artist novel faces form-problems and contradictions of its own, which Ernst Bloch identified in a famous series of essays. For it is not enough to tell the reader that your protagonist is a genius, you must prove it somehow. But how? By inserting a work within the work, and giving a sample of his achievements (which may well be better than the novelist's own, but which ought in any case to be different)? The result is most often what Bloch calls a utopian hole or absence at the centre of the work, a transcendence which can only be imagined, a space that only the future can colonise. Otherwise, it might be better to make these putative works failures as well, as in *Le Chef d'oeuvre inconnu* or Zola's Cézanne novel, *L' Oeuvre*; at which point the protagonist rejoins the long and dismal line of capitalism's outcasts and rejects.

Lykke-Per deftly sidesteps this second dilemma by making its genius an engineer and by submitting, as its work within the work, a project that can be imagined and judged on its own merits, indeed a project whose fundamental ambition conjoins the novel's theme of modernisation and of the national destiny with that other even more fundamental one of luck, happiness and success, which is to say of desire itself. National allegory is alone achieved at that price, the coincidence of the collective destiny with that of the individual.

Per's scientific gift (although it does not yet quite strike the note of the two cultures debate) is itself an implicit judgment on the major Danish intellectual and cultural figure of the period, Georg Brandes (a scarcely disguised character in the novel, and also, not coincidentally, a Jew). Brandes was a giant figure for all of Northern Europe, a tireless champion of the avant-garde, very much including Nietzsche, and a major player in that late 19th-century European cultural revolution which led both to modern art and modern industrial development. Brandes/Nathan is an essential station on the line of development of Per's Bildungsroman; but his repudiation is no less characteristic of the form, marking the abandonment of a vision of a purely aesthetic and cultural modernity for a more comprehensive development that includes the national and the economic as well.

Yet engineering does not really take us that far away from art, inasmuch as Per, like any 'great artist' in embryo, has nourished the project of his Hauptwerk from adolescence on: it is (like the ending of *Faust*) the draining of the marshes and the opening of a series of waterways in Jutland that will shift the very position and strategic importance of Denmark in Europe itself:

Per's proposal is to move the south Jutland landing back to the old place, or rather a bit north of that, namely Tarp, at the mouth of the Varde River. From there, traffic could go further inland. This waterway, deepened and straightened, with the help of a couple of locks, would be connected with the Vejle river and together they would form the most southern of the two channels that, according to his plan, would unite in conjunction with the Belts, the North Sea and the Baltic.

He writes that only the completion of at least one of these lines of connection could bring a competition with the north German ports, especially Hamburg, whose growing business power, he contends, is the real danger that threatens Denmark's independence. Denmark's defeat in the battle for business markets that, secretly or openly, is the concern of international politics, will be more and more fateful; on the other hand, a victory would be a golden triumph and, gradually, Denmark would become the centre point of Europe, moving Russia's rising developing might and culture farther and farther east.

The plan is utopian and realistic/historical all at once, and I can only think of Saccard's dream of colonising the Middle East (in Zola's *L' Argent*) as a comparable moment in the 19th-century novel. Yet it remains unfulfilled; and the novel stands or falls with this unresolved dissonance, in which the project is suspended at the very moment in which (unlike the manias of Balzacian characters, for example) it finds practical and financial support and could actually be realised.

But this is what happens with all Per's plans and desires: they are abandoned at the moment of success. His love affair with Jakobe dissolves at the very moment of marriage: one can't say that it is broken off by a quarrel, or that the love affair that seems to come between them is anything more than a pretext, even though he also 'loves' the new infatuation (indeed, this one he goes so far as to marry, in a liaison that dissolves as readily as the old one). This is not, I think, the existential fear of commitment, on the order of Kierkegaard's seducer or Sartre's *Age of Reason*. Nor do we have to do here with Fourier's 'butterfly temperament', or the more serious professional conquests of a Don Juan. What is authentic is Per's capacity for new enthusiasms, intellectual as well as sentimental: but this renewal of interests does not exactly result in their conflict, in some painful hesitation between two desires, or the proverbial clash between love and duty. Per knows a double success – he has been adopted (figuratively) by a wealthy older woman and taken to Rome to experience the treasures of the city and its high society (shades of James, whose characters were there at much the same time), and in his absence the great engineering project for the seacoast has been taken up by some influential people and seems on the point of realisation – but then he receives a message urgently calling him back to Copenhagen to promote the scheme, which is the project of his life. His refusal to do so is not to be understood as the hesitation between two desires, two temptations, even though it does seem to be expressed in terms of indolence, new and luxurious pleasures, the inability of the will to throw off these weak and effeminate indulgences and to embrace his duty (or his destiny). In fact, Per is not a particularly pleasure-oriented figure, and Rome has nothing special for him, save as an excuse not to hurry back to Copenhagen.

No, I think the situation stands otherwise, and could perhaps be put like this: now that he knows the great project can be completed, he loses interest, he no longer needs to complete it. I think that what startled its contemporaries about this strange novel was not the representation of the usual motivations, but rather the sense of something new, one of those as yet unnamed and perhaps unnameable psychic discoveries for which the novelists of the period – from Dostoevsky to James – desperately searched, in the exhaustion of traditional narratives.

Perhaps the most plausible competitor in this struggle of interpretations is the now current topic of melancholia, which would seem very apt to describe the strange feeling-tone of a lack of feeling that characterises Per. Lack of feeling does not here mean the absence of passion – Per has many and diverse passions – but rather the failure of any of his passions or interests to cut deeply, to make their mark on a fundamental indifference which is not experienced in anxiety (as in the various existentialisms) but rather as a kind of permanent ground-bass of existence. This cosmic neutrality can itself take on a range of tonalities: from the ecstatic encounters with a nature that generally takes the form of an inorganic sublime (from rocks and mountains to the mines in which Per works for a time), to a more properly melancholy calm, as when Per accompanies the coffin of his mother back to the tiny port village in which he and his brothers and sisters grew up:

Per had already, for some time, been shipboard on the open sea. Like a giant floating sarcophagus, the ship's large, dark body glided over the peaceful surface in the twilight while smoke billowed over it like mourning crêpe. The sky was covered with clouds and hung heavy and black over the horizon. Here and there was a rift in the clouds through which a few pale stars peeked down like angel eyes watching over the solemn journey of the corpse.

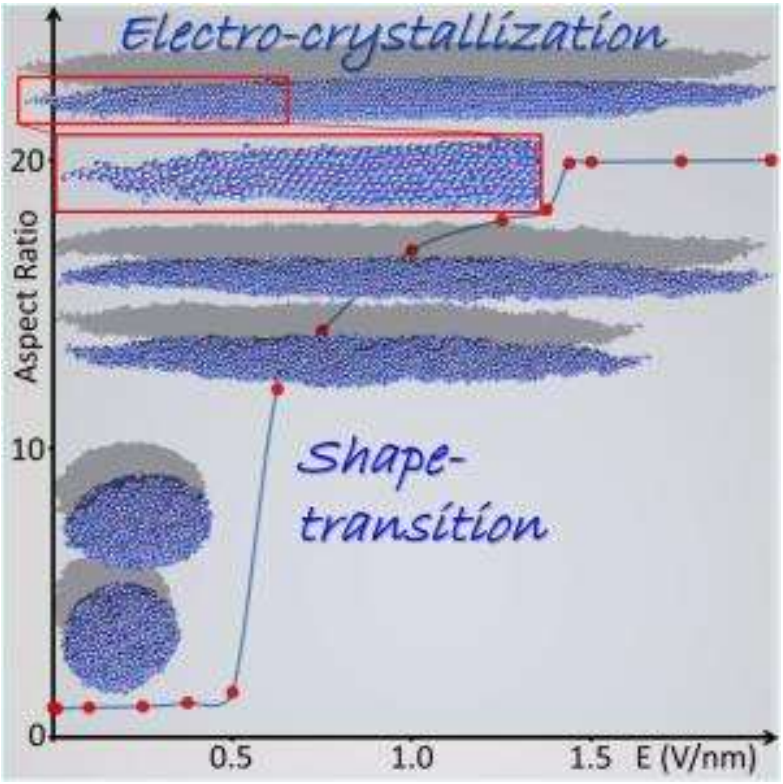
Pontoppidan's discovery, if we judge it to be that and do not reduce it to older narrative stereotypes, is something closer to the Freudian or Lacanian death wish: the idea that beneath all our conscious desires, which may or may not be satisfied, beneath all the successes that ought to bring fulfilment and at least a passing moment of satisfaction, there persists some immortal drive that can never be silenced (except by organic death) and which, 'in us more than us' and insatiable, renders both success and failure meaningless. But we must avoid the temptation of a religious or ascetic interpretation, and the accents either of asceticism or of existential pathos and Pascalian 'misery'. We must resist the temptation to see Per's final return to Jutland as a withdrawal from the world:

The place had a special attraction for him personally and, as he now realised, just *because* of its sterile and sad deserted nature, its full solitude. It seemed to him that he never had looked so deeply into himself as at that moment. It was as if he saw the ground of his own Being uncovered and was staring at it. When, in spite of all the good fortune that had come his way, he wasn't happy, it was because he had not *wanted* to be happy in the general sense of the word.

'In the general sense of the word': yes, this turns out to have been the novel's project – to change the sense of the word, to modify our sense of what luck or happiness means. 'Il faut imaginer Sisyphe heureux,' Camus concluded superbly, at the end of his book on the uselessness of passion. In just that way we must imagine that the fairytale of stupid Hans has a happy ending; and that Lucky Per himself has managed to get beyond success or failure.

http://www.lrb.co.uk/v33/n20/fredric-jameson/cosmic-neutrality

Liquid Can Turn Into Solid Under High Electric Field, Physicists Show in Simulations



Electrocrystallization. (Credit: Image courtesy of Georgia Institute of Technology)

ScienceDaily (Oct. 12, 2011) — Physicists have demonstrated in simulations that under the influence of sufficiently high electric fields, liquid droplets of certain materials will undergo solidification, forming crystallites at temperature and pressure conditions that correspond to liquid droplets at field-free conditions. This electric-field-induced phase transformation is termed electrocrystallization.

The study, performed by scientists at the Georgia Institute of Technology, appears online and is scheduled as a feature and cover article in the 42nd issue of Volume 115 of the *Journal of Physical Chemistry C*.

"We show that with a strong electric field, you can induce a phase transition without altering the thermodynamic parameters," said Uzi Landman, Regents' and Institute Professor in the School of Physics, F.E. Callaway Chair and director of the Center for Computational Materials Science (CCMS) at Georgia Tech.

In these simulations, Landman and Senior Research Scientists David Luedtke and Jianping Gao at the CCMS set out first to explore a phenomenon described by Sir Geoffrey Ingram Taylor in 1964 in the course of his study of the effect of lightning on raindrops, expressed as changes in the shape of liquid drops when passing through an electric field. While liquid drops under field-free conditions are spherical, they alter their shape in response to an applied electric field to become needle-like liquid drops. Instead of the water droplets used in the almost decade-old laboratory experiments of Taylor, the Georgia Tech researchers focused their theoretical study on a 10 nanometer (nm) diameter liquid droplet of formamide, which is a material made of small polar molecules each characterized by a dipole moment that is more than twice as large as that of a water molecule.

With the use of molecular dynamics simulations developed at the CCMS, which allow scientists to track the evolution of materials systems with ultra-high resolution in space and time, the physicists explored the response of the formamide nano-droplet to an applied electric field of variable strength. Influenced by a field of less than 0.5V/nm, the spherical droplet elongated only slightly. However, when the strength of the field was raised to a critical value close to 0.5 V/nm, the simulated droplet was found to undergo a shape transition resulting in a needle-like liquid droplet with its long axis -- oriented along the direction of the applied field -- measuring about 12 times larger than the perpendicular (cross-sectional) small axis of the needle-like droplet. The value of the critical field found in the simulations agrees well with the prediction obtained almost half a decade ago by Taylor from general macroscopic considerations.

Past the shape transition further increase of the applied electric field yielded a slow, gradual increase of the aspect ratio between the long and short axes of the needle-like droplet, with the formamide molecules exhibiting liquid diffusional motions.

"Here came the Eureka moment," said Landman. "When the field strength in the simulations was ramped up even further, reaching a value close to 1.5V/nm, the liquid needle underwent a solidification phase transition, exhibited by freezing of the diffusional motion, and culminating in the formation of a formamide single crystal characterized by a structure that differs from that of the x-ray crystallographic one determined years ago under zero-field conditions. Now, who ordered that?" he added.

Further analysis has shown that the crystallization transition involved arrangement of the molecules into a particular spatial ordered lattice, which optimizes the interactions between the positive and negative ends of the dipoles of neighboring molecules, resulting in minimization of the free energy of the resulting rigid crystalline needle. When the electric field applied to the droplet was subsequently decreased, the crystalline needle remelted and at zero-field the liquid droplet reverted to a spherical shape. The field reversal process was found to exhibit a hysteresis.

Analysis of the microscopic structural changes that underlie the response of the droplet to the applied field revealed that accompanying the shape transition at 0.5 V/nm is a sharp increase in the degree of reorientation of the molecular electric dipoles, which after the transition lie preferentially along the direction of the applied electric field and coincide with the long axis of the needle-like liquid droplet. The directional dipole reorientation, which is essentially complete subsequent to the higher field electrocrystallization transition, breaks the symmetry and transforms the droplet into a field-induced ferroelectric state where it possesses a large net electric dipole, in contrast to its unpolarized state at zero-field conditions.

Along with the large-scale atomistic computer simulations, researchers formulated and evaluated an analytical free-energy model, which describes the balance between the polarization, interfacial tension and dielectric saturation contributions. This model was shown to yield results in agreement with the computer simulation experiments, thus providing a theoretical framework for understanding the response of dielectric droplets to applied fields.

"This investigation unveiled fascinating properties of a large group of materials under the influence of applied fields," Landman said. "Here the field-induced shape and crystallization transitions occurred because formamide, like water and many other materials, is characterized by a relatively large electric dipole moment. The study demonstrated the ability to employ external fields to direct and control the shape, the aggregation phase (that is, solid or liquid) and the properties of certain materials."

Along with the fundamental interest in understanding the microscopic origins of materials behavior, this may lead to development of applications of field-induced materials control in diverse areas, ranging from targeted drug delivery, nanoencapsulation, printing of nanostructures and surface patterning, to aerosol science, electrospray propulsion and environmental science.

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Journal Reference:

1. William D. Luedtke, Jianping Gao, Uzi Landman. **Dielectric Nanodroplets: Structure, Stability, Thermodynamics, Shape Transitions and Electrocrystallization in Applied Electric Fields**. *The Journal of Physical Chemistry C*, 2011; 110901150249036 DOI: 10.1021/jp206673j

http://www.sciencedaily.com/releases/2011/10/111011112913.htm

The paradoxes of Russian Orientalism

Rachel Polonsky

David Schimmelpenninck van der Oye
RUSSIAN ORIENTALISM
Asia in the Russian mind from Peter the Great to the emigration
298pp. Yale University Press. £25 (US $40).978 0 300 11063 0

Vera Tolz
RUSSIA'S OWN ORIENT
The politics of identity and Oriental Studies in the late imperial and Soviet periods
224pp. Oxford University Press. £55 (US $99).
978 0 19 959444 3

Published: 9 September 2011

T hough he dropped out of Kazan University's Faculty of Oriental Languages after his first year, Leo Tolstoy's grades in Arabic and Turko-Tatar were good. It was history, which Tolstoy considered a "false science", in which his examiners declared him a "total failure". Tolstoy's Professor of Turco-Tatar Letters was a Persian from the Caucasus called Mirza Kazem-Bek, who had been converted to Presbyterian Christianity by Scottish missionaries in the 1820s, changing his name from Muhammad to Alexander. Though he had rejected the Islamic way of life and thinking as "too fanatical", and was a loyal subject of the Tsar, he proudly wore flowing robes and a silk turban in the streets of Kazan, and insisted on the Persian title "Mirza", meaning "scribe".

Mirza Kazem-Bek embodied the paradoxes of Kazan, a city on the Volga, less than 450 miles east of Moscow, which in its turn embodies the paradoxes of Russian Orientalism. As the Encyclopedia of Islam summarizes, Kazan was a Muslim Tatar khanate in the fifteenth and sixteenth centuries, and had become a Russian university town by the nineteenth. One traveller remarked on its "strange blend of Russian sophistication and Asian simplicity, Islam and Christianity, Russian and Tatar". As St Petersburg looked west, Kazan looked east. Alexander Herzen called it "the main caravansarai on the path of European ideas to Asia

and Asian character to Europe". For the first half of the nineteenth century, Kazan University (founded by imperial decree in 1804) pioneered orientology in the Russian academy, with the explicit purpose of training government officials for service in Asia (both within and beyond the borders of the empire). By the 1840s, the University had chairs in Mongolian, Kalmyk, Mandarin, Armenian and Sanskrit, and could boast, as one official in the Ministry of Education did, that it taught Oriental languages in a "depth and variety unsurpassed by any other institution of higher learning in all of Europe".

For David Schimmelpenninck van der Oye, Kazan University, despite all its explicit linking of academic scholarship with the governing interests of empire, complicates the "Saidian distinction between self and other". In his highly readable study, Russian Orientalism: Asia in the Russian mind from Peter the Great to the emigration, he restores to the words "Oriental", "orientology" (vostokovedenie), and "Orientalist" (vostokoved) the innocent "pre-Saidian" sense that they still have in Russian. Like other recent writers on Orientalism (notably Robert Irwin in For Lust of Knowing, 2006), he prizes his subject free of Edward Said's mind-clamping schema by exploring Russia's "imaginary geography" through the stories of scholarly and artistic lives, and of institutions of learning, in all their fragmentariness and flux.

His account (which is not strictly chronological) begins with the origins of Rus, and ends with a brief survey of how the Russian sense of a shared heritage with Asia is still ideologically potent under Vladimir Putin and Dmitry Medvedev. Russia's imaginary geography arises out of its real geography, in which forest and steppe, rather than East and West, were the original "self" and "other". The East Slavs who settled the wooded lands on Europe's north-eastern edges in the eighth and ninth centuries traded with the powers of the Baghdad caliphate, Persia and Byzantium; some paid tribute to the Khazars, an Inner Asian nomad nation of the steppe, whose elite had converted to Judaism. In the earliest Russian written sources, the monastic chronicles of medieval Kiev, the Turkic nomads of the southern steppe (the "wild field") are presented as ferocious raiders. However, these nomads were also trading partners, and useful allies in internecine strife between Russian princes, who were sometimes married off to the daughters of Turkic khans.

In the first half of the thirteenth century, fiercer invaders swept across the steppe from further east. The marauding horsemen of Batu Khan (Genghis Khan's grandson) burned their way across the southern grasslands and up into the northern principalities of Rus, which they subjugated for over two centuries. The Mongol overlords (called the Golden Horde by Russians) collected tribute and maintained order from their capital Sarai on the Caspian steppe. The Horde converted to Islam in the fourteenth century, but tolerated other faiths, exempting the Orthodox clergy from taxation in exchange for prayers for the khan. Though Rus continued to look to Byzantium in matters of religion, the Golden Horde had a lasting influence in politics, business and diplomacy. The words for "money" (dengi) and "customs" (tamozhnya) flowed into Russian from Tatar. As the historian Nikolai Karamzin (1766–1826) observed, referring to the autocratic ruling style of sixteenth-century Muscovy, "Moscow owes its greatness to the khans". Karamzin's own name, like the names of many other Russian families of ancient lineage – Yusupov, Ushakov, Dashkov – was of Tatar provenance.

It was in the reign of Peter the Great, when curiosity became a virtue, that Russia began to look at the East through Western eyes. Prompted by foreign advisers such as the philosopher Gottfried Wilhelm von Leibniz, who thrilled to the civilizational possibilities of Russia's geographical position between Europe and China, the modernizing Tsar established the foundations for orientology. Yet, as Vera Tolz argues in Russia's Own Orient, Russian orientology took until the end of the nineteenth century to evolve into a fully fledged academic discipline, uniting a community of scholars around a clearly defined set of ideas and a field of study. In the eighteenth century, Oriental studies in Russia amounted to a few Prussian schoolmasters – numismatists and linguists – hired by the ruler to grace the new Academy of Sciences. A more lasting legacy was left by a Moldavian prince, Dmitry Cantemir, born in an Ottoman vassal principality, who was sent to Constantinople as a young man, and instead of yielding to the luxuries of the waning empire's metropolis, devoted himself to learning. In later years, as a pampered exile in Russia, Cantemir wrote a nuanced study of Islam, as well as the History of the Growth and Decay of the Othman Empire, which was translated from

Latin into English (1734), German and French, and remained a standard reference on the Ottomans for a century, cited by William Jones, as well as by Gibbon, Byron and Voltaire.

Russian Orientalism is structured around the lives of individuals like Kazem-Bek and Cantemir, whom the author calls "representative". In their diversity and eccentricity, and their often complicated ethnic and cultural origins, they reveal that until the emergence of academic orientology in St Petersburg at the turn of the twentieth century, there was no "representative" Russian Orientalism, but rather an endlessly varied unfolding of scholarly and artistic engagements with a multitude of imagined "easts", interwoven in often surprising ways with the changing interests of the imperial state.

Schimmelpenninck van der Oye's gift for apt and evocative storytelling comes into play in his chapter on Catherine the Great's decorative Orientalism. It begins with the Tsarina's stately passage in a train of gilded carriages to the newly conquered Crimean Peninsula in 1787, her silver jubilee year. For the court of the learned ruler who had, twenty years earlier, proclaimed Russia "a European state", the Crimea evoked not only Russia's origins (Prince Vladimir had reportedly been baptized in 988 in nearby Kherson), but also the worlds of ancient Greece and Byzantium. (Catherine's grandsons were named Alexander and Constantine after the Greek conqueror and the Byzantine emperor.) Stage-managed with fantastic extravagance by Prince Grigory Potemkin, this journey of thousands of miles culminated with a cruise down the Dnieper river, and a final carriage procession across the steppe, with diversion provided by thousands of Don Cossacks, Kalmyk horsemen, and Crimean Tatar cavalry, and even a regiment of "Amazons", female warriors from the ancient Scythia of Herodotus, regaled in neoclassical breastplates and white ostrich plumes. The symbolic high point of Catherine's journey was a late spring sojourn in Bakhchisarai, the former capital of the Crimean khanate and a last remnant of the power of the Golden Horde. "I lay here in the summer-house of the khan / Amidst the infidel and faith Mohammedan," the Tsarina wrote in a poem for her viceroy, "And disturbed from my sleep amidst Bakhchisarai / By tobacco smoke and cries . . . . Is this not paradise?" Even more appealing to the imagination of the Voltairean Catherine and her court than the picturesque Islamic world of the Thousand and One Nights was China's Middle Kingdom, with its associations of reason, imperial power and exquisite taste in porcelain, embroidered silk and architecture.

Asian themes resurface powerfully with Alexander Pushkin's Byronic "southern poems". In 1820, Pushkin had just published the verse fairytale Ruslan and Ludmila (which combined themes from the Thousand and One Nights with Russian folklore), when he was exiled to the empire's south-western frontier for a political poem that had circulated in manuscript. Pushkin's travels in the Caucasus and the Crimea led to the narrative poems Captive of the Caucasus and The Fountain of Bakhchisarai, which brought him great acclaim, as well as a number of shorter lyrics inspired by the medieval Persian poet Sa'di. In the tradition of Catherine the Great, Pushkin kept a sure sense of what he called his European "taste and eye", even in "the rapture of Oriental splendour".

In the 1830s, wars against the Muslim tribes in the Caucasus inspired the poetry and prose of Mikhail Lermontov, the Decembrist exile Alexander Bestuzhev (who wrote under the pseudonym Marlinsky) and a number of other modish writers of travel prose, adventure fiction and verse. Their literary Orientalism has been insightfully explored by Susan Layton in Russian Literature and Empire (1995) and by Monika Greenleaf in Pushkin and Romantic Fashion (1995), but Schimmelpenninck's account of the early nineteenth-century "oriental muse" usefully places these writers in the context of the developing Russian fascination with many different "easts".

Poets do not reappear prominently in the story of Russian Orientalism until the Symbolist movement of the turn of the twentieth century. In Schimmelpenninck van der Oye's account, the mid-nineteenth century belongs, for the most part, to scholars and missionaries: uncommon men, ready to cross both geographical and cultural boundaries, to confront doubts, and to change their minds. "Among all European nations, Russia is best qualified to study Asia", wrote Count Sergei Uvarov in his proposal for an "académie asiatique". As education minister under Nicholas I, Uvarov (notorious as the reactionary ideologue of "Orthodoxy,

Autocracy and Nationality") was a champion of orientology; he hoped the hierarchical traditions of the East would be a counter to European radicalism. As Vera Tolz writes, in Uvarov's "imagined academy", a "European critic" would work side by side with an "Asiatic lama".

To the great sinologist Nikita Yakovlevich Bichurin (1777–1853), better known by his monastic name of Fr Hyacinth, Russia's long border with China gave it an insurpassable advantage over Western Europe in the study of the Middle Kingdom. He remarked to the historian Mikhail Pogodin that the judgement of European scholars about matters concerning Central and East Asia "is no more reliable than that of a blind man about colours". Hyacinth was a disreputable priest, but a fine scholar. He raised the discipline of sinology to such a level that by mid-century the study of China was more advanced in Russia than anywhere in Western Europe. Hyacinth was a Chuvash (of mixed Finno-Ugric and Turkic blood) and the son of a village deacon. Educated at the Kazan seminary, he spent many years in China as head of a diplomatic mission, neglecting religious and administrative duties for his studies. In the 1820s, he returned to St Petersburg, where he lived a loose life, and frequented literary salons with the prominent writers of the day. In 1830, Pushkin was refused permission by the secret police to accompany the priest on an expedition to China through the tea-trading frontier town of Kyakhta. (Pushkin never succeeded in crossing the border of the Russian empire, though he tried several times.) Two years later, Fr Hyacinth founded Russia's first Chinese-language school in Kyakhta.

With its inauguration in 1855, the Faculty of Oriental Languages in St Petersburg University took over the growing field from Kazan. Its first dean was Mirza Kazem-Bek, who boasted that "nowhere else in Europe have as many orientologists ever gathered in one academic institution as here". The special promise of Russian orientology that Uvarov and others since the early nineteenth century had asserted more as a figure of speech than a reality was only fulfilled in the last decades of that century. It is here that Vera Tolz takes up the story, in an erudite and closely argued interpretation of the significance of a remarkable group of scholars, known as the "Rosen school". The Arabist Baron Viktor Romanovich Rosen became dean of St Petersburg's Faculty of Oriental Languages in 1893. Though he was distinguished more for his achievements in academic administration, reviewing and teaching than for original research, Rosen was seen by his disciples as the founder of an "entire new school of orientology", which gained international standing by focusing on Russia's "own orient". The most illustrious scholars in the Rosen school were Vasily Barthold, Sergei Oldenburg, Fedor Shcherbatskoy and Nikolai Marr, whose principal areas of study were Central Asia, Buddhism (particularly its living oral traditions within the Russian empire) and the Caucasus.

Tolz is concerned with "families of ideas" rather than with individual biographies, but she notes that though these men forged an authentic and distinctive "Russian" school of orientology, none of them was ethnically Russian. Rosen, a Baltic baron who grew up speaking German, was a fervent advocate of Russian as a language of scholarship among European orientologists. Tolz lays out, in all its complicated, often contradictory detail, the extent of their political and intellectual influence beyond the field of "science" in the early decades of the twentieth century. The ideas of the Rosen school shaped early Soviet policies towards ethnic groups in the Caucasus and Siberia. At a time when Russian imperial policies were being questioned in works such as Tolstoy's sublime late masterpiece Hadji Murat, whose hero is a Chechen, the Russian imperial scholars and their "minority associates" were redefining certain ethnic groups as national communities, and creating a picture of Russia as a distinctive "political and cultural space", open and multi-polar, in which there was no discernible boundary between East and West.

In the past decade, there has been vigorous argument among scholars (particularly in the journal Kritika) about the relevance of Edward Said's ideas for Russian Orientalism. Tolz takes the debate in a new direction by revealing the traces of Russian Oriental studies in Said's thinking. Though he did not know the work of the Rosen school directly, Said was heir to its particular style of thought through the mediation of the Marxist and postcolonial nationalist Arab intellectuals of the early 1960s. The Egyptian Anwar Abdel-Malek, who strongly influenced Said, studied in the Soviet Union in the 1950s, and borrowed directly from Sergei Oldenburg's critique of the relationship between knowledge and imperial power in Western European Orientalism. Having followed the course of grand ideas along a trail of footnotes, Tolz concludes that

Oldenburg was in many ways a more important influence on Said than Michel Foucault, whom he explicitly invokes and who set the terms for Orientalism's essentialized picture of the "West" and its polemical discussion of Orientalist "discourse". Though the legacy of the Rosen school is in many respects contradictory, in particular in relation to the question of the development of "national consciousness" in the context of a state-framed empire like Russia's, Tolz proposes that contemporary postcolonial scholarship be seen as a descendant of early twentieth-century Russian orientology.

Russian self-confidence about its unique academic advantages in this field reached its clearest expression in a remarkable series of lectures, "The History of the Study of the East in Europe and in Russia", by Vasily Barthold, delivered for the golden jubilee of the St Petersburg Faculty of Oriental Languages in 1905. Barthold called Russia a "scientific world apart", at once asserting the "scientific" nature of history, and Russia's own, distinct "Oriental" cultural identity. He was a scholar of international repute. He contributed hundreds of entries on Central Asia, Crimea and the Caucasus – places beyond the field of inquiry for Western scholars – to the Encyclopedia of Islam, published in Leiden between 1913 and 1938. (One was the entry on the Russian city of Kazan.) The English Orientalist Edward Denison Ross wrote his obituary for The Times.

Stalinism and the Cold War combined to deprive Barthold and his colleagues of their rightful standing, both in Russia and abroad. Their discoveries fed the imaginations of the creative elite, and influenced the Eurasianists of the 1920s, who asserted Russia's fundamental difference from Europe. They created images of the "East" – from the empire of Genghis Khan to the Caucasus – that directly inspired early twentieth-century Symbolist poets and "Eurasianist" thinkers as they reimagined Russia's "exotic self" in poetry, mysticism, apocalyptic prophecy and anti-Western polemic, which invoked Scythia and the heritage of the steppe. A number of these writers explicitly rejected the ideal of the "European eye" and turned, as Tolstoy did in later life, to Indian and Chinese thought. Yet it was in the name of the "false science" of history, imported from Europe in the eighteenth and nineteenth centuries, that the manifold aesthetic, philosophical and religious riches of the East, as well as Russia's own Eastern origins, were first brought to light – in the lecture halls of Kazan and St Petersburg, and the staid periodicals of the Imperial Geographical Society.

Vera Tolz ends Russia's Own Orient by gently suggesting that in Putin and Medvedev's Russia, when it is fashionable again to emphasize Russia's eastward-facing heritage, the intellectual legacy of the forgotten "Rosen school" – which used the tools of European "science" to study and celebrate non-European cultures and traditions – would make a far richer source of national inspiration than an aggressive revived "Eurasianism" that presents the West and its putative values as a threat to Russia's distinct cultural identity.

Rachel Polonsky's most recent book is Molotov's Magic Lantern: Uncovering Russia's secret history, 2010. She teaches in the Slavonic department at the University of Cambridge

http://www.the-tls.co.uk/tls/public/article771912.ece

The Deaths Map

Jeremy Harding writes about the war on America's southern border

Migration is said to be good for host cultures. Geographers, demographers and business people believe it is, especially in the US, where one migrant group after another – Jews, Poles, Italians, Irish – has auditioned for a role in the great musical of American identity. The competition has been bitter, especially between newcomers and predecessors, and the typecasting has been crude, yet sooner or later every minority earns its place in the chorus. Nonetheless there's a growing sense in some parts of the US that enough is enough, the stage is full to capacity and the show can no longer go on as it has. The source of this impatience is illegal immigration from Mexico, which is no longer seen primarily as a supply of service employees, farm labour and building workers, but as a threat to an indebted nation still embroiled in distant wars, with land borders to north and south that it can't patrol as effectively as it would like and unemployment hovering at around 9 per cent. The US already has more than 11 million unauthorised migrants. About six and a half million are from Mexico and another two million from other parts of Latin America. Every year, many thousands more are crossing from Mexico without permission, to swell their ranks. Roughly 500,000 Hispanics – 8 per cent of the population of the state – are living in Arizona without authorisation. Arizona has become an operational front in yet another desert conflict.

The battle against illegal migration is a domestic version of America's interventions overseas, with many of the same trappings: big manpower commitments, militarisation, pursuit, detection, rendition, loss of life. The Mexican border was already the focus of attention before 9/11; it is now a fixation that shows no signs of abating even as Obama draws down the numbers abroad. Despite war-weariness at home, war has remained the model for curbing illegal immigration; territorial integrity and the preservation of national identity are the goals. Unlike the invasion of Iraq, this is a respectable struggle – all nation states assert the right to secure borders. Yet watertight security is becoming harder to achieve as the global era brings new pressures to bear on the frontier, adding to the older challenge posed by people wishing to move freely. At fortified boundaries, frailty lurks beneath the show of strength.

The tough stance on the US southern border is fuelling bitter animosities. It endorses the north-south divide between two continents and two big economies, and gives offence in Mexico, where the northerly movement of undocumented people is seen as a vital form of exchange for both countries. Political liberals in the US tend to agree on this, seeing the benefits to Mexicans and the families they support from abroad. So do corporate boards and chambers of commerce, whose members celebrate migrant labour, on or off the books: that's business at the price of immigration control. Then there are the ultras, neoliberals who favour greater freedom of human movement, in step with the boundless mobility of capital: that's business at all costs, above and beyond the petty constraints of sovereignty. But conservatives in the South-West don't like what they're seeing and in Arizona they have drafted state laws on illegal immigration that vex the federal courts and alienate the business community. Most worrying, they raise local tension between Hispanics and whites. Over the last ten years, beefed-up border control has led to many more deaths among migrants, forcing them to find alternative routes through remote desert in their quest for a livelihood. In this thicket of dangerous contradictions, the illegal alien is both villain and victim. The question is whether punitive legislation and warlike methods of enforcement can strengthen the frontier or whether they turn manageable disorder into a disaster.

The border with Mexico stretches for nearly 2000 miles. Much of that is underwritten by the Rio Grande, but as natural barriers go, the river is less formidable than the wilderness either side of the frontier. The harsh Sonoran Desert in the south-western borderlands runs deep into Arizona, and into the defensive imagination of a white majority who take it as a god-given affirmation of the integrity of their state, and of the United States itself. A magnificent and costly border wall – 'the fence', 'the barrier' – now runs in sections, like a work by Christo and Jeanne Claude, along parts of the frontier, but the terrain in most of Arizona is so fierce that it was thought until recently to be a stronger disincentive to illegal entry than any man-made obstacle.

Border vigilance in its present form took shape in the 1990s under the first Clinton administration. In 1993 the Border Patrol in Texas reacted to large numbers of illegal crossings near El Paso with high-profile reinforcement. Operation Gatekeeper, designed to stem illegal migrant flows at San Diego, followed in California. Army surplus landing mats, dating from Vietnam, were stood on their ends to build a short stretch of wall along the border, where more than half a million 'illegal aliens' had been apprehended the previous year. People could cut holes in the steel panels or climb them – there were useful toe and hand holds – but the wall put an end to cars and pick-ups going across and set up a physical marker between north and south. As it grew, it transformed a line defined by international treaty, a few dusty frontier posts, cattle barriers and rolls of barbed wire, into a monumental declaration of intent. Numbers of illegal entries fell sharply around El Paso in the east and San Diego in the west, leaving a broad migrant channel in the intervening stretch of borderland. Many Latin Americans were ready to try it, especially after Mexico devalued the peso in 1994. At that stage crossing the wilderness wasn't the only option for a clandestine migrant, but matters were moving fast and in 2006, the US Congress passed the Secure Fence Act, requiring 700 miles of built deterrence: not a wall as such, but a series of extended barriers along stretches of the border. The landing mats looked footling by comparison.

By 2010 Arizona had at least 125 miles of high fencing and about 180 miles of vehicle barriers. Determined migrants could still get across, and by now it was clear that the desert was not doing all that it should to keep out the enemy. Border towns were among the first places to be reinforced and security has been upgraded since. There are two crossings, for instance, between Nogales, Arizona and Nogales, Mexico. The aged fencing at the downtown crossing, weakened by wear and tear, including tunnelling, was replaced this year. The Mariposa crossing, on the outskirts of town, is mainly a transit point for heavy goods, where articulated trucks back up for half a mile or more on the US side, an endless line of upright exhaust pipes beside a verge of sand, scrub and trash. This, too, is undergoing a major overhaul, largely to cope with the volume of traffic, but security is being tightened as well. Mariposa is the preferred point of deportation for illegal migrants: truck drivers, unlike the crowds of tourists at the downtown crossing, are used to the sight of captives being herded into Mexico like livestock.

In the view from the Arizona state capitol, human smuggling and drug smuggling are intimately connected. During a gubernatorial debate in 2010, Jan Brewer, the Republican governor, said of undocumented migrants: 'The majority of them in my opinion and I think in the opinion of law enforcement … are not coming here to work. They are coming here, and they're bringing drugs.' But how does this hold up under scrutiny? It is true that many of the men profiting from human smuggling, with their millionaire ranches on the edges of the cities in northern Mexico, are making bigger amounts from drugs. Take Nogales again. In terms of cartel geography, it belongs to a generous swathe of territory worked by the Sinaloa cartel. There were clashes last year with rival cartels (the remnants of the Beltrán Levya brothers' cartel and the paramilitary group Los Zetas), but drugs continue to cross the border and some, it is also true, are carried by unauthorised migrants: people who don't have the money to pay for their passage can repay the debt by acting as mules, delivering packages to safehouses in the US. But the carrying capacity of a foot-slogger is no match for a commercial trailer, or the hydraulic arm of a towtruck, or a hidden compartment in an outsize SUV. The impressive quantities of narcotics confiscated along the US/Mexican border in 2009-10 (three million kilos of marijuana, cocaine, heroin and other drugs) and the drainage of weapons from the US into Mexico (6800 seized en route in the same year) tell us less about the vices of the undocumented migrant than they do about sophisticated smuggling operations, North American drug preferences, the effect of prohibition and the promiscuity of gun culture.

Unlike Brewer, Border Patrol staff believe that fewer than 10 per cent of the people they catch coming across have criminal intentions. The figures contradict her too. If drugs are the reason migrants infiltrate the border, why are there so many apprehensions of 'illegals' (170,000 in the Tucson Sector from October 2009 to June 2010, for instance) and so few federal prosecutions in the state on drugs charges (1107 in the same period)? How is it that out of the half-million undocumented Hispanics in Arizona, fewer than 3000 are in state penitentiaries on drug offences? Why, in Pima County, a frontline border county which includes Tucson, do

crime figures for 2010 published by the sheriff's office show incidents involving 'controlled substances' running at lower rates than fraud, criminal damage or burglary and only slightly higher than drunk driving?

Drugs or no drugs, unauthorised migration puts pressure on the border, and since 9/11 the crackle of vigilance has grown steadily louder as federal, state and county resources pour in to check a threat that is ill-defined in reality but which, like the spectre of WMD in Iraq, achieves high resolution in the eyes of policy-makers. Among the various agencies hovering over 'border issues' in Arizona are US Immigration and Customs Enforcement (ICE), US Customs and Border Protection, the Federal Emergency Management Agency (Fema), the DEA, the FBI, the Arizona Department of Public Safety and the sheriffs' officers of several counties, including Maricopa, which has more than 700 on its rolls. More than 500 National Guard troops were sent to Arizona in 2010 and should have left in September: the redeployment is on hold. A move is afoot in Washington to increase Border Patrol staff, now roughly 20,000, by a further 5000 in the next four years and to deploy 6000 National Guard along the length of the frontier. The bill is sponsored by John McCain (Arizona), who, like George W. Bush, was once an immigration liberal but sees where the votes have come to lie in recent years.

Two highly visible protagonists in the immigration drama, Salvador Reza and the Republican state senator, Russell Pearce, embody the tensions in Arizona, almost to the point of caricature. In February 2011, Reza, a Latino commun-ity leader in Phoenix, was detained in the downtown county jail. His offence was not wholly clear. The trouble began the previous day while he'd been in an overflow room at the state capitol listening in as a senate committee debated a bill to crack down on undocumented migrants. The gist of the bill was to make life impossible for anyone in Arizona without papers: impossible to drive a car, or enrol a child in school, or be treated at a hospital for non-emergency care. Any infant born to an undocumented migrant would acquire a docket stating that it was not a US citizen. The presence of one undocumented person in a rent-paying household would mean the landlord had to evict them all. Reza, a large man in his sixties, with silver hair in a ponytail and a walrus moustache, was applauding arguments against the bill from opponents in committee.

Pearce, the president of the State Senate and the driving force behind the legislation, was furious and told security that in future Reza should not be allowed into the capitol buildings. When Reza arrived the following day for a meeting, he was told to leave; there was a scuffle; he and a fellow activist were arrested. Though he's a US citizen, Reza is a pantomime monster for worried conservatives in Arizona, just as Pearce is for Hispanics and liberal whites. Pearce is a fifth-generation Arizonan, and a stickler for law and order, border law in particular. He comes to the point a fraction too soon and has no time for nuance; the fine interpretation of a law and its violation are much the same in his view and, oddly for a legislator, he won't agree that if it's unenforceable, it's of very little use to anyone. He parries accusations of racism with the assertion that the law is colour-blind, which only adds to his villainy in the eyes of his enemies. He is a broad-shouldered, powerful man, in his sixties like Reza, who speaks in well-formed sentences that aren't quite soundbites; he has a thick, acrylic complexion, like a work in progress left on the easel overnight.

Pearce announced when we met that he had never been against immigration, only illegal immigration: what's 'not to understand' about the word 'illegal'? He followed with some terse thoughts on race: 'I don't care what colour it is, as long as it's American.' Business people who were opposed to his stance, he said, were mostly the ones who acted unfairly, outside the law, driving down their own labour costs and cheating honest competitors. This was a kind of theft – 'I don't support stealing, though I see it benefits the thief and his family' – and it displaced American workers (the figures are always hotly debated but they suggest 'illegals' do indeed compete with high-school drop-outs in the job market). 'It's embarrassing,' he added, 'and anti-American.' He deplored the loss of tax revenue and social security contributions, though many undocumented aliens file tax returns and even more have social security payments deducted at source, under a false social security number, or someone else's, which means that they pay in even though they will never be able to claim. The sums come out differently depending on the accounting, but Pearce sticks to his headline findings that illegal immigrants are a net loss to government and besides, as he reminded me, the law, not the money,

is the bottom line. 'Take the handcuffs off of law enforcement,' he said with the ghost of a gleam in his battle-hardened eye.

Several hours after Reza was arrested at the capitol buildings, his supporters were crowded round another monitor, in the county court in Phoenix, which doubles as a jailhouse, waiting to hear whether he would get out and what charges, if any, would be brought. I was in the building, crammed against a TouchPay banking machine for transfers to prisoners ('a fast, secure, convenient way to deposit money into inmate accounts … Mastercard or Visa'). An anti-anti-immigration senator cut a furrow through the room and addressed a sterling defence of Reza to the nearest news camera. The feeling among the crowd, largely Latino, was that Pearce had blackballed Reza from the state capitol, that the charge would be trespass and that this would probably violate the First Amendment. In a whisper, but hardly in confidence, a young Latino lawyer told me: 'They want to de-*tain* his ass.' Reza was released later that night, along with his colleague, pending a court appearance. On the steps of the 4th Avenue jail he assumed a statuesque pose, legs apart, plaid shirt filling in the breeze, and denounced 'a level of repression I have never seen before'. Arizona, he said, 'has to come back into civilisation'. Huddled in the chilly night air, the crowd applauded. The younger activist detained with him had put up a fight, been manhandled by security at the capitol buildings, and dragged out by the hair. A journalist asked her for a contact number but she'd used her cellphone to film the fracas and it had been confiscated.

In Roberto Bolaño's novel *2666*, a TV talk-show host watches enviously as a rival on Tijuana TV interviews a doomed cross-border veteran who holds 'the record for most expulsions from the United States': he is a scapegoat for the failures of the Mexican economy, the second largest in Latin America, who keeps returning, unbidden, from the wilderness in which he was supposed to disappear. 'Do you know how many times he had entered the United States illegally? Three hundred and forty-five!' After the 50th crossing, we're told, a heartfelt sympathy set in and the smugglers stopped charging him. On subsequent crossings he became a magical asset: better to have him in the group, because if anyone were to be caught, it was sure to be him. The talk-show host asks if he means to keep on trying. 'Trying what?' the man says. This mythic figure, steeped in heroic absurdity, is worth remembering as you stand at the border in the dust storm of deterrence that makes it hard to see to the other side, where national sovereignty means little to people impoverished by fate or political economy. The other figure to bear in mind is this: for every illegal migrant apprehended, Border Patrol estimates that three get across.

In Arizona, the pursuit of aliens is no longer confined to a costly cat and mouse game along the frontier. It is a grim paper-chase that takes place in traffic queues and metered parking zones in Phoenix, the kitchens of fast-food restaurants, mechanics' workshops and building sites miles from the fence. Oscar, a fluent English speaker in his thirties, was not the symbolic serial offender imagined by Bolaño, but he had a sobering story to tell about the new crackdown, what it was to attempt the border and how it felt to fail. I found him stacking cans of peeled tomatoes by a portable gas stove in a tent shelter just across the frontier in Nogales set up by a migrant-support NGO. He had been holed up in Mexico for months, having lived in the US, been expelled and crossed back over several times, only to be caught and returned. Oscar's misfortunes began in 2005, when it was discovered that his immigration documents were not in order. He'd opted for voluntary departure – a dismal alternative to detention or unaffordable lawsuits – and then crept back in. Subsequently, in Phoenix, he'd run up a couple of parking fines and paid them off using a fake ID. He'd let the third one slide, and wound up in an ICE detention facility for three months for illegal entry, before being deposited in Nogales. Not long afterwards he came back through the downtown crossing and managed to remain in the US for three years, until he was nailed on a traffic offence, sent to a detention facility in Arizona and deported again.

Oscar was not a man to hang around. Within days he'd joined a party of migrants, led by a coyote, or paid guide, on a venture into the Sonoran Desert. It was a three-day walk from the frontier to their pick-up point. He was flayed below the knees by cacti and when his shoes came to pieces – the shoes he'd been given in prison in Arizona – he walked the last day barefoot over red rock, a coarse oxidised sandstone. In Tucson he discovered that the soles of each foot had become a single blister, from ball to heel, like a gel pack. He was

deported again and on his next attempt, shortly afterwards, he and his companions were spotted by Border Patrol. During the chase he lost his food and water. He survived for two days (it was October) and eventually made it to Phoenix. Soon enough he got on the wrong side of a drugs bust – his brother-in-law's marijuana was found in his car, he claimed – and he was deported yet again. The refuge by the border post where a dozen indigent, would-be migrants hung in the shade with a listless posse of dogs, was now the long and short of it for Oscar. He'd been using crack, he admitted, but had managed to shake the habit: his suppressed rage and the look of convertible longing in his eyes – a longing for his family, or maybe his earlier life, or maybe a proscribed substance – made you wonder if he was telling the truth.

In fact the difficulty for Oscar had arisen very much earlier, when the family lawyer had failed to sort out his paperwork in the 1990s. The deeper problem still was that his family had brought him to Chicago in the mid-1980s, when he was three. He had a wife, an ex by now, and three young daughters with US citizenship living in Arizona, where he had worked as a courier, a line manager at a fast-food chain and a damp-course expert. He knew everyone and their grandmother in Phoenix. In Mexico his circle of acquaintance was probably confined to a handful of drug-users, dealers, human smugglers and deportees: the edgy feeling in the refuge in Nogales had something to do with drug dependency. His cheerful, busy friend Ricardo, who breezed in while Oscar was telling his story, had been pulled in for jaywalking in Phoenix in 2009. He'd shown the police his papers from the Mexican Consulate and a student ID – he was enrolled to study architecture – but he was handed over to ICE and chose voluntary deportation over a spell in federal detention. Ricardo was 24. He'd been nearly two years in limbo when we met. He'd been brought to the US at an earlier age even than Oscar – he was one year old – and had almost no family connections in Mexico. Oscar and Ricardo were Mexican on paper, but cast adrift in an unfamiliar environment they were closer to what Hannah Arendt and her generation would have described as 'apatrides'.

Phoenix lay under a dull sky. It was early morning, with few signs of life, when we left. We picked up State Route 85 at Buckeye and headed south through a magnificent valley strewn with saguaro and palo verde; after an hour or more we passed the Barry M. Goldwater Air Force Range, a test site for dummy ordnance. I was making for the borderlands again and before long my companions would be putting out water supplies on desert routes where migrants were known to travel and known to have died. Liana Rowe took a hand off the wheel and gestured at the bombing range. There were no water stations there, she said, because the military had refused permission. 'Really,' one of the volunteers in the back said with deadpan sarcasm. 'But we know people come through there,' Rowe went on. Another hour and we were on the outskirts of Ajo, an old copper settlement, where the pale terraced workings rose in the near distance like the remains of an abstruse civilisation. When the mines opened during World War One they generated a surge of Mexican migrant labour, but extraction ended in the 1980s and now the place is solemn and still, though the area is part of the regular beat for Border Patrol.

In May 2001, among dozens of crossings, a group of 26 migrants entered the Tucson Sector from Mexico. During a vigorous pursuit by Border Patrol, 14 lost their bearings, including three guides, ending up in a stretch of desert known as the Devil's Highway, where they died. They were not the first casualties since Operation Gatekeeper but this was the highest number of recorded deaths in a single incident and pointed up the human consequences of the security drive at the border, where undocumented migrants had been moving back and forth in relative safety for decades.

The deaths were a scandal on both sides of the frontier. By then a group of activists in Tucson had already formed Humane Borders, an NGO seeking to 'reduce the number of migrants dying in the desert' and advocating secure legal status for undocumented immigrants. Rowe, an ordained minister in the United Church of Christ, is the Phoenix co-ordinator of the organisation, one of many support and solidarity groups that sprang up in Arizona as a result of tightened border policy. Her work, she explained, was a legacy of the Sanctuary movement of the early 1980s, when churches in the US brought refugees from the wars in El Salvador and Guatemala to safety north of the border, using a modern version of the underground railroad. Arizona had played a prominent part in this movement. 'Sanctuary activists could see what was going to

happen as the urban crossings were sealed off,' Rowe said, referring to San Diego and El Paso, and events confirmed their misgivings.

Humane Borders and others have compiled a painstaking log of migrant deaths in the Sonoran Desert, with information from the medical examiners' offices, Border Patrol and the Mexican Consulate. Geographers have taken the data and expressed them as a map of the frontier area, studded with red dots, each representing at least one death inside the US. The dots are so densely grouped in places that you might be looking at lumpfish caviar. A ten-year retrospective 'deaths map', covering the period 1999-2009, charts 1755 deaths. 'They were wrong,' Rowe said as she ran through the figures, 'about the desert putting people off.' The primary purpose of the deaths map is not to alert the world to the fate of desperate or adventurous people, but to give Rowe and her colleagues an idea where to set out water: after careful extrapolations from the map and tough negotiations with landowners, private and public, Humane Borders has established water stations in dozens of locations in the middle of nowhere.

At a depot in the Organ Pipe Cactus National Monument, a Unesco 'biosphere reserve', Rowe switched the car for a flatbed truck loaded with five-gallon bottles, a large container of water and two wheelbarrows, drove it out to the first water station, parked the truck, filled the bottles and had us wheel them to the station, a distance from the road, where we topped up a barrel. She checked the tap and ran a chlorine test. The volunteers, probation officers in the Phoenix area who were bitterly opposed to the crackdown on undocumented migrants, picked up a bit of litter – someone had been here – and we moved on to the next station to repeat the process. Litter dumped in nature reserves by exhausted migrants counts against them in the eyes of hardline environmentalists, and their bodies are only slightly more acceptable: plenty of migrants have struggled through this nature reserve and many have died in it. Some people say Humane Borders is complicit in illegal migration, Rowe remarked. 'Because we put out water. That's a refusal to see what drives them across in the first place.'

We secured the wheelbarrows and bottles on the tailboard, drove to the depot and put away the truck. On the way back in Rowe's car, she spoke at length about the harsh new conditions facing migrants. She evoked an earlier age, when clandestine migration was mostly 'a mom, pop and donkey operation'; you could almost glimpse the Flight into Egypt, restaged with plaster figurines in the crypt of a Mexican church – for a long moment I'd forgotten Rowe was a devout Christian. Border vigilance had raised the stakes, she went on, attracting new, high-powered Mexican smugglers who looked for wide profit margins (the going rate for a crossing that starts in Guatemala is around $7000). A cottage industry has been transformed into a lucrative business whose clients are forced to part with far more money than previous generations paid, for a far more dangerous crossing. Homeland Security, Rowe argued, has burnished the dollar signs in the eyes of the drug cartels, driven up the costs for migrants and introduced a death penalty clause into their ordeal by forcing them through remote desert. 'If you're going to quote me, please don't refer to me as Reverend Rowe. Or Reverend anything.' The skies had cleared, the sun was behind us, and the desert city of Phoenix, where she would preach the next morning, rose ahead like a landlocked Dubai.

On the morning of 11 August 2010, Angélica Martínez was working in a restaurant in Phoenix when police raided it, searching for undocumented migrants. She was removed to a detention facility outside town and appeared in court in the evening. She raised the money for a bond and was released the following day. In September she was sentenced and spent three weeks in Estrella Women's Jail in Phoenix, under the jurisdiction of the Maricopa County sheriff, going from there into the charge of Immigration and Customs Enforcement (ICE), at a federal detention centre, where she spent another three and a half months. This is normally the prelude to deportation, but Angélica was able to remain by filing a lawsuit whose outcome, when I met her earlier this year, looked uncertain. She has been in the US since 1999: 'I came in a car with my daughter and another family. My son was born here.' She has worked for most of that time in the service sector. It's not clear that the family is a net loss to the state of Arizona, as Russell Pearce's version has it: what Angélica parts with in sales taxes in a year outstrips what she might have paid in income tax, always assuming she was paid off the books, in cash (but millions of working 'illegals' pay tax and social security

contributions). Her children will eventually become able-bodied adults, who can launder the clothes, tend the lawns and flip the burgers of their fellow Arizonans at competitive rates. Angélica's son is a US citizen but his mother has no papers; neither does his sister.

Angélica is typical of the new, urban offender invented by the culture of pursuit and prosecution in cities a good distance from the frontier, where people of different ethnic and national origins, one group with the power to drive legislation, the other with the impertinence to resist, are increasingly at odds. This conflict has been building for a while: Latino activists identify a key moment in 2000, when Arizona passed a law ending bilingual teaching in schools in favour of segregated classes with special English immersion for Spanish-speakers. Opponents of the legislation claimed that immigrant pupils would fumble the curriculum by being streamed away into language learning. Border discipline in the state had already hardened and there was a growing suspicion of Hispanics, who read the law as a deliberate affront. Then, in 2004, the state legislature made it a crime for public service employees to fail to report undocumented migrants and obliged anyone handling social security benefits to verify the legal status of applicants. Raids on workplaces increased and traffic offences soon spiralled into 'illegal alien' cases. Looking back over the legislation, a Hispanic activist in Phoenix told me, people felt they should have seen it coming. Whites, he thought, were better at anticipating trouble: when it was clear that Hispanic children might shortly be a majority in kindergarten and primary schools – they're currently 42 per cent and rising – the threatened majority, already concerned about Hispanics taking too many jobs, had reacted fast. The 2004 legislation, in his eyes, was proof of their alacrity.

In 2008 the Legal Arizona Workers Act increased pressure on companies to hire within the law and check the status of potential employees on E-Verify, a Homeland Security website. More than 90,000 Latinos left the state in the following two years; the number of waged Hispanic employees fell by about 56,000 and the number of 'self-employed' rose by 25,000. The Public Policy Institute of California, which crunched the numbers, argued convincingly that these trends were not driven by recession. But it was legislation in 2010 that felt to Hispanics like a declaration of war. SB1070, as the bill was known, proposed a federal responsibility for local law enforcers, who would now be able to check the papers of anyone they had already stopped for a separate offence, typically a traffic infringement. In essence, the law formalised the growing reality of workplace raids and selective vehicle checks. It made the federal offence of unauthorised immigration into a state crime: Arizona was about to become a stop-and-detain jurisdiction. Like the 'no bilingualism in schools' ruling, SB1070 brought many legal residents and US citizens of Hispanic origin across the stepped divide that normally separates 'legals' and 'illegals' in migrant communities everywhere: it seemed to both to have a punitive, ethnic edge. Migrant rights groups call it 'hate legislation'. The spirit of the law drew fire from Washington and cursory criticism from Obama; the letter of the law met with opposition from the federal courts – and injunctions on several counts. As matters stand, the provision in SB1070 allowing a local police inquiry on a specific offence to evolve into a demand for documents has still not passed into law and in theory there is no mission creep when a migrant is pulled over for running a red light. Local law enforcement sets little store by theory, however, and Arizona has come to be seen as a 'papers please' culture, rolling inexorably towards racial profiling and from there to racism pure and simple: a rogue state at the margins of the Union.

Opponents across the country decided on a boycott, also their riposte in the late 1980s when Arizona baulked at the Martin Luther King holiday. After SB1070, a group of California truckers refused to work in the state, the mayor of San Francisco advised his employees to avoid visiting and by 2011, dozens of valuable conference bookings had been stood down. Money and contracts have been veering away ever since and many businessmen who oppose the laws admit that it's difficult to separate the mounting damage done by the boycott from the lingering effects of the financial crisis in 2008, which dealt a shattering blow to the construction industry, where many Hispanics work. The de facto boycott remained in place, as Latinos continued leaving the state for other parts of the US: many families are still eyeing up the possibility. Others, separated by a deportation, have already opted for upheaval and poverty – reunion in any case – by moving to Mexico (not 'back' to Mexico, because often this is their first journey outside the US). If Angélica's luck runs out, she and her children will have to consider this possibility.

The latest bill, the one Reza had disparaged at the state capitol, is even more incendiary in the eyes of Hispanics, which made it seem odd that this forceful character, often accused of anti-white prejudice by his enemies, hadn't played up the race angle on the steps of the 4th Avenue jail on the night of his release. Most activists and many Latinos are convinced that Arizona is in the grip of race hysteria: an idea hotly denied by Pearce and Governor Brewer. Alfredo Gutiérrez, a radical of Reza's generation who held a state senate seat in Arizona for nearly 15 years, is outspoken about what he takes to be the racial component in this bitter struggle. Gutiérrez argues that 'Arizona is for immigration what Mississippi was for civil rights,' that 'the term "illegal immigration" stands for hatred of Mexicans' and that 'somewhere in this country the immigration debate may be about immigration, but not in Arizona.'

Reza and Gutiérrez both know about the language controversy in schools: as a boy in Texas, Reza says, he was beaten on the hands with a wooden board for speaking Spanish; in Arizona, Gutiérrez had his mouth taped up when he did the same. Both are highly eloquent, doubtless as a consequence, even if their approaches differ. Reza's militancy maps the immigration issue onto old indigenous land claims and cosmologies; I've seen him with conches, incense and totemic spears, summoning indigenous American ancestors in the grounds of the capitol building, before trudging onto the dreary stone concourse to demonstrate against Pearce's laws. Gutiérrez, for his part, isn't sure about the conches and totems – evidence in his eyes that the dubious appeal of faith and origin is on the rise, on one side as on the other. But he's not surprised that the history of the South-West, whether it's a religious nativist interpretation or a long-standing quarrel with 19th-century state formation in continental America, remains a mustering point for Latino activists.

Gutiérrez doesn't dismiss the old arguments out of hand. The fact that the US acquired so much territory administered or claimed by Mexico in the 1840s and 1850s – the whole of modern-day Texas, New Mexico, California, Arizona, Nevada, Utah, parts of Wyoming and Colorado – looms like unfinished business at the back of his conversation. But he is more intent on the recent history of migration. Gutiérrez was born in the US to Mexican parents. His father was deported in the 1930s under Hoover's forced repatriation programme and returned during World War Two to mine copper in Arizona. By then the US had turned away from repatriation and begun drafting in Mexican labour, mostly in agriculture, under the Bracero programme. The scheme would have ended in 1947, had it not been for pressure from US farmers to keep it going. There were still plenty of Mexican labourers in the country in the 1950s, including Gutiérrez Sr, and the processing of newcomers had grown relaxed, to say the least. But if the presence of 'illegals' was useful, it was also unsettling: Operation Wetback, a well-advertised eviction programme that threw roughly a million Mexicans back over the border in 1954, helped to allay the anxiety. People like Gutiérrez take a dim view of US immigration policy on the southern border. First you need us, then you don't. Much that has happened since the 1990s recalls the dark days of Operation Wetback.

Matters look even more troubling to anyone with doubts about the settlement of the US/Mexican frontier in the first place. There are around 31 million people of Mexican origin in the US and by no means all of them cling to a sense of old territorial injustice. In Arizona, however, the sense of a creeping reconquista – a Hispanic recovery of land lost in the course of US expansion – is the stuff of ultra-conservative fantasy. It rarely surfaces in migrant discourse, yet earlier this year, on the steps of the state assembly, a Hispanic fundamentalist shouted at a deputy from the Maricopa sheriff's office that he and his kind – which I took to mean whites – would soon be a minority in the state. And perhaps all the border states? I found myself thinking, as the words took on a bitter, coded resonance: it was systematic settlement by North Americans in the 1820s and 1830s, intended to outnumber Mexicans, that had paved the way to independence for Texas. At this remote edge of the ethnic political imagination, the Union's acquisition of so much land a century and a half ago, by war and purchase, remains a burning issue, despite the solemn ratifications and the money made over to the Mexican exchequer ($245 million in present-day terms for the last purchase, in 1853). Even level heads like Gutiérrez will invoke the territorial history in their defence of immigrants if you push hard enough. Unlawful movement across a frontier generates friction, and so do historic grievances. The border may have been upholstered and fortified since the 1990s, but these quarrels can reduce it to a cordon of frayed rope.

Arguments about freedom of movement are part of the wider controversy over free trade agreements and the benefits of market liberalisation. The 1994 North American Free Trade Agreement comes under a barrage of criticism from migration activists, who believe it has hastened the decline of small and medium-sized agriculture in Mexico that began with the Green Revolution of the 1940s and 1950s. Nafta has pushed campesinos off their land into the cities and forced millions to look for a new life in the US. The battleground is maize. Nafta has spewed subsidised US maize into Mexico, and hammered the price of local maize through the floor. Large, mechanised, low-labour agribusiness has survived but medium-sized farms have laid off their workers, often peasants supplementing subsistence farming with a daily wage. Alternative jobs in manufacturing for which these destitute people were meant to raise a glass have not materialised. In terms of numbers, migration into the US is now comparable to the exodus towards the cities inside Mexico itself. By the late 1990s, more than a million people a year were apprehended trying to cross into the US from Mexico without authorisation – a 40 per cent increase on 1994, when Nafta took effect and Mexico devalued the peso.

A feature of this liberal market emigration to the US is the rising number of indigenous Indians, the custodians of subsistence farming in southern Mexico, who appear to be crossing. Figures are hard to come by, but one sign of the flight from ruin is the presence in the US of Mexicans who barely speak Spanish. (At the Mexican Consulate in Tucson there are speakers of indigenous languages on call.) At the same time, native American groups are firmly opposed to the state immigration laws. The Navajo Nation Council spoke against SB1070 in 2010 and when Senator Pearce's recent, egregious bills were unveiled in committee in February, Albert Hale, a former state senator and president of the Navajo Nation, was quick to observe that his people 'understand immigration from a different perspective': 'We have been subjected to undocumented immigration since day one, since 1492.' The Tohono O'odham, a native Indian people whose 4500 square miles of desert reservation extend to the frontier, also opposed SB1070 on civil and human rights grounds, suspecting it would add racial profiling to their list of woes. The O'odham have never been reconciled to an international frontier that cuts their traditional lands in two. Now they argue that the recent security fixation has funnelled illegal activity their way from Mexico, ravaged the local ecology and seen Homeland Security building over their archaeological sites. Very many undocumented migrants cross via the reservation. Indeed this is where the red dots on the deaths map are mostly thickly clustered. Business in human and drug smuggling is brisk, some of it involving younger O'odham themselves. At the same time it is much harder now for O'odham living in Mexico to cross over and visit relatives, or for those living north of the border to reach sacred sites to the south. As aboriginal voices grow louder, they inject a powerful ingredient into the immigration debate: a sense of the longue durée, shared by all minorities who know they must wait it out. Slowly but surely the argument in Arizona is taking on the character of a New World dispute about who was here first.

Seen from this perspective, every lawmaker in the state capitol is a parvenu, and the main building itself, which was completed in 1901, has an air of callow officiousness. The point Reza and his fellow militants are making by performing ancestral rites on the lawns is clear enough: the historic annexations of Mexican land, the invention of Arizona, the founding of the state legislature, the creation of an international border and then of the category 'illegal' for people crossing it without papers: none of this is authoritative or venerable in their eyes – it is all much too recent and depends, in the last instance, on force rather than tradition.

Perhaps white people can be forgiven for imagining a reconquista by stealth and numbers, aided and abetted by an aboriginal rights renaissance. But if ethnic ideologies are in the air, it's largely in reaction to zealous border security and anti-immigration sentiment in the South-West, Arizona especially. Notwithstanding denials from Pearce and Brewer this sentiment, too, has a nativist undertone, which echoes loudly in the mannered style of law enforcement and incarceration. The sheriff of Maricopa County, Joe Arpaio, an influential eccentric obsessed by border issues (even though Maricopa does not extend to the border), is famous for forcing inmates in his jails to wear pink underwear, introducing pink handcuffs and making his detention facilities as humiliating as possible – Angélica described the food in one of Arpaio's jails as 'dog vomit'. A deportee I met in Mexico recalled several grim days in a county cell with no beds and a floor with raised joists at narrow intervals, making it impossible to lie down. Arpaio has also reintroduced chain gangs and set up an open-air tent city in Phoenix for detainees, apparently at Pearce's suggestion, to minimise

detention costs. All this is bracing and colourful, but Arpaio has run up against the federal courts for violating prisoners' rights and for 'unconstitutional' searches. In a devastating profile for the *New Yorker* in 2009, William Finnegan showed that whatever the sheriff had spared the taxpayer by serving inedible food to inmates, it was nothing beside the millions demanded by the courts as compensation for violent deaths in his custody.

Pearce was once chief deputy sheriff under Arpaio. They have since fallen out, but they still share a propensity to see border security and immigration in terms of America's epic national struggles against al-Qaida, for control of the Middle East and the pacification of Afghanistan. Pearce told me 'the greatest threat to homeland security' was the border and went on to say that 'four of the five conspirators' in the 9/11 hijackings had been stopped by law enforcement in the US and were 'in violation of immigration laws'. In 2003, when Arpaio's prisoners, many of whom were undocumented migrants, complained of the soaring summer temperatures in his tent city, he reminded them that it was '120 degrees in Iraq, and the soldiers are living in tents and they didn't commit any crimes, so shut your mouths.' It's this readiness to envisage the same war on different fronts that has turned Arizona into a militarised desert principality: the adversary is hard to see, but the terrain itself is strewn with roadblocks, barriers, walls, fences, detachments of armed personnel, armoured vehicles, sniffer dogs and vigilantes.

I nearly forgot to add prisons. In December 2009, while Pearce was putting together support for SB1070, he made a presentation in Washington DC at a meeting of the American Legislative Exchange Council (ALEC). ALEC is an influence forum, where state politicians and corporate businessmen mull things over to their mutual advantage. The ALEC taskforce event at which Pearce sketched out his vision of SB1070 was attended by delegates from the Corrections Corporation of America, which runs more than 60 federal, state and city jails in the country. CCA liked Pearce's mission statement and proposed to help him draft his bill: migrant detention looked like the next big expansion for the company. The bill went on to win 36 sponsors in the Arizona statehouse and, according to an investigation by National Public Radio, 30 received donations from companies specialising in 'outsourced correctional services', including MTC, 'a leader in the management and operation of private correctional facilities', and the Geo Group (Geo UK runs Harmondsworth, the largest immigration detention centre in Europe). CCA was also a donor. Arizona has, inter alia, ten state penitentiaries, five federal prisons, five ICE detention centres for immigration offences and eight county jails in Maricopa County alone.

It is hard to say how many people are under lock and key at any one time, but ICE currently has room for about 4000 offenders and, pending massive expansion, it rents inmate space in local jails. A new county jail conveniently situated in Nogales can hold 370 inmates and takes federal detainees, almost all undocumented migrants, at a charge to the US government of $65 per inmate per night. There are 40,000 prisoners in the state's own penitentiaries. The law may be the bottom line for Pearce, but he needs help from the private sector. The detention industry, by happy contrast, depends on the law as the unique market for its expertise, and is the perfect partner for Pearce. Here, the analogy with distant wars holds up: similar relationships existed in Iraq between the US government and companies like Halliburton or KBR, which made a tidy profit out of the invasion.

The difficulty for Pearce and his followers, and for Governor Brewer, is to convince opponents in the rest of the country that they are not racists, even though their legislation splits the community in Arizona along racial lines; or white supremacists, even though they have extremist ethnic supporters. The tide has run in their favour. They have come up against the federal courts but, more important, they have sounded a note of defiance to federal government: if it cannot enforce its immigration policy, it should mind its manners when states take matters into their own hands. This approach has served the politicians well, even though their complaints about Washington's indifference are largely posturing: Arizona is a net beneficiary of federal largesse, propped up by Obama's 2009 recovery programme to the tune of half the state's annual budget. The Obama administration has, in addition, put billions of dollars into border security, detention and deportation, some of it going direct to border states, including Arizona, for rental prison space.

Brewer and Pearce have gambled on SB1070 becoming a contagious piece of legislation and this, too, has paid off. By the end of last year at least 16 state legislatures had introduced similar bills. Laws in Georgia have been countered by federal injunction but Arizona has ceded first place for 'rogue state' to Alabama, where an even more drastic version of SB1070 was upheld, on key points, by the federal courts last month. The Obama administration has gone to appeal, but the bleak intransigence of Arizona's lawmakers is already a model for conservatives across the country.

More encouraging still, for Brewer and Pearce, is the unmistakable convergence between Arizona's rawhide approach and the humming policy machinery in Washington. Take Homeland Security's Secure Communities programme, road-tested under Bush and implemented by Obama. S-Comm depends on many of the strategies pioneered in Arizona: overlapping state and federal law enforcement, fingerprint-sharing between the two – the 'integrated biometric database' – and the escalation of parking violations into evictions. It is essentially a deportation mechanism, which attempts with mixed success to target undocumented migrants involved in serious crime. In the first five months of 2011, around 30,000 people were deported under S-Comm, some 25 per cent charged with serious crimes and 32 per cent with immigration violations only. The Obama administration is in a mess over S-Comm. Illinois, New York and Massachusetts are trying to withdraw, arguing that the programme undermines trust between local police and immigrant communities, but the administration insisted in August that no state can opt out. At the same time Homeland Security announced that 300,000 planned deportations – of unauthorised migrants, already detained, but with no criminal record – would be put on hold, as a result of intense pressure from Hispanic communities. It seems at first hearing as though immigration is forcing Obama to dance to two tunes, as the band in Arizona plays for all it's worth. But what if they were merely variations on a theme? Obama has presided over roughly a million deportations since the beginning of 2009, a greater number than Bush in any comparable period and perhaps a record for any US president: no one knows for sure how many Mexicans were thrown out during Operation Wetback. One million is yet another figure to keep in mind, when the time comes to look back on the Obama legacy.

Pearce's astonishing tenure is lately under attack: there are efforts to oust him from office before term, in a recall voting procedure based on a citizens' petition. He and his followers understand that in the long term the demography will turn against ethnic ultra-conservatism, but the short term has been compelling. Pearce always accused his political opponents of seeking 'cheap votes' as well as 'cheap labour', even though he remained in the ascendant by playing up the threat of lawless brown people at a time when figures for illegal entry were plummeting. Had he counted in the dead, who'd fallen prey to the desert? Were fresh cohorts of spectral Mexicans gliding through the cactus in terrifying numbers, whispering to the living who trudged beside them? In any case, Pearce's vision worked with the voters of Arizona, where many Latinos who might have fought back are not on the electoral register, while 58 per cent of the state's population is white non-Hispanic. Since 2008, Arizona has risen to second place in the list of states with the most poverty – Mississippi is still ahead – but it remains a retirement haven for elderly, prosperous whites who vote with their putters. White nativism may not have time on its side, but it's had money and power to be going on with.

Not long after Senator Pearce had given me the time of day, I went back into Mexico and met up with Father Pete, a Jesuit priest from Douglas, Az., who was on a visit to a feeding centre for deportees. There were scores of newly deported and a handful of hangers-on, eating at long tables in a breeze-block building with a kitchen to the side. Grace was said before beans and tortillas. A plausible ne'er-do-well, in his forties, told me he'd been raised as a child in California, lived in the US ever since, and been deported a few days earlier. He'd been arrested on suspicion of a minor felony and his papers were out of order. His name was Moisés. He was trying to get back to the US, but the Red Sea wouldn't part for him. He saw it clearly now, he was a fugitive. Yet the real disaster, he went on, was that he'd been blissfully unaware of the fact for years. He was broke, clean-shaven and well turned out, even though, like many deportees who fetched up for a plate of food that afternoon, he was sleeping rough – in a nearby cemetery. Others had crossed once, twice, several times, and been turfed back over the border. A Guatemalan man and his wife were peeling potatoes for the next day's wave of deportees. We struck up a conversation and they rehearsed their harrowing journey through Mexico, a long story, and before it was done, Father Pete had tapped me on the shoulder: it was dusk and time to head back to the United States. The husband apologised. It turned out he'd only taken us as far as his first

attempt at the border, a year or more ago. On that occasion, they'd been caught, jailed and flown back to Guatemala City by the federal authorities. So where were we now? I asked in haste. They had just failed on their second bid, two days earlier, but at least they weren't back at square one. They aimed to try again within the month. The man was small and rugged; in Guatemala City he'd worked in construction. His wife was smaller still and about as rugged as it gets. The Sonoran Desert, and arrest and detention in the US, were nothing beside the dangers they'd faced on their first trip through Mexico. Father Pete gave them his high pastoral fives and the couple went back to their work.

The consensus is that about 11 million undocumented migrants are living in the US. Bear Stearns took a punt, a few years before its demise, and put the figure at 20 million: somewhere, in any case, between 3 and 7 per cent of the population. One answer to this is an amnesty package, which would legalise their presence and offer them the possibility of citizenship later on. Reagan signed an amnesty bill in 1986, when four to six million people were living unlawfully in the US, many from Central America, whose asylum claims would have contradicted Washington's stated objectives in the region. Since then, the figure has risen again and a new act is overdue, yet in recent years four Comprehensive Immigration Reform bills have been introduced and failed, despite powerful backing (John McCain, Bush Jr, Edward Kennedy). During his presidential campaign, Obama spoke in favour of reform – he spoke in favour of many things – but it's since become clear that he is a border security politician by default, and a reformer on the hustings only.

The pressures of inward migration to wealthy parts of the developed world since the 1970s suggest that amnesty programmes, introduced from time to time, or even triggered when figures rise beyond an agreed level, are a sensible way to manage liberal societies with high numbers of undocumented migrants. No responsible state wants unentitled people hidden in the creases of the wider social fabric. The legislation that has stalled in Congress since 2005 would have made what happened to Oscar and Ricardo, the two young men in Nogales, impossible. It would have raised tax revenues. It might well have reduced the jet black areas of the grey economy, where undocumented migrants find themselves trafficked into lives of semi-slavery. It might also have allowed wages among the poorest paid US citizens – invariably African-American – to hold up better than they have. These would be real achievements and the idea of comprehensive immigration reform has not gone away. There are proposals for a new bill and powerful voices in its favour, including that of Michael Bloomberg's Partnership for a New American Economy – a partnership with Rupert Murdoch, among others.

Almost every high-profile proponent of amnesty, including Bloomberg and Murdoch, endorses a fortress approach to illegal immigration (the phrase is normally 'secure our borders'). The rugged right don't believe what they're hearing: to them it is a hollow quid pro quo from people whose real intention is to create millions of new Americans: Pearce described it as 'hypocrisy', though no partner for a new American economy loses sleep over poverty in Latin America. Bloomberg et al want to 'attract and keep the best, the brightest and the hardest working': they acknowledge a need for low-wage service personnel and hardy seasonal labour, in the bracero tradition, but the emphasis still falls on skilled, well-educated migrants. That leaves many rural poor, dispersed by their government's economic programmes and battered by free trade agreements, waiting on the wrong side of the threshold, along with growing numbers of unemployed in cities near the border: in Ciudad Juárez, once a Nafta showcase, now ravaged by guns and drugs, unemployment is running at around 20 per cent.

The advantages of market liberalisation have been slow to migrate away from wealthier countries, while the battered ideal of the free market, like the battered ideal of Communism, has brought ruin on smallholders, as collectivisation did, and offered little in return. It continues to promise Mexicans everything if only they would renew their faith in the doctrine. In Mexico, where the World Bank estimates that more than 40 per cent of the population live in poverty, people have been clinging on since the convulsive market reforms of the 1980s. In the orthodox model, goods, services and capital must enjoy full freedom of movement, while economic justice remains a sovereign affair, subject, just as human beings are, to the law of the frontier. This anomaly, framed by border security, drives millions of Latinos north to redress it themselves, and accounts for

the fact that the migrant remittance, at roughly $25 billion a year, is now Mexico's second highest source of external income. Depriving lower wage-earners of the opportunity to send money back to their families at home compounds their poverty and ensures continued pressure on the border.

Migration out of Mexico may well become the war that Homeland Security has anticipated. The phenomenology of the US/Mexico frontier is martial: a vast, straggling set of defences, edified at extraordinary cost, where America's sense that it is under siege can be properly enacted. To believe in this story, you have to imagine that the miserable encampment in Nogales where I found Oscar and Ricardo is really the tent of Achilles. But if you do, you must also accept that the Trojans have something they should negotiate. Whites in Arizona don't: in their parochial version of the tale, tens of thousands of undocumented Mexicans are infiltrating every year into territory that once belonged to Mexico. And if they peer over the edge of the border debate, at an epic in which human movement is not just the pursuit of a better life but a competitive struggle for food, energy and water, their worries seem doubly justified. Many white nativist websites assert, correctly, that population increase in Arizona will be hard to sustain; few admit that the frontier is an artificial line across interlocking ecosystems, under pressure from top-heavy consumer lifestyles to the north and a congestion of poverty in the south. The result is a twilight world of flight, seclusion and incarceration, with Hispanics eager to leave the state for other parts of the US. Those who remain lapse into self-employment lite, staying at home when they can, reluctant even to pick up a set of car keys. The less fortunate are hauled into custody, to service the rituals of authority and humiliation, which Sheriff Arpaio means to perfect by putting his prisoners to work on the building of more prison space for more prisoners, the great majority undocumented migrants.

Most weekdays you can see the same rituals performed in the federal court house in Tucson, as new detainees apprehended near the border, anything from 50 upwards at a single hearing, are sentenced under a programme that whisks them through a shorthand criminal procedure and off to deportation, or a jail term ending in deportation. Enthusiasts claim that Operation Streamline is bringing down the number of unauthorised crossings. Numbers happen to be falling, but Streamline is only one of several factors in play. The price of this courtroom spectacle is exorbitant. Where else in the world does a court resound with the noise of rattling chains, as prisoners, shackled at the feet and handcuffed, sit in rows – women in one area, men in another – and stir from time to time, waiting to be called before the bench in groups of seven, where they make their way like hobbled animals, have their names read to them, are asked if they understand their rights, and then enter a guilty plea? Sentences are handed down at breakneck speed, some as low as 30 days, others as high as 180, all followed by deportation. As one batch nods a cursory thanks to their lawyers and US marshals lead them away, another seven shuffle forward to the bench. Many still have the dust of a failed crossing on their clothes. They might be prisoners taken on the field of battle.

'It's not pretty, is it?' the judge asked when we met a few minutes after one such hearing. He reckoned that in his court, Streamline costs $50,000 a week in attorneys' fees alone. When he added Streamline and the other fast-track judicial procedures together, the best outcome he could see was about 8000 deportations a month. 'Ask yourself if that makes a difference,' he said, pulling the wrapper from a nicotine substitute. Anyone can research the correct answer. There are already 500,000 undocumented Hispanic residents in Arizona alone. In 2010, along the length of the frontier with Mexico, Border Patrol caught more than 400,000 people trying to enter without authorisation. Perhaps its three-for-one estimate is an exaggeration, but we can safely assume that a good many people slipped across a frontier which has never articulated north and south to the satisfaction of either party. Why should it do so now? Unfair, leaky immigration systems, the kind we have learned to live with, express this contradiction even as they struggle to manage it. But what is it that's expressed by the radical wish to exclude, imprison and deport? And what kind of management is that?

http://www.lrb.co.uk/v33/n20/jeremy-harding/the-deaths-map

Treasures of Islamic Manuscript Painting from the Morgan
October 21, 2011, through January 29, 2012

A Young Lady Reclining After a Bath
Leaf from the Read Persian Album
Herat (Afghanistan), 1590s
By Muhammad Mu'min
MS M.386.5. Purchased by Pierpont Morgan, 1911
It may come as a surprise that in addition to its acclaimed collection of medieval and Renaissance illuminated manuscripts, the Morgan is also home to important Islamic manuscripts dating from the late middle ages to the nineteenth century. *Treasures of Islamic Manuscript Painting from the Morgan* marks the first time the Morgan has gathered these spectacular volumes together in a single exhibition.

On view are such treasures as a thirteenth-century treatise on animals and their uses that is regarded by some experts as one of the greatest of all Islamic manuscripts, single illuminated pages, Qur'ans, and an illustrated treatise on astrology, wonders of the world, demonology, and divination.

A rare, illustrated translation of the life of Rumi, the celebrated Persian poet and mystic, reveals the special place of poetry in Persian culture. Also presented are six illustrated manuscripts of Nizami's *Khamsa* ("The Quintet"), which include depictions of the legendary tales of ill-fated lovers Laila and Majnun, the Persian Romeo and Juliet, as well as Iskander (Alexander the Great), and Bahram Gur and the Seven Princesses.

The centrality of the Qur'an to Islamic life is represented by a large mosque Qur'an that takes center stage at the beginning of the exhibition. The earliest Qur'ans—beautifully handwritten on vellum and in oblong format—are shown, along with later Qur'ans—on paper and in vertical format.

Treasures of Islamic Manuscript Painting from the Morgan is organized by William Voelkle, curator and head of the Department of Medieval and Renaissance Manuscripts.

http://www.themorgan.org/exhibitions/exhibition.asp?id=50

Putin's Rasputin

Peter Pomerantsev

The next act of Russian history is about to begin: Putin and Medvedev will pop off-stage into the Moscow green room, switch costumes, and re-emerge to play each other's roles. Putin as president, again, Medvedev as PM. It's the apotheosis of what has become known as 'managed democracy', and the ultimate triumph of the show's writer-director, Putin's chief ideologue and grey cardinal, Vladislav Surkov, the 'Kremlin demiurge'. Known also as the 'puppetmaster who privatised the Russian political system', Surkov is the real genius of the Putin era. Understand him and you understand not only contemporary Russia but a new type of power politics, a breed of authoritarianism far subtler than the 20th-century strains.

There is something cherubic in Surkov's soft, smooth face, something demonic in his stare. He trained as a theatre director then became a PR man; now his official role is 'vice-head of the presidential administration', but his influence over Russian politics is unsurpassed. He is the man behind the concept of 'sovereign democracy', in which democratic institutions are maintained without any democratic freedoms, the man who has turned television into a kitsch Putin-worshipping propaganda machine and launched pro-Kremlin youth groups happy to compare themselves to the Hitler Youth, to beat up foreigners and opposition journalists, and burn 'unpatriotic' books on Red Square. But this is only half the story.

In his spare time Surkov writes essays on conceptual art and lyrics for rock groups. He's an aficionado of gangsta rap: there's a picture of Tupac on his desk, next to the picture of Putin. And he is the alleged author of a bestselling novel, *Almost Zero*. 'Alleged' because the novel was published (in 2009) under the pseudonym Natan Dubovitsky – Surkov's wife is called Natalya Dubovitskaya. Officially Surkov is the author of the preface, where he denies being the author of the novel, then makes a point of contradicting himself: 'The author of this novel is an unoriginal Hamlet-obsessed hack'; later, 'this is the best book I have ever read.' In interviews he has come close to admitting to being the author while always pulling back from a complete confession. Whether or not he actually wrote every word of it he has gone out of his way to associate himself with it.

The novel is a satire of contemporary Russia whose hero, Egor, is a corrupt PR man happy to serve anyone who'll pay the rent. A former publisher of avant-garde poetry, he now buys texts from impoverished underground writers, then sells the rights to rich bureaucrats and gangsters with artistic ambitions who publish them under their own names. The world of PR and publishing as portrayed in the novel is extremely dangerous. Publishing houses have their own gangs, whose members shoot each other over the rights to Nabokov and Pushkin, and the secret services infiltrate them for their own murky ends. It's exactly the sort of book Surkov's youth groups burn on Red Square.

Born in provincial Russia to a single mother, Egor grows up as a bookish hipster disenchanted with the late Soviet Union's sham ideology. In the 1980s he moves to Moscow to hang out on the fringes of the bohemian set; in the 1990s he becomes a PR guru. It's a background that has a lot in common with Surkov's, the details of which were barely known until an article in *Novoye Vremya* earlier this year set the record straight. He was born in 1964, the son of a Russian mother and a Chechen father who left when Surkov was still a young child. Former schoolmates remember him as someone who made fun of the teacher's pets in the Komsomol, wore velvet trousers, had long hair like Pink Floyd, wrote poetry, was a hit with the girls. He was a straight-A student whose essays on literature were read aloud by teachers in the staff room: it wasn't only in his own eyes that he was too smart to believe in the social and political set-up around him.

In the 1980s and early 1990s Russia was experimenting with different modes at a dizzying rate: Soviet stagnation led to perestroika, which led to the collapse of the Soviet Union, liberal euphoria, then economic disaster. How to believe in anything when everything around you is changing so fast? Surkov abandoned a range of university careers from metallurgy to theatre directing, put in a spell in the army, went to bohemian parties, had regular violent altercations (he was expelled from drama school for fighting). Surkov, it said (or allegedly said) in one of the US diplomatic cables released by WikiLeaks, had always thought of himself as an unrecognised genius, but it took him a while to find his metier.

He trained at a martial arts club with Mikhail Khodorkovsky, then one of Russia's emerging young business stars. Khodorkovsky took him on as a bodyguard, saw he had more use for his brains than his muscles and promoted him to PR manager. He became known for his ability not only to think up ingenious PR campaigns but to manipulate others into getting them distributed in the major media with a mixture of charm, aggression and bribery. 'Surkov acts like a Chekist of the 1920s and 1930s,' Dmitry Oreshkin, a political analyst, said. 'He can always sniff out your weak spot.' Top jobs followed at banks and TV channels. In 1999 he was invited to join Yeltsin's presidential administration. Looking more like a designer than a bureaucrat, he stood out from the rest. He was one of the key spin doctors behind the promotion of Putin for president in 2000. Since then, while many of his colleagues have fallen from grace, Surkov has managed to stay in the game by remaking himself to suit his masters' needs. 'Slava is a vessel,' according to Boris Nemtsov, a prominent opposition politician: 'Under Yeltsin he was a democrat, under Putin he's an autocrat.'

At one point he began to fear that success would be his undoing: there was speculation that he had presidential ambitions, a dangerous rumour, especially in political circles, and he immediately leaked the fact of his Chechen father, which he had previously kept secret, in order to rule himself out of higher office, or so it's said. It was his way of saying 'I know my place.' One of his former bosses described him as 'a closed person, with many demons. He is never on the level with people. He needs to be either above or, if need be, below: either the boss or the slave.'

The most interesting parts of *Almost Zero* come when the author moves away from social satire to the inner world of his protagonist. Egor is described as a 'vulgar Hamlet' who can see through the superficiality of his age, but is unable to have any real feelings for anyone or anything: 'His self was locked in a nutshell … outside were his shadows, dolls. He saw himself as almost autistic, imitating contact with the outside world, talking to others in false voices to fish out whatever he needed from the Moscow squall: books, sex, money, food, power and other useful things.' The novel refers to Hamlet over and over again – even though Prospero might have been more apt – while the main protagonists are compared to the Players, 'prepared to perform pastoral, tragedy or something in between'. The novelist Eduard Limonov describes Surkov himself as having 'turned Russia into a wonderful postmodernist theatre, where he experiments with old and new political models'. There's something in this. In contemporary Russia, unlike the old USSR or present-day North Korea, the stage is constantly changing: the country is a dictatorship in the morning, a democracy at lunch, an oligarchy by suppertime, while, backstage, oil companies are expropriated, journalists killed, billions siphoned away. Surkov is at the centre of the show, sponsoring nationalist skinheads one moment, backing human rights groups the next. It's a strategy of power based on keeping any opposition there may be constantly confused, a ceaseless shape-shifting that is unstoppable because it's indefinable.

This fusion of despotism and postmodernism, in which no truth is certain, is reflected in the craze among the Russian elite for neuro-linguistic programming and Eriksonian hypnosis: types of subliminal manipulation based largely on confusing your opponent, first developed in the US in the 1960s. There are countless NLP and Eriksonian training centres in Moscow, with every wannabe power-wielder shelling out thousands of dollars to learn how to be the next master manipulator. Newly translated postmodernist texts give philosophical weight to the Surkovian power model. François Lyotard, the French theoretician of postmodernism, began to be translated in Russia only towards the end of the 1990s, at exactly the time Surkov joined the government. The author of *Almost Zero* loves to invoke such Lyotardian concepts as the breakdown of grand cultural narratives and the fragmentation of truth: ideas that still sound quite fresh in Russia. One blogger has noted that 'the number of references to Derrida in political discourse is growing beyond all reasonable bounds. At a recent conference the Duma deputy Ivanov quoted Derrida three times and Lacan twice.' In an echo of socialism's fate in the early 20th century, Russia has adopted a fashionable, supposedly liberational Western intellectual movement and transformed it into an instrument of oppression.

In Soviet times a functionary would at least nominally pretend to believe in Communism; now the head of one of Russia's main TV channels, Vladimir Kulistikov, who used to be employed by Radio Free Europe, proudly announces that he 'can work with any power I'm told to work with'. As long as you have shown loyalty when it counts, you are free to do anything you like after hours. Thus Moscow's top gallery-owner advises the Kremlin on propaganda at the same time as exhibiting anti-Kremlin work in his gallery; the most fashionable film director makes a blockbuster satirising the Putin regime while joining Putin's party; Surkov writes a novel about the corruption of the system and rock lyrics denouncing Putin's regime – lyrics that would have had him arrested in previous times.

In Soviet Russia you would have been forced to give up any notion of artistic freedom if you wanted a slice of the pie. In today's Russia, if you're talented and clever, you can have both. This makes for a unique fusion of primitive feudal poses and arch, postmodern irony. A property ad displayed all over central Moscow earlier this year captured the mood perfectly. Got up in the style of a Nazi poster, it showed two Germanic-looking youths against a glorious alpine mountain over the slogan 'Life Is Getting Better'. It would be wrong to say the ad is humorous, but it's not quite serious either. It's sort of both. It's saying this is the society we live in (a dictatorship), but we're just playing at it (we can make jokes about it), but playing in a serious way (we're making money playing it and won't let anyone subvert its rules). A few months ago there was a huge 'Putin party' at Moscow's most glamorous club. Strippers writhed around poles chanting: 'I want you, prime minister.' It's the same logic. The sucking-up to the master is completely genuine, but as we're all liberated 21st-century people who enjoy Coen brothers films, we'll do our sucking up with an ironic grin while acknowledging that if we were ever to cross you we would quite quickly be dead.

This is the world Surkov has created, a world of masks and poses, colourful but empty, with little at its core but power for power's sake and the accumulation of vast wealth. The country lives by the former wannabe theatre director's script. Surkov's victory appears total. But it isn't, quite. *Almost Zero* isn't the only recent bestseller written by a member of the country's political and economic elite. In January, his old friend Khodorkovsky, the jailed oil tycoon turned prominent political dissident, published a collection of his essays and interviews. Surkov and Khodorkovsky have a complicated personal history. Khodorkovsky, it's said, never completely trusted Surkov, so when the young PR manager asked to become a full partner in his oil and banking company Khodorkovsky refused. The two fell out, and many argue that their mutual enmity was a factor in Khodorkovsky's imprisonment. Now their two books represent the intellectual axis dividing Russia. Khodorkovsky's essays deal mainly with his thoughts about the country's political future. He's become a social democrat during his time in prison, and denounces the rapacious capitalism that allowed him to make his fortune. His ideas aren't original: what is striking is the book's tone – calm, dignified, measured. Khodorkovsky neither attacks his jailers nor bends his knee to them, but bending his knee is what he is supposed to do.[*]

As far as the Kremlin is concerned, the ideal scenario, the one most of the other oligarchs have followed, would be for Khodorkovsky to break, beg for mercy, sign a fake confession: the old KGB strategy. He refuses to do any of this, which has made him a rallying figure for liberals. Nobody thinks he was purer in heart than any of the other billionaires of the 1990s, but his behaviour now, in the context of Surkovian conformism, is impressive. The recent trial that sentenced him to a further six years in prison saw him accused of somehow stealing his own company's oil. On top of that, the judge announced in his closing statement that two former ministers who had given evidence supporting Khodorkovsky had actually given evidence against him. Black was turned to white, white to black. The very absurdity was the point: the Kremlin was saying it had complete control over reality and that whatever it said, however ridiculous, was the truth.

Since the Khodorkovsky trial there have been a few unexpected whelps of protest from formerly loyal subjects. First a glamorous ballerina, not known for her political bravery, resigned from the party Surkov created when her signature was included on a public document denouncing Khodorkovsky. Then the press officer at the court where Khodorkovsky was sentenced tearfully admitted that the judge had been forced to read a closing statement prepared by the Kremlin. Most recently, Mikhail Prokhorov, most famous of the as yet unjailed oligarchs, denounced Surkov as a 'puppetmaster', since when Prokhorov has been stripped of his membership of the President's Commission for Modernisation. The photograph of Khodorkovsky staring out from behind prison bars on the cover of his *Collected Essays* has changed its meaning. When he was arrested in 2003 it was this image that announced Putin's pre-eminence, taming the powerful oligarchs overnight. 'You're only a photograph away from the cover of *Forbes* to a jail cell,' the picture said, and it would have been Surkov's business to make sure the image was distributed as widely as possible. Eight years later, Khodorkovsky is still behind bars, but the image now says something more like: 'While I am behind bars, then all of Russia is a prison.'

In a neat instance of calling black white, the Surkov-controlled media refer to liberal supporters of Khodorkovsky as the 'demoshiza' (short for 'democratic schizophrenics'), when it is the Surkovian ideology that is, in the vulgar sense, schizophrenic: it's Khodorkovsky's supporters who demand consistency. The 'demoshiza' tag also serves a useful purpose in conflating 'democracy' with 'mental illness'. The word 'democratic' has an unhappy status in Russia: it is mainly used as an uncomplimentary synonym for 'cheap' and 'low-grade': McDonald's has 'democratic' prices, the door policy at a particularly scuzzy club can be described as 'democratic' – i.e. they let anybody in. A few restaurants are proud of their 'democratic' tags: run by the children of former Soviet dissidents, they are places where the town's liberal artists, filmmakers, journalists and other 'demoshiza' smoke, drink, eat and prance all night.

I found myself in one of them late one night, having finally, after a month of phone calls, begging, blackmailing and pleading, managed to get a ticket to see the theatre version of *Almost Zero*, the most exclusive play this deeply theatrical city has ever seen. Official tickets started at $500. Black market tickets were going for four figures. The final price? Two bottles of champagne and the opportunity for one of the theatre's leading actresses to use my parents' London home rent-free. It turned out that the fee wasn't even worth a proper seat. The ushers let me in after the lights were dimmed. They gave me a cushion and told me to sit on the floor by the front row. My head spent the night knocking against the perfumed thigh of an impossibly perfect model, her brutal-looking husband seeming none too pleased. The audience was full of these types: the hard, clever men who rule the country and their stunning female satellites. You don't usually find them at the theatre but they were there because it was the thing to do: if they ever bumped into Surkov they could tell him how much they liked his fascinating piece. The other half of the audience were the city's artistic leaders: impresarios, directors, actors. They had a similar reason to be present: Surkov is famous for giving grants to theatres and festivals. It wouldn't do not to have seen the play.

'I would never go to something like that,' a well-known journalist told me in the 'democratic' bar. 'I wouldn't want to touch anything Surkov is part of. And what about that shit Serebrennikov? Who'd have thought he'd sink to something so low? Sucking up to the Kremlin that way.' Serebrennikov is the play's director. He is famous for staging scandalous, subversive pieces and for always wearing sunglasses. Many think him a

genius. His collaboration with Surkov is the equivalent of Brecht putting on a play by Goebbels. There are those in Moscow who will never forgive such a partnership. But Serebrennikov has found a crafty way through this most delicate situation. His staging of *Almost Zero* has transformed the novel. His Egor is a Faustian hero who has sold his soul to the devil but now wants it back. His shiny, empty life, with its parties, easy sex and casual humiliations, is a living hell. This Egor is emotional and wracked with self-loathing, quite the opposite of the cold hero of the novel. In passages that were added in, Serebrennikov's actors talk straight at the audience, accusing it of being at ease in a world of nepotism, corruption and violence. The bohemians in the audience laughed uncomfortably. The hard men and their satellites stared ahead unblinking, as if these provocations had nothing to do with them. Many left at the interval. Thus the great director pulled off a feat entirely worthy of the Age of Surkov: he pleased his political masters – Surkov sponsors an arts festival that Serebrennikov runs – while preserving his liberal integrity. One foot in Surkov's camp, the other in Khodorkovsky's. A fine performance.

'Life in Russia,' the journalist told me in the democratic bar, 'has got better but leaves a shitty aftertaste.' We had a drink. 'Have you noticed that Surkov never seems to get older? His face has no wrinkles.' We had more drinks. We talked about Surkov's obsession with *Hamlet*. My companion recalled an interpretation of the play suggested by a literature professor turned rock producer (a very Moscow trajectory).

'Who's the central figure in *Hamlet*?' she asked. 'Who's the demiurge manipulating the whole situation?'

I said I didn't know.

'It's Fortinbras, the crown prince of Norway, who takes over Denmark at the end. Horatio and the visiting players are in his employ: their mission is to tip Hamlet over the edge and foment conflict in Elsinore. Look at the play again. Hamlet's father killed Fortinbras's father, he has every motive for revenge. We know Hamlet's father was a bad king, we're told both Horatio and the players have been away for years: essentially they left to get away from Hamlet the father. Could they have been with Fortinbras in Norway? At the end of the play Horatio talks to Fortinbras like a spy delivering his end-of-mission report. Knowing young Hamlet's unstable nature they hired the players to provoke him into a series of actions that will bring down Elsinore's rulers. This is why everyone can see the ghost at the start. Then when only Hamlet sees him later he is hallucinating. To Muscovites it's obvious. We're so much closer to Shakespeare's world here.' On the map of civilisation, Moscow – with its cloak and dagger politics (designer cloak, diamond-studded dagger), its poisoned spies, baron-bureaucrats and exiled oligarchs who plan revolutions from abroad, its Cecil-Surkovs whispering into the ears of power, its Raleigh-Khodorkovskys imprisoned in the Tower – is somewhere near Elsinore.

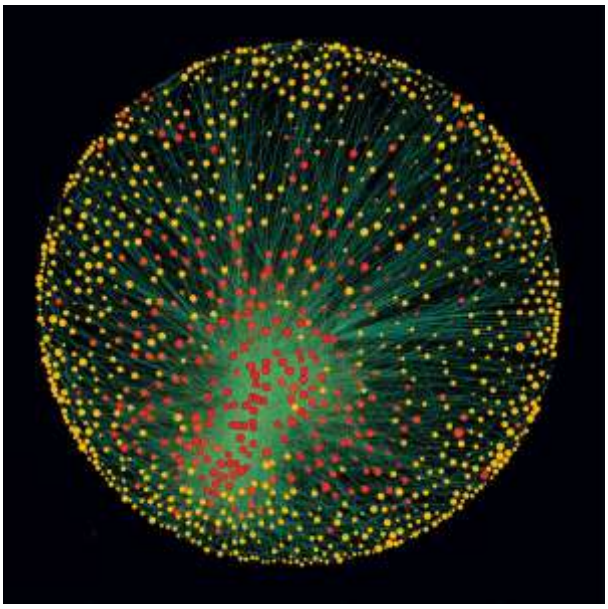
[*] Keith Gessen wrote about Khodorkovsky in the *LRB* of 25 February 2010.

http://www.lrb.co.uk/v33/n20/peter-pomerantsev/putins-rasputin

Revealed – the capitalist network that runs the world

- 19 October 2011 by **Andy Coghlan** and **Debora MacKenzie**

Magazine issue 2835.



The 1318 transnational corporations that form the core of the economy. Superconnected companies are red, very connected companies are yellow. The size of the dot represents revenue *(Image:* PLoS One*)*

AS PROTESTS against financial power sweep the world this week, science may have confirmed the protesters' worst fears. An analysis of the relationships between 43,000 transnational corporations has identified a relatively small group of companies, mainly banks, with disproportionate power over the global economy.

The study's assumptions have attracted some criticism, but complex systems analysts contacted by *New Scientist* say it is a unique effort to untangle control in the global economy. Pushing the analysis further, they say, could help to identify ways of making global capitalism more stable.

The idea that a few bankers control a large chunk of the global economy might not seem like news to New York's Occupy Wall Street movement and protesters elsewhere (see photo). But the study, by a trio of complex systems theorists at the Swiss Federal Institute of Technology in Zurich, is the first to go beyond ideology to empirically identify such a network of power. It combines the mathematics long used to model natural systems with comprehensive corporate data to map ownership among the world's transnational corporations (TNCs).

"Reality is so complex, we must move away from dogma, whether it's conspiracy theories or free-market," says James Glattfelder. "Our analysis is reality-based."

Previous studies have found that a few TNCs own large chunks of the world's economy, but they included only a limited number of companies and omitted indirect ownerships, so could not say how this affected the global economy - whether it made it more or less stable, for instance.

The Zurich team can. From Orbis 2007, a database listing 37 million companies and investors worldwide, they pulled out all 43,060 TNCs and the share ownerships linking them. Then they constructed a model of which companies controlled others through shareholding networks, coupled with each company's operating revenues, to map the structure of economic power.

The work, to be published in *PloS One*, revealed a core of 1318 companies with interlocking ownerships (see image). Each of the 1318 had ties to two or more other companies, and on average they were connected to 20. What's more, although they represented 20 per cent of global operating revenues, the 1318 appeared to collectively own through their shares the majority of the world's large blue chip and manufacturing firms - the "real" economy - representing a further 60 per cent of global revenues.

When the team further untangled the web of ownership, it found much of it tracked back to a "super-entity" of 147 even more tightly knit companies - all of their ownership was held by other members of the super-entity - that controlled 40 per cent of the total wealth in the network. "In effect, less than 1 per cent of the companies were able to control 40 per cent of the entire network," says Glattfelder. Most were financial institutions. The top 20 included Barclays Bank, JPMorgan Chase & Co, and The Goldman Sachs Group.

John Driffill of the University of London, a macroeconomics expert, says the value of the analysis is not just to see if a small number of people controls the global economy, but rather its insights into economic stability.

Concentration of power is not good or bad in itself, says the Zurich team, but the core's tight interconnections could be. As the world learned in 2008, such networks are unstable. "If one [company] suffers distress," says Glattfelder, "this propagates."

"It's disconcerting to see how connected things really are," agrees George Sugihara of the Scripps Institution of Oceanography in La Jolla, California, a complex systems expert who has advised Deutsche Bank.

Yaneer Bar-Yam, head of the New England Complex Systems Institute (NECSI), warns that the analysis assumes ownership equates to control, which is not always true. Most company shares are held by fund managers who may or may not control what the companies they part-own actually do. The impact of this on the system's behaviour, he says, requires more analysis.

Crucially, by identifying the architecture of global economic power, the analysis could help make it more stable. By finding the vulnerable aspects of the system, economists can suggest measures to prevent future collapses spreading through the entire economy. Glattfelder says we may need global anti-trust rules, which now exist only at national level, to limit over-connection among TNCs. Bar-Yam says the analysis suggests one possible solution: firms should be taxed for excess interconnectivity to discourage this risk.

One thing won't chime with some of the protesters' claims: the super-entity is unlikely to be the intentional result of a conspiracy to rule the world. "Such structures are common in nature," says Sugihara.

Newcomers to any network connect preferentially to highly connected members. TNCs buy shares in each other for business reasons, not for world domination. If connectedness clusters, so does wealth, says Dan Braha of NECSI: in similar models, money flows towards the most highly connected members. The Zurich study, says Sugihara, "is strong evidence that simple rules governing TNCs give rise spontaneously to highly connected groups". Or as Braha puts it: "The Occupy Wall Street claim that 1 per cent of people have most of the wealth reflects a logical phase of the self-organising economy."

So, the super-entity may not result from conspiracy. The real question, says the Zurich team, is whether it can exert concerted political power. Driffill feels 147 is too many to sustain collusion. Braha suspects they will

compete in the market but act together on common interests. Resisting changes to the network structure may be one such common interest.

The top 50 of the 147 superconnected companies

1. Barclays plc
2. Capital Group Companies Inc
3. FMR Corporation
4. AXA
5. State Street Corporation
6. JP Morgan Chase & Co
7. Legal & General Group plc
8. Vanguard Group Inc
9. UBS AG
10. Merrill Lynch & Co Inc
11. Wellington Management Co LLP
12. Deutsche Bank AG
13. Franklin Resources Inc
14. Credit Suisse Group
15. Walton Enterprises LLC
16. Bank of New York Mellon Corp
17. Natixis
18. Goldman Sachs Group Inc
19. T Rowe Price Group Inc
20. Legg Mason Inc
21. Morgan Stanley
22. Mitsubishi UFJ Financial Group Inc
23. Northern Trust Corporation
24. Société Générale
25. Bank of America Corporation
26. Lloyds TSB Group plc
27. Invesco plc
28. Allianz SE 29. TIAA
30. Old Mutual Public Limited Company
31. Aviva plc
32. Schroders plc
33. Dodge & Cox
34. Lehman Brothers Holdings Inc*
35. Sun Life Financial Inc
36. Standard Life plc
37. CNCE
38. Nomura Holdings Inc
39. The Depository Trust Company
40. Massachusetts Mutual Life Insurance
41. ING Groep NV
42. Brandes Investment Partners LP
43. Unicredito Italiano SPA
44. Deposit Insurance Corporation of Japan
45. Vereniging Aegon
46. BNP Paribas
47. Affiliated Managers Group Inc
48. Resona Holdings Inc

49. Capital Group International Inc
50. China Petrochemical Group Company

* Lehman still existed in the 2007 dataset used

Graphic: The 1318 transnational corporations that form the core of the economy

(Data: PLoS One*)*

http://www.newscientist.com/article/mg21228354.500-revealed--the-capitalist-network-that-runs-the-world.html?full=true&print=true

Retrain Your Brain After Stroke

Physical Therapists Use A Split-belt Treadmill To Help Stroke Patients Walk More Easily
December 1, 2008 — Physical therapists used motion detector cameras to analyze how patients move on a specially designed split-belt treadmill--the belt is divided to move together or at independent speeds. When the legs move at speeds different from one another, the brain receives an error signal and the brain and nervous system use the feedback to adjust. The cerebellum recalls this message even after the treadmill stops and for a few minutes, stroke patients can walk easier.

Stroke patients often have to overcome a number of challenges before they can get back on their feet. Physical therapists are using a new tool to help patients not only retrain their bodies but also rewire their brains.

Two years ago, Terri Knudsen suffered a sudden, massive stroke while she was talking to a friend. "I noticed I was talking funny, like I had an accent, and she said it sounded like I was underwater," said Knudsen.

Knudsen lost mobility on her left side. She spent months relearning how to stand and how to walk. Physical therapists are using a new tool to help patients like Knudsen regain an even gait.

Using motion detector cameras, physical therapist Darcy Reisman, Ph.D., an expert in biomechanics and movement science at the University of Delaware in Newark, Del., analyzes how a patient moves on a specially designed split-belt treadmill. The belts can run together, or therapists can program the belts separately.

Dr. Reisman says when a patient's legs move at two different speeds, the brain gets an error signal. Next, the patient's brain and nervous system use the feedback to adjust. The cerebellum is the part of the brain that controls coordination. It remembers what it has learned even after the treadmill stops. For just a few minutes, stroke patients have an easier time on solid ground.

"You notice immediately that you want to take a bigger stride," Knudsen said. "It was a definite carryover from the treadmill."

"There's the immediate effect that you get," said Dr. Reisman. "The problem is, of course, that it decays."

Dr. Reisman wants to know if additional treadmill therapy will help rewire the brain, resulting in longer periods of even walking -- and making the split-belt treadmill the first step towards a faster recovery for stroke patients.

ABOUT STROKES: A stroke is a type of cardiovascular disease that affects the arteries leading to and from the brain. When one of these becomes blocked, or bursts, blood and oxygen can't get to that part of the brain and it begins to die. Strokes can cause paralysis, affect language and vision, and lead to memory loss. Strokes kill nearly 163,000 people every year; it is the third leading cause of death, behind heart disease and cancer.

ABOUT MOTOR FUNCTION: Even a simple motor movement involves many different regions of the body, but the primary motor cortex of the brain is one of the most important. It sends out electrical impulses through nerve cells called neurons that control the execution of movement. Every part of the body is represented in the primary motor cortex; the left side of the brain controls the right side of the body, and vice versa. Certain diseases or brain damage can disrupt these basic functions. For instance, cerebral palsy is a disorder that affects body movement and muscle coordination because of brain damage, which interferes with messages from the brain the body, and vice versa.

HOW WE WALK: Walking is different from a running gait because only one foot at a time lifts off the ground. During forward motion, the leg that leaves the ground swings forward from the hip, like a pendulum. Then the leg strikes the ground with the heel and rolls through the toe in a motion similar to an inverted pendulum. The motion of the two legs is coordinated so that one foot or the other is always in contact with the ground -- a so-called 'double pendulum' strategy. The process of walking recovers about 60 percent of the energy expended thanks to the pendulum dynamics and the ground reaction force. The legs act as long levers that transfer ground reaction force to the spine.

***Editor's Note**: This article is not intended to provide medical advice, diagnosis or treatment.*

http://www.sciencedaily.com/videos/2008/1207-retrain_your_brain_after_stroke.htm

Artificial crystals get their own textbook laws

- 15:21 14 October 2011 by **Charles Harvey**

Now available in nanoparticles and DNA *(Image: Captain Tucker ISS/NASA)*

An alternative chemistry of DNA-bonded nanoparticles, rather than chemically bonded atoms, just got a boost. We now have rules for building crystals like this, which means they can be created on demand.

In nature, the atoms of different elements arrange themselves in very different ways to form crystals. How many partners each atom is bonded to, and the length of the bonds, depend on the sizes and properties of the atoms in question. So sodium chloride forms a "face-centred cubic" structure, in which each sodium atom is surrounded by six chlorines and vice versa; whereas in gallium arsenide, say, the atoms arrange themselves differently and each has only four nearest neighbours.

Chad Mirkin of Northwestern University in Evanston, Illinois, and colleagues wondered if they could wrest control from nature and create crystals where the bond lengths and number of bonds don't depend on the size or composition of the component particles.

To do this the researchers coated their atom analogues – gold nanoparticles – with multiple DNA molecules. The DNA contained exposed, single-stranded sections that formed "sticky" regions on each particle which could bond to complementary sections on strands coating other gold particles.

It's not the first time that researchers have used these building blocks to create artificial structures. In the past few years, structures have been build that resembled natural crystals, with the nanoparticles as "atoms" and the DNA linkers standing in for chemical bonds. A current limitation is that the identities of the particles being assembled often determine the structures that can be synthesised – so certain structures can only be built using certain nanoparticles and vice versa.

Now Mirkin and colleagues have worked out how to dictate the number of nanoparticles and the length of bonds for a system of particles of a given size and composition – and summarised their findings in six rules. For instance, the total size of the nanoparticle, including its DNA coating, determined what sort of crystal developed – and this size could be tailored either by using different lengths of DNA or different-sized nanoparticles.

Against nature

These rules could be used to design artificial crystals with totally novel properties, says Mirkin. This is "one of the most fundamental demonstrations of man over nature", he adds.

For instance, he suggests using the rules to design materials that can absorb light of low energy and release it in the form of high-energy photons. This might drastically improve the efficiency of solar cells.

"There are extremely few successful examples of crystals with nanoparticles, and these were obtained after extremely difficult procedures and with little control over the final structure," says Alex Travesset of Iowa State University in Ames. "This paper shows how DNA-programmed self-assembly provides a relatively simple route to solve this very fundamental technological problem."

Journal reference: *Science*, DOI: 10.1126/science.1210493

http://www.newscientist.com/article/dn21050-artificial-crystals-get-their-own-textbook-laws.html?full=true&print=true

Planet-Sized Object as Cool as Earth Revealed in Record-Breaking Photo

An artist's impression of the coldest imaged companion, named WD 0806-661 B, (right foreground) orbiting at a large distance from a white dwarf --the collapsed-core remnant of a dying star. Credit: (Credit: NASA Goddard Space Flight Center/Francis Reddy)

ScienceDaily (Oct. 19, 2011) — The photo of a nearby star and its orbiting companion -- whose temperature is like a hot summer day in Arizona -- will be presented by Penn State Associate Professor of Astronomy and Astrophysics Kevin Luhman during the Signposts of Planets conference at NASA's Goddard Space Flight Center on Oct. 20, 2011.

A paper describing the discovery will be published in the *Astrophysical Journal*.

"This planet-like companion is the coldest object ever directly photographed outside our solar system," said Luhman, who led the discovery team. "Its mass is about the same as many of the known extra-solar planets -- about six to nine times the mass of Jupiter -- but in other ways it is more like a star. Essentially, what we have found is a very small star with an atmospheric temperature about cool as the Earth's."

Luhman classifies this object as a "brown dwarf," an object that formed just like a star out of a massive cloud of dust and gas. But the mass that a brown dwarf accumulates is not enough to ignite thermonuclear reactions in its core, resulting in a failed star that is very cool. In the case of the new brown dwarf, the scientists have gauged the temperature of its surface to be between 80 and 160 degrees Fahrenheit -- possibly as cool as a human.

Ever since brown dwarfs first were discovered in 1995, astronomers have been trying to find new record holders for the coldest brown dwarfs because these objects are valuable as laboratories for studying the atmospheres of planets with Earth-like temperatures outside our solar system.

Astronomers have named the brown dwarf "WD 0806-661 B" because it is the orbiting companion of an object named "WD 0806-661" -- the "white dwarf" core of a star that was like the Sun until its outer layers were expelled into space during the final phase of its evolution. "The distance of this white dwarf from the Sun is 63 light years, which is very near our solar system compared with most stars in our galaxy," Luhman said.

"The distance of this white dwarf from its brown-dwarf companion is 2500 astronomical units (AU) -- about 2500 times the distance between the Earth and the Sun, so its orbit is very large as compared with the orbits of planets, which form within a disk of dust swirling close around a newborn star," said Adam Burgasser at the

University of California, San Diego, a member of the discovery team. Because it has such a large orbit, the astronomers say this companion most probably was born in the same manner as binary stars, which are known to be separated as far apart as this pair, while remaining gravitationally bound to each other.

Luhman and his colleagues presented this new candidate for the coldest known brown dwarf in a paper published in spring 2011, and they now have confirmed its record-setting cool temperature in a new paper that will be published in the Astrophysical Journal.

To make their discovery, Luhman and his colleagues searched through infrared images of over six hundred stars near our solar system. They compared images of nearby stars taken a few years apart, searching for any faint points of light that showed the same motion across the sky as the targeted star. "Objects with cool temperatures like the Earth are brightest at infrared wavelengths," Luhman said. "We used NASA's Spitzer Space Telescope because it is the most sensitive infrared telescope available."

Luhman and his team discovered the brown dwarf WD 0806-661 B moving in tandem with the white dwarf WD 0806-661 in two Spitzer images taken in 2004 and 2009. The images, which together show the movement of the objects, are available online (http://science.psu.edu/alert/photos/research-photos/astro/Luhman-moving-labels.gif). "This animation is a fun illustration of our technique because it resembles the method used to discovery Pluto in our own solar system," Luhman said.

In a related new discovery involving a different cool brown dwarf, Penn State Postdoctoral Scholar John Bochanski and his colleagues have made the most detailed measurement yet of ammonia in the atmosphere of an object outside our solar system. "These new data are much higher quality that previously achieved, making it possible to study, in much more detail than ever before, the atmospheres of the coldest brown dwarfs, which most closely resemble the atmospheres that are possible around planets," Bochanski said.

"Brown dwarfs that are far from their companion stars are much easier to study than are planets, which typically are difficult to observe because they get lost in the glare of the stars they orbit," Burgasser said. "Brown dwarfs with Earth-like temperatures allow us to refine theories about the atmospheres of objects outside our solar system that have comparatively cool atmospheres like that of our own planet."

This research was sponsored by grants from the National Science Foundation and the NASA Astrophysics Theory Program.

Story Source:

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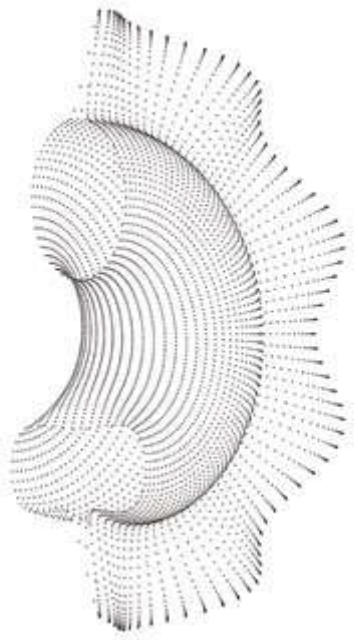
Spaghetti functions: The mathematics of pasta shapes

- 18 October 2011 by **Richard Webb**
- Magazine issue 2834.



A galletti pasta shape described by Legendre's equations *(Image: Stefano Graziani)*

What possessed an architect to boil down the beauty of pasta to a few bare formulae?

ALPHABETTI spaghetti: now there was a name to conjure with when I was a kid. Succulent little pieces of pasta, each shaped into a letter of the alphabet, served up in a can with lashings of tomato sauce. Delicious, nutritious – and best of all they made playing with your food undeniably educational.

Some thirty years on, in an upscale Italian restaurant near the London offices of *New Scientist*, I decide against sharing this reminiscence of family mealtimes with my lunching partner. George Legendre doesn't look quite the type. For one thing, he is French, and possibly indisposed to look kindly on British culinary foibles. For another, he is an architect, designer and connoisseur of all things pasta. In fact, he has just compiled the first comprehensive mathematical taxonomy of the stuff.

Quiz: Can you match the pasta with its mathematical equation?

According to a recent survey by the charity Oxfam, pasta is now the world's favourite food. Something like 13 million tonnes are produced annually around the globe, with Italy topping the league of both producers and consumers, according to figures from the International Pasta Organisation, a trade body. The average Italian gets through 26 kilograms – that's the uncooked mass – of pasta each year.

The plate of *paccheri* in front of me seems positively modest by comparison. To my untrained eye, it consists of large, floppy and slightly misshapen penne. I might not be too wide of the mark. "If you look carefully,

there are probably only three basic topological shapes in pasta – cylinders, spheres and ribbons," Legendre says.

Nevertheless, that simplicity has, in the hands of pasta maestros throughout the world, spawned a multiplicity of complex forms – and inspired many a designer before Legendre (see "Primi piatti"). It was a late-night glass of wine too many at his architectural practice in London that inspired Legendre, together with his colleague Jean-Aimé Shu, into using mathematics to bring order to this chaotic world.

"The first thing we did was order lots of pasta," Legendre says. Then, using their design know-how, they set about modelling every shape they could lay their hands on to derive formulae that encapsulate their forms. "It took almost a year and almost bankrupted the company," he says.

For each shape, they needed three expressions, each describing its form in one of the three dimensions. This provides a set of coordinates that, plotted on a graph, faithfully represents the pasta in 3D. The curvaceous shapes of most pasta lend themselves to mathematical representations mainly through oscillating sine and cosine functions.

For some pastas, the right recipe was obvious. Spaghetti, for example, is little more than an extruded circle. The sine and cosine of a single angle serves to define the coordinates of the points enclosing its unvarying cross- section, and a simple constant characterises its length. Similarly, grain-like *puntalette* are just deformed spheres. The sines and cosines of two angles, together with different multiplying factors to stretch the shape out in three dimensions, supply its mathematical likeness. "The compactness of the expression is beautiful," says Legendre.

Other shapes were harder to crack. Scrunched-up *saccottini*, for example, looks for all the world like the crocheted representation of a hyperbolic plane that adorns my desk at *New Scientist*, and its shape is captured by a complex mathematical mould of multiplied sines and cosines. Simple features such as the slanted ends of *penne* take some low modelling cunning, involving chopping the pasta into pieces, each represented by slightly different equations.

Sharp inflections, such as the undulating crests of the cockscomb-like *galletti* (shown above), are tricky too, though trigonometric functions again turn out to be the best tools for the job: raising sines and cosines to a higher power constricts the smooth, oscillating shape of the function into something approaching a spike. A similar technique can be used to broaden out the function into something approaching a right angle – a trick Legendre dubs an "asymptotic box". "Saying to colleagues you're developing mathematics to make a box makes them think you're crazy," he says.

In the end, he had a compendium of 92 pasta shapes, each exactly modelled and divided into categories according to the mathematical relationships revealed between them – some obvious, some less so. The twisted ribbons of *sagne incannulate* and the "little hats", *cappelletti* (below), turn out to be topologically identical: given sufficiently pliant dough, deft hands could stretch, twist and remould one shape into the other without the intervention of a knife or pair of scissors.

Whimsical though such insights may be, the project has a serious note too. Legendre's pasta taxonomy provides a playful proof that immense variety and seeming complexity can be reduced to simple mathematical beginnings. Legendre is convinced that could lead to a new, more efficient way of translating design into engineering that is useful for much larger structures. Plans for an arbitrarily complex skyscraper, for example, might be reduced to equations for each of its three dimensions just like those that define the pasta shapes. "You can see the equations for a cross-section as indicative of a floor, with a third equation for the elevation," he says.

In fact, he has already put the principle into practice. Legendre's Henderson Waves bridge in Singapore has an undulating form more than a little reminiscent of graceful pasta-like curves, and was modelled using exactly the same principles. "I just gave the engineers equations," he says.

His own pasta shape is next on the menu. His original intention there was to bridge a gap between his passion and his profession. The pasta world has a relative dearth of the sturdy, rectilinear shapes that form the basis of most architecture. In the current pasta taxonomy, this sort of form is represented only by *trenne*, hollow bars with a triangular cross-section. But making such seemingly basic shapes accurately turns out to be fiendishly difficult using the traditional process of extruding the dough through a bronze die – a wrinkle that Legendre is trying to iron out with a pasta manufacturer.

Do things need to be that complex? My imagination is piqued by the idea that I might one day hook my computer, equipped with a pasta modelling package, to a 3D printer and print my own pasta. Legendre is not so sure the results would tickle my taste buds. Each pasta shape is the product of a different regional or local tradition, and centuries of painstaking R&D to match the right shape with the right sauce, he says.

That's the kind of love mathematics cannot buy – but it might, perhaps, be food for another project. "I would love to see a book that deals with the right seasoning as rigorously," he says wistfully.

Me too: perhaps then alphabetti spaghetti and its oozing tomato sauce will be given the belated recognition it deserves. Meanwhile, I have to admit I'm regarding the melange of pasta, buffalo mozzarella, aubergines and tomatoes in front of me in a new light. Legendre, for his part, is having the risotto.

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Primi piatti

The Italian designer Giorgetto Giugiaro has a string of supercars to his name, conceived for the likes of Ferrari, Maserati and Lamborghini. In 1999 he was voted "car designer of the century" by an international jury of motoring journalists.

Less well known are his activities as a designer of pasta. In 1983, the Neapolitan manufacturer Voiello commissioned him to design a new shape compatible with the traditional manufacturing method of extrusion, in which the pasta dough is forced through a slit in a bronze die. In the event, his "Marille" design, consisting of two parallel tubes with a flap protruding from their join, rather landed him in hot water. While pleasing on the eye, its intricacy meant that different parts of the pasta cooked at vastly different rates.

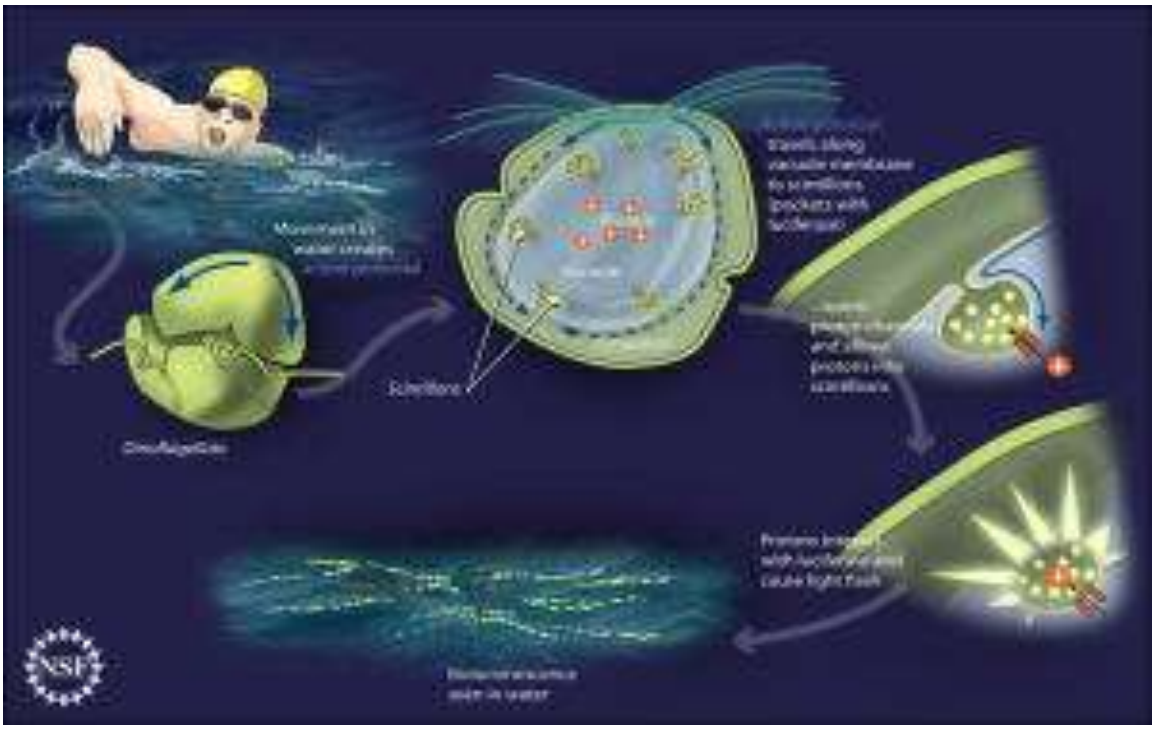
In 1987, the celebrated designer Philippe Starck conceived a similar-looking shape for the French pasta maker Panzani. Called the Mandala, it resembled a yin-yang symbol elongated in a third dimension. It, too, failed to break through into the pasta big time.

Fun rather than practicality seemed to be on the minds of two designers from the Bezalel Academy of Arts and Design in Jerusalem, Israel, who devised their own pasta in 2009. Resembling penne, it could be used as a whistle before cooking.

***Richard Webb** is a feature editor for New Scientist*

http://www.newscientist.com/article/mg21228342.400-spaghetti-functions-the-mathematics-of-pasta-shapes.html

Bioluminescence: Explanation for Glowing Seas Suggested



Proposed bioluminescence mechanism: When a dinoflagellate is mechanically agitated, an electrical impulse travels around its vacuole membrane. This impulse opens up proton channels that allow protons to flow from the vacuole into the scintillons, where they activate light-emitting luciferase proteins. The result: A flash of light. (Credit: Zina Deretsky, National Science Foundation)

ScienceDaily (Oct. 19, 2011) — It has long been known that distinctive blue flashes--a type of bioluminescence--that are visible at night in some marine environments are caused by tiny, unicellular plankton known as dinoflagellates. However, a new study has, for the first time, detailed the potential mechanism for this bioluminesence.

The study, which was partially funded by the National Science Foundation, is reported by Susan Smith of Emory School of Medicine, Thomas DeCoursey of Rush University Medical Center and colleagues in the Oct. 17, 2011 issue of the *Proceedings of the National Academy of Sciences* (PNAS).

A key aspect of the potential mechanism for bioluminescence in dinoflagellates proposed in the PNAS study involves voltage-gated proton channels--channels in membranes that can be opened or closed by chemical or electrical events.

J. Woodland Hastings, a member of the Smith and DeCoursey research team and an author of the PNAS article, suggested the presence of voltage-gated proton channels in dinoflagellates almost forty years ago. But the Smith and Decoursey team only recently confirmed them by the identification and subsequent testing of dinoflagellate genes that are similar to genes for voltage-gated proton channels that had previously been identified in humans, mice and sea squirts.

According to the study, here is how the light-generating process in dinoflagellates may work: As dinoflagellates float, mechanical stimulation generated by the movement of surrounding water sends electrical impulses around an internal compartment within the organism, called a vacuole--which holds an abundance of

protons. These electrical impulses open so-called voltage-sensitive proton channels that connect the vacuole to tiny pockets dotting the vacuole membrane, known as scintillons.

Once opened, the voltage-sensitive proton channels may funnel protons from the vacuole into the scintillons. Protons entering the scintillons then activate luciferase--a protein, which produces flashes of light, that is stored in scintillons. Flashes of light produced by resulting luciferase activation would be most visible during blooms of dinoflagellates.

This research illuminates the novel mechanisms underlying a beautiful natural phenomenon in our oceans, and enhances our understanding of dinoflagellates--some of which can produce toxins that are harmful to the environment.

Story Source:

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Mouse manoeuvres in the dark reveal brain's map links

- 19:00 20 October 2011 by **Chelsea Whyte**

Ever wondered how you can make your way down a dark hallway in the night without stubbing your toe? New research in mice has shown for the first time that the cerebellum – an area of the brain that is known to control motor learning – plays a crucial role in this type of navigation.

Another area of the brain, the hippocampus, is known to house a kind of mental map, created by three types of cell: "place" neurons that fire when an animal is in a specific location and only that location; "head direction" cells that fire when the animal is facing a certain direction; and "grid" cells that fire at regular intervals as the animal moves, leaving a virtual "breadcrumb trail" that helps to create a sense of location relative to other places visited.

But until now there has been no evidence that the cerebellum is a partner in creating the representation of the body in space.

"We never knew that the cerebellum and hippocampus communicated," says Christelle Rochefort at Pierre and Marie Curie University in Paris, France, who worked on the study. This new finding reveals that there are networks in the brain that haven't yet been explored, she says.

"It seems that there is some crosstalk between the two structures," says research team leader Laure Rondi-Reig, also at Pierre and Marie Curie University.

Swim for it

The team found that the crosstalk was mediated by an enzyme called cerebellar protein kinase C (PKC). PKC helps to strengthen neurons in the cerebellum involved in processing self-motion cues such as balance, the relative movement of body parts and depth perception. Rondi-Reig's team engineered mice to lack PKC to test whether those cerebellar neurons in the played a role in mental map-making in the hippocampus.

In one of their experiments, they trained six of the mice lacking PKC – and five normal mice – to swim through a water maze toward an escape platform. With the lights on, the mutant mice navigated the maze just as well as their normal counterparts. But when the researchers killed the lights, the mutant mice took a more circuitous path to safety.

Without visual cues, says Rondi-Reig, all of the mice's place cells fired at a much lower rate, leaving them reliant on self-motion indicators in the cerebellum to find their way to the exit. Because the modified mice lacked PKC, the neurons within the cerebellum could not work at full strength, and the rodents lost their sense of direction in the dark.These findings could have implications for how humans find their way through space as well, says Rochefort, because the connection from the cerebellum to the cerebral cortex is similar in rodents and primates."It's something that's not conscious, contrary to how we might think we navigate," she says. "We can get around without cues from the external world. There's so much more going on in our cerebellum to control our body movement that we don't even think about."

Journal reference: *Science*, DOI: 10.1126/science.1207403

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Young Human-Specific Genes Correlated With Brain Evolution

Researchers calculated when young genes were expressed in the human brain, discovering that they were more likely to appear during fetal or infant development. (Credit: © Noel Powell / Fotolia)

ScienceDaily (Oct. 19, 2011) — Young genes that appeared since the primate branch split from other mammal species are expressed in unique structures of the developing human brain, a new analysis finds. The correlation suggests that scientists studying the evolution of the human brain should look to genes considered recent by evolutionary standards and early stages of brain development.

"There is a correlation between the new gene origination and the evolution of the brain," said Manyuan Long, PhD, Professor of Ecology & Evolution at the University of Chicago and senior author of the study in *PLoS Biology*. "We're not talking about one or two genes, we're talking about many genes. This is a process that is continually moving and changing our brain."

Scientists have long sought to solve how the brain evolved to have the anatomical features and functional ability that separate humans from their primate ancestors. With the completion of the Human Genome Project in 2003 and the growing availability of genome sequences for primates and other species, researchers have looked to genetics for answers on brain evolution.

From these studies, many scientists have hypothesized that differential regulation of conserved genes shared across species, rather than the arrival of new species-specific protein-encoding genes, was responsible for the

dramatically different human brain. But in a 2010 study, Long's laboratory discovered that the younger species-specific genes could be just as important as older conserved genes to an organism's development.

For the *PLoS Biology* paper, researchers merged a database of gene age with transcription data from humans and mice to look for when and where young genes specific to each species were expressed.

The researchers found that a higher percentage of primate-specific young genes were expressed in the brain compared to mouse-specific young genes. Human-specific young genes also were more likely to be expressed in the recently expanded human brain structures, such as the neocortex and prefrontal cortex.

"Newer genes are found in newer parts of the human brain," said Yong Zhang, PhD, postdoctoral researcher and first author on the study. "We know the brain is the most remarkable difference between humans and other mammals and primates. These new genes are a candidate for future studies, as they are more likely to underlie this difference."

The timing of when the young human-specific genes are expressed in the brain also intrigued the researchers. Inspired by an ultrasound appointment with his pregnant wife, Zhang calculated when young genes were expressed in the human brain, discovering that they were more likely to appear during fetal or infant development.

The early activity of these genes suggests scientists should be looking at earlier developmental stages for genetic activity that ultimately shapes the complexity of the human brain.

"What's really surprising is that the evolutionary newest genes on the block act early," said co-author Patrick Landback, a graduate student in Long's laboratory. "The primate-specific genes act before birth, even when a human embryo doesn't look very different from a mouse embryo. But the actual differences are laid out early."

Thus far, researchers comparing adult brains between species have focused on regulatory differences as the primary driver of evolutionary changes. But the new research suggests that new genes with novel functions may have also played an important, previously overlooked role in the evolution of the human brain.

"Traditionally, people don't believe that a new protein or a new gene can play any role in an important process. Most people pay attention to only the regulation of genes," Long said. "But out of a total of about 1,300 new genes, only 13 percent were involved in new regulation. The rest, some 1,100 genes, are new genes that bring a whole new type of function."

Future research will look at the function of these genes and the role they may have played in building the unique human brain.

"People tend to study genes that are old functions present in organisms, and not those from new genes," said Maria Vibranovski, PhD, study co-author and research assistant professor. "This work will open a window such that people will start working in these new genes to try to figure out what exactly the functions are."

For now, the authors stress that their finding is only a correlation between the appearance of young human-specific genes and the evolutionary appearance of advanced brain structures. More data will need to be collected on the timing and location of gene expression in non-human primates to determine precisely which new genes and biological functions contributed to the evolution of the human brain.

"We don't know if this observation has any causation biologically, and there is a long way to go from there, but this correlation can predict some future work to do," Long said.

The paper, "Accelerated Recruitment of New Brain Development Genes into the Human Genome," will be published October 18 by *PLoS Biology* [10.1371/journal.pbio.1001179]. Funding for this work was provided by the National Institutes of Health, the National Science Foundation and the Chicago Biomedical Consortium.

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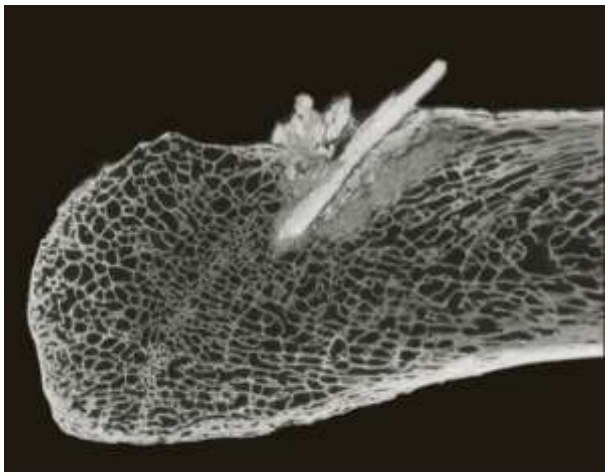
First Americans hunted mastodons 13,800 years ago

- 19:00 20 October 2011 by **Michael Marshall**



This CT scan shows the weapon's point piercing the mastodon bone *(Image: Center for the Study of the First Americans, Texas A&M University)*

Humans were hunting mastodons in what is now Washington state 13,800 years ago. The finding adds to the evidence that humans entered North America at least 800 years before the rise of the Clovis culture, long thought to have been the first Americans.

Back in 1977, archaeologist Carl Gustafson – then at Washington State University in Pullman – excavated a male mastodon near Sequim, Washington. Buried in one of the ribs he found a bone fragment that didn't belong to the elephant-like animal, which he suggested was from the tip of a weapon used to kill the beast. Carbon dating of the remains revealed a surprise: they appeared to be around 14,000 years old – predating humans' first arrival in North America, according to the theories of the time.

Other archaeologists were unconvinced. "The dating was tenuous," says Michael Waters of Texas A&M University in College Station. Since then, however, evidence has grown that humans were in the Americas before the rise of the Clovis culture, prompting Waters and Gustafson to reanalyse the remains with the latest carbon-dating technology.

They have confirmed that both the skeleton and the bone fragment are 13,800 years old. Detailed CT scans reveal that the bone had been sharpened to a point and driven into one of the mastodon's ribs. Waters thinks the sharpened bone came from the tip of a weapon that was thrust into the animal by a hunter who was aiming for the lungs, but missed.

Pictures: The mastodon rib with the embedded weapon point fragment

DNA and protein from the sharpened bone show that it came from another mastodon. To get it, the humans must have either killed one or scavenged a fresh carcass.

Munching on mastodon

Waters thinks the first American colonists came over the Bering land bridge from Asia, and may have reached Alaska as early as 20,000 years ago. From there they headed south 16,000 years ago, eventually giving rise to the more advanced Clovis culture, which used distinctive stone tools, in what is now the south-east US. A second, seafaring society may have arisen on the California coast.

"The vast majority of archaeologists now accept the pre-Clovis colonisation of the Americas," says Dennis Jenkins of the University of Oregon in Eugene.

The first colonists probably contributed to the mass extinction of large animals like mastodons, which died out as the ice age ended 12,000 years ago. "Changing weather and ecology contributed substantially to the extinction of the megafauna," says Jenkins. "However, there is no doubt that hunting by humans hastened their demise."

Journal reference: *Science*, DOI: 10.1126/science.1207663

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U.S. Rivers and Streams Saturated With Carbon

Scientists added a harmless titanium dioxide tracer to streams and rivers to track carbon flow. (Credit: Diana Karwan, Stroud Water Research Center)

ScienceDaily (Oct. 19, 2011) — Rivers and streams in the United States are releasing substantially more carbon dioxide into the atmosphere than previously thought, according to researchers publishing their results in the current issue of the journal *Nature Geoscience*.

Their findings could change the way scientists model the movement of carbon among land, water and the atmosphere.

"Direct measurements of carbon dioxide concentrations and fluxes in streams and rivers are still extremely rare," said Henry Gholz, program director in the National Science Foundation's (NSF) Division of Environmental Biology, which funded the research.

"This study demonstrates that both are much higher than assumed. The research should enable more predictive and precise models of carbon cycling at regional to global scales."

The researchers found that a significant amount of carbon contained in land, which first is absorbed by plants and forests through the air, is leaking into streams and rivers and then released into the atmosphere before reaching coastal waterways.

"What we are able to show is that there is a source of atmospheric carbon dioxide from streams and rivers, and that it is significant enough for terrestrial modelers to take note of it," said David Butman, a co-author of the paper and scientist at the Yale University School of Forestry & Environmental Studies.

He and his co-author, ecologist Peter Raymond also of Yale, analyzed data from samples of more than 4,000 rivers and streams throughout the United States, and incorporated detailed geospatial data to model the flux of carbon dioxide from water.

This release is equal to a car burning 40 billion gallons of gasoline, enough to drive back and forth to the moon 3.4 million times.

"These rivers breathe a lot of carbon," said Butman. "They are a source of carbon dioxide, just like we breathe out carbon dioxide and like smokestacks emit carbon dioxide.

"This has never been systematically estimated from a region as large as the United States."

The paper, titled "Significant Efflux of Carbon Dioxide from Streams and Rivers in the United States," also indicates that as the climate heats up there will be more rain and snow, and that an increase in precipitation will result in even more terrestrial carbon flowing into rivers and streams and being released into the atmosphere.

Any accurate estimate of carbon uptake vs. carbon released must include the carbon in streams and rivers, Butman said.

The researchers note that currently it's difficult to determine how to include this flux in regional carbon budgets, because the influence of human activity on the release of carbon dioxide into streams and rivers is still unknown.

The research was also funded by a NASA Earth and Space Science Fellowship, a NASA Carbon & Ecosystems Program grant, and the Yale School of Forestry & Environmental Studies.

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In praise of stem-cell simplicity

- 17 October 2011
- Magazine issue 2834.

We should keep all avenues of stem-cell research open but be grateful when simpler alternatives emerge

Read more: "Diabetic rats cured with their own stem cells", "Baby repair kit found inside the womb" and "Regenerating a stem-cell ethics debate"

DID you know that you have accessible stem cells up your nose? Or that human fetuses shed stem cells into the fluid around them? Both of these seemingly random facts could spawn novel, personalised stem-cell treatments that, if not simple per se, are simpler than what has gone before.

What marks these treatments out is that they are eminently practical and ethically unquestionable. This is in stark contrast to much previous work, which has focused on human embryonic stem cells, or hESCs.

From the outset, the use of hESCs has been fraught with controversy. Only last week, after years of trying, and the notorious fraud involving Korean researcher Woo Suk Hwang, hESCs were finally created through a variant of the cloning technique that gave us Dolly the sheep. This fused skin and egg cells, leaving the nucleus of the latter intact. Unfortunately, human eggs are still required, embryos still perish in the process and in this case the embryos and resulting hESCs had three sets of chromosomes instead of two, ruling out medical uses.

A promising alternative to hESCs emerged in 2006 when researchers produced so-called induced pluripotent stem cells (iPS) from ordinary tissue such as skin. But to convert adult cells into embryonic-like cells means genetic reprogramming, for example with a virus, and the reprogrammed cells do not yet match embryonic stem cells.

Now there are different avenues of research that are simpler in many ways. In "Diabetic rats cured with their own stem cells", we report how researchers cured diabetic rats by turning brain stem cells extracted through the nose into insulin-producing cells in the pancreas. They did this without any genetic trickery.

And in "Baby repair kit found inside the womb", we report how congenital defects such as holes in the diaphragm could be patched up using a baby's own stem cells extracted from the surrounding amniotic fluid.

Of course all avenues of stem cell research should continue, not least because work on embryos provides fundamental insights. But it pays to keep looking for new approaches, and nature's locker can often yield useful secrets. Though there are never easy answers, sometimes there are unexpectedly simple ones.

http://www.newscientist.com/article/mg21228343.200-in-praise-of-stemcell-simplicity.html

NASA's Spitzer Detects Comet Storm in Nearby Solar System

This artist's conception illustrates a storm of comets around a star near our own, called Eta Corvi. Evidence for this barrage comes from NASA's Spitzer Space Telescope, whose infrared detectors picked up indications that one or more comets was recently torn to shreds after colliding with a rocky body. (Credit: NASA/JPL-Caltech)

ScienceDaily (Oct. 19, 2011) — NASA's Spitzer Space Telescope has detected signs of icy bodies raining down in an alien solar system. The downpour resembles our own solar system several billion years ago during a period known as the "Late Heavy Bombardment," which may have brought water and other life-forming ingredients to Earth.

During this epoch, comets and other frosty objects that were flung from the outer solar system pummeled the inner planets. The barrage scarred our moon and produced large amounts of dust.

Now Spitzer has spotted a band of dust around a nearby bright star in the northern sky called Eta Corvi that strongly matches the contents of an obliterated giant comet. This dust is located close enough to Eta Corvi that Earth-like worlds could exist, suggesting a collision took place between a planet and one or more comets. The Eta Corvi system is approximately one billion years old, which researchers think is about the right age for such a hailstorm.

"We believe we have direct evidence for an ongoing Late Heavy Bombardment in the nearby star system Eta Corvi, occurring about the same time as in our solar system," said Carey Lisse, senior research scientist at the Johns Hopkins University Applied Physics Laboratory in Laurel, Md., and lead author of a paper detailing the

findings. The findings will be published in the *Astrophysical Journal*. Lisse presented the results at the Signposts of Planets meeting at NASA's Goddard Space Flight Center in Greenbelt, Md., on Oct. 19.

Astronomers used Spitzer's infrared detectors to analyze the light coming from the dust around Eta Corvi. Certain chemical fingerprints were observed, including water ice, organics and rock, which indicate a giant comet source.

The light signature emitted by the dust around Eta Corvi also resembles the Almahata Sitta meteorite, which fell to Earth in fragments across Sudan in 2008. The similarities between the meteorite and the object obliterated in Eta Corvi imply a common birthplace in their respective solar systems.

A second, more massive ring of colder dust located at the far edge of the Eta Corvi system seems like the proper environment for a reservoir of cometary bodies. This bright ring, discovered in 2005, looms at about 150 times the distance from Eta Corvi as Earth is from the sun. Our solar system has a similar region, known as the Kuiper Belt, where icy and rocky leftovers from planet formation linger. The new Spitzer data suggest that the Almahata Sitta meteorite may have originated in our own Kuiper Belt.

The Kuiper Belt was home to a vastly greater number of these frozen bodies, collectively dubbed Kuiper Belt objects. About 4 billion years ago, some 600 million years after our solar system formed, scientists think the Kuiper Belt was disturbed by a migration of the gas-giant planets Jupiter and Saturn. This jarring shift in the solar system's gravitational balance scattered the icy bodies in the Kuiper Belt, flinging the vast majority into interstellar space and producing cold dust in the belt. Some Kuiper Belt objects, however, were set on paths that crossed the orbits of the inner planets.

The resulting bombardment of comets lasted until 3.8 billion years ago. After comets impacted the side of the moon that faces Earth, magma seeped out of the lunar crust, eventually cooling into dark "seas," or maria. When viewed against the lighter surrounding areas of the lunar surface, those seas form the distinctive "Man in the Moon" visage. Comets also struck Earth or incinerated in the atmosphere, and are thought to have deposited water and carbon on our planet. This period of impacts might have helped life form by delivering its crucial ingredients.

"We think the Eta Corvi system should be studied in detail to learn more about the rain of impacting comets and other objects that may have started life on our own planet," Lisse said.

NASA's Jet Propulsion Laboratory in Pasadena, Calif., manages the Spitzer mission for the agency's Science Mission Directorate in Washington. Science operations are conducted at the Spitzer Science Center at the California Institute of Technology in Pasadena. Caltech manages JPL for NASA.

For more information about Spitzer, visit http://spitzer.caltech.edu/ and http://www.nasa.gov/spitzer .

Story Source:

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http://www.sciencedaily.com/releases/2011/10/111019161940.htm

Malaria vaccine halves risk of infection in infants

- 11:05 19 October 2011 by **Andy Coghlan**

Could be getting a malaria vaccine in 2015 *(Image: Simon Rawles/Getty Images)*

Good news from the world's largest and most advanced trial of a vaccine against malaria. The vaccine, called RTS,S, halved the risk of developing the disease.

The RTS,S trial involves 15,460 children in seven African countries. The new result comes from an interim analysis of 6000 of the participants, aged 5 to 17 months, a year after they received their jabs.

"We're pleased with this result," says Mary Hamel, a member of the vaccine trial team based at the Kenya Medical Research Institute in Nairobi.

"We're on track to what would be the first malaria vaccine for African children," she says, adding that with continued progress, the vaccine could be in general use as soon as 2015. "At an efficacy of 50 per cent, it would be sufficient to save hundreds of thousands of lives."

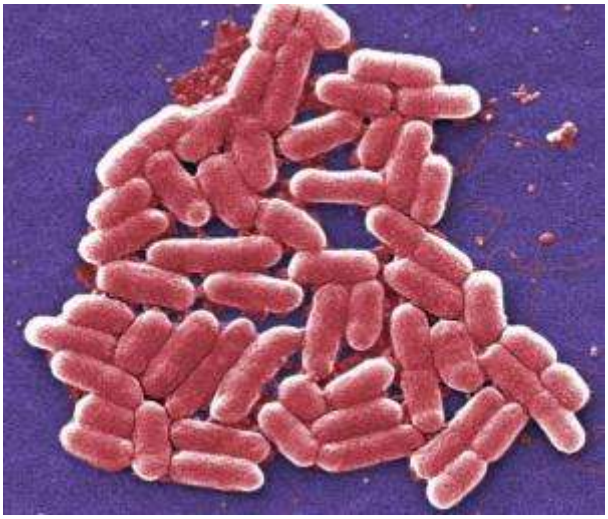
The vaccine reduced the risk of developing clinical malaria – when the disease requires medical treatment – by 56 per cent. The possibility of developing severe malaria dropped by 47 per cent.

Final results from the trial, including those from vaccinating infants aged a mere 6 to 12 weeks, are due in 2014. The results so far have matched those from earlier trials of RTS,S. Other vaccines under development could soon enter trials too.

Journal reference: *New England Journal of Medicine*, DOI: 10.1056/nejmoa1102287

http://www.newscientist.com/article/dn21062-malaria-vaccine-halves-risk-of-infection-in-infants.html

Computing Building Blocks Created from Bacteria and DNA



Scientists have successfully demonstrated that they can build some of the basic components for digital devices out of bacteria and DNA, which could pave the way for a new generation of biological computing devices. (Credit: Janice Haney Carr)

ScienceDaily (Oct. 18, 2011) — Scientists have successfully demonstrated that they can build some of the basic components for digital devices out of bacteria and DNA, which could pave the way for a new generation of biological computing devices, in research published October 18 in the journal *Nature Communications*.

The researchers, from Imperial College London, have demonstrated that they can build logic gates, which are used for processing information in devices such as computers and microprocessors, out of harmless gut bacteria and DNA. These are the most advanced biological logic gates ever created by scientists.

Professor Richard Kitney, co-author of the paper from the Centre for Synthetic Biology and Innovation and the Department of Bioengineering at Imperial College London, says: "Logic gates are the fundamental building blocks in silicon circuitry that our entire digital age is based on. Without them, we could not process digital information. Now that we have demonstrated that we can replicate these parts using bacteria and DNA, we hope that our work could lead to a new generation of biological processors, whose applications in information processing could be as important as their electronic equivalents."

Although still a long way off, the team suggest that these biological logic gates could one day form the building blocks in microscopic biological computers. Devices may include sensors that swim inside arteries, detecting the build up of harmful plaque and rapidly delivering medications to the affected zone. Other applications may include sensors that detect and destroy cancer cells inside the body and pollution monitors that can be deployed in the environment, detecting and neutralising dangerous toxins such as arsenic.

Previous research only proved that biological logic gates could be made. The team say that the advantage of their biological logic gates over previous attempts is that they behave more like their electronic counterparts. The new biological gates are also modular, which means that they can be fitted together to make different types of logic gates, paving the way for more complex biological processors to be built in the future.

In the new study, the researchers demonstrated how these biological logic gates worked. In one experiment, they showed how biological logic gates can replicate the way that electronic logic gates process information by either switching "on" or "off."

The scientists constructed a type of logic gate called an "AND Gate" from bacteria called *Escherichia coli* (*E.Coli*), which is normally found in the lower intestine. The team altered the *E.Coli* with modified DNA, which reprogrammed it to perform the same switching on and off process as its electronic equivalent when stimulated by chemicals.

The researchers were also able to demonstrate that the biological logic gates could be connected together to form more complex components in a similar way that electronic components are made. In another experiment, the researchers created a "NOT gate" and combined it with the AND gate to produce the more complex "NAND gate."

The next stage of the research will see the team trying to develop more complex circuitry that comprises multiple logic gates. One of challenges faced by the team is finding a way to link multiple biological logic gates together, similar to the way in which electronic logic gates are linked together, to enable complex processing to be carried out.

Story Source:

The above story is reprinted from materials provided by **Imperial College London**.

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Journal Reference:

1. Baojun Wang, Richard I Kitney, Nicolas Joly, Martin Buck. **Engineering modular and orthogonal genetic logic gates for robust digital-like synthetic biology**. *Nature Communications*, 2011; 2: 508 DOI: 10.1038/ncomms1516

http://www.sciencedaily.com/releases/2011/10/111018111929.htm

People with autism unaffected by social reputation

- 19 October 2011
- Magazine issue 2834.

"WHAT will the neighbours think?" is a question people with autism are unlikely to ask. While the rest of us tend to act more charitably when being watched, those with autism are just as generous when alone.

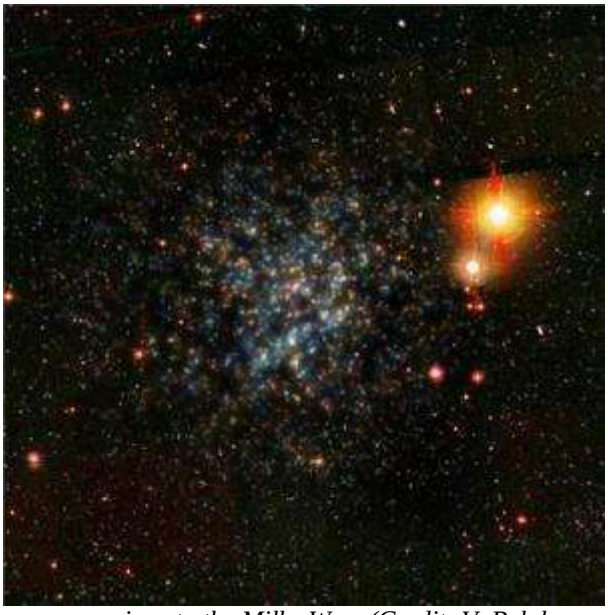
Keise Izuma at the California Institute of Technology in Pasadena and colleagues gave $45 to 10 people with autism and to 11 without, with the option of donating various portions to charity. When under a watchful eye, non-autistic people donated more often and more generously than when alone. People with autism were unaffected by the observer (*Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.1107038108).

Weighing up how we think our actions will be evaluated by others is a complex cognitive task, says Izuma. People with autism may not be influenced in the same way because they are less able to deduce the opinions of the observer.

Situations that are normally socially rewarding fail to activate brain-reward circuitry in autistic children, Izuma adds, so they may also find the idea of a good social reputation less rewarding.

http://www.newscientist.com/article/mg21228345.800-people-with-autism-unaffected-by-social-reputation.html

How the Milky Way Killed Off Nearby Galaxies



An image of the dwarf galaxy Bootes II, one of 21 known companions to the Milky Way. (Credit: V. Belokurov and Sloan Digital Sky Survey collaboration)

ScienceDaily (Oct. 18, 2011) — Two researchers from Observatoire Astronomique de Strasbourg have revealed for the first time the existence of a new signature of the birth of the first stars in our galaxy, the Milky Way. More than 12 billion years ago, the intense ultraviolet light from these stars dispersed the gas of our Galaxy's nearest companions, virtually putting a halt to their ability to form stars and consigning them to a dim future. Now Pierre Ocvirk and Dominique Aubert, members of the Light in the Dark Ages of the Universe (LIDAU) collaboration, have explained why some galaxies were killed off, while stars continued to form in more distant objects.

The two scientists publish their results in the October issue of the letters of the journal *Monthly Notices of the Royal Astronomical Society*.

The first stars of the Universe appeared about 150 million years after the Big Bang. Back then, the hydrogen and helium gas filling the universe was cold enough for its atoms to be electrically neutral. As the ultraviolet (UV) light of the first stars propagated through this gas, it broke apart the proton-electron pairs that make up hydrogen atoms, returning them to the so-called plasma state they experienced in the first moments of the Universe. This process, known as reionisation, also resulted in significant heating, which had dramatic consequences: the gas became so hot that it escaped the weak gravity of the lowest mass galaxies, thereby depriving them of the material needed to form stars.

It is now widely accepted that this process can explain the small number and large ages of the stars seen in the faintest dwarf galaxy satellites of the Milky Way. It also helps scientists understand why galaxies like the Milky Way have so few satellites around them -- the 'missing satellites' problem. The stripping out of gas from these galaxies makes them sensitive probes of the UV radiation in the reionisation epoch.

The satellite galaxies are also relatively close, from 30000 to 900000 light-years away, which allows us to study them in great detail, something that will be enhanced by the coming generation of larger telescopes.

Comparing the population of their stars in each galaxy with its position could give us a unique insight into the structure of the UV radiation emitted from the earliest stars in the Milky Way.

Until now, models for this process assumed that the radiation leading to the removal of gas from galaxy satellites was produced collectively by all the large galaxies nearby, resulting in a uniform background of UV light. The new model put together by the two French researchers proves this assumption wrong.

Ocvirk and Aubert looked at the way the invisible 'dark matter' that makes up about 23% of the Universe structured itself with the stars in our Galaxy and its environs from shortly after the Big Bang to the present day. They used the high resolution numerical simulation Via Lactea II to model the formation of stars in gas trapped in the dark matter haloes that envelop galaxies, and then to describe how this gas reacted to UV radiation.

Pierre Ocvirk comments, "This is the first time that a model accounts for the effect of the radiation emitted by the first stars formed at the centre of the Milky Way on its satellite galaxies.

'In contrast to previous models, the radiation field produced is not uniform, but decreases in intensity as one moves away from the centre of the Milky Way.

'The satellite galaxies close to the galactic centre see their gas evaporate very quickly. They form so few stars that they can be undetectable with current telescopes. At the same time, the more remote satellite galaxies experience on average a weaker irradiation. Therefore they manage to keep their gas longer, and form more stars. As a consequence they are easier to detect and appear more numerous."

The new model appears to be a close match to observations of our Galaxy and its neighbourhood and suggests that the first stars of our galaxy played a major role in the photo-evaporation of the satellite galaxies' gas, adds Dr Ocvirk. "It is not large nearby galaxies but our own that caused the demise of its tiny neighbours, asphyxiating them through its intense radiation."

Story Source:

The above story is reprinted from materials provided by **Royal Astronomical Society (RAS)**.

Note: ScienceDaily reserves the right to edit materials for content and length. For original reprint permissions, please contact the source cited above.

Journal Reference:

1. Pierre Ocvirk, Dominique Aubert. **A signature of the internal reionisation of the Milky Way?** *Monthly Notices of the Royal Astronomical Society*, 2011 [link]

http://www.sciencedaily.com/releases/2011/10/111018092155.htm

Chronic fatigue syndrome eased by cancer drug

- Updated 10:17 20 October 2011 by **Andy Coghlan**

An anti-cancer drug could hold the key to treating chronic fatigue syndrome (CFS). Symptoms of the disease eased in 10 of 15 patients given rituximab, an anti-lymphoma drug.

Rituximab works by destroying white blood cells that make antibodies, called B cells. The results of the trial therefore suggest that these white blood cells might be involved in causing CFS – a disorder also known as myalgic encephalomyelitis (ME), and one that has so far defied explanation.

The research was jointly led by Øystein Fluge and Olav Mella at the Haukeland University Hospital in Bergen, Norway. Their team discovered by accident that rituximab might work against CFS after seeing symptoms ease in a patient who had both lymphoma and CFS.

"We think it affects all symptoms [of CFS], so it must touch the central pathological mechanism causing the disease," Fluge says.

Two of the 15 people in the trial appear to have completely recovered since they first received the drug three years ago. "Those two are both back at work," Mella says.

Dramatic results

"It's the most encouraging drug result so far in the history of this disease," according to Charles Shepherd, medical adviser to the UK ME Association. "Although it's a small trial, it's produced dramatic results."

The researchers say that following two doses of the drug being given in the first two weeks of the trial, there was a lag of three to eight months before symptoms began to subside. They say this delayed response tallies with the idea that CFS is caused by autoantibodies – antibodies, made by B cells, that mistakenly attack the body's own tissues.

Rituximab is itself an antibody designed to target and destroy B cells. Mella says that all the B cells are gone within two weeks or so of the treatment, but autoantibodies typically survive in the body for another two or three months. "Washing out these antibodies is the most probable explanation for the time lag in benefits," he says.

The researchers found no trace of XMRV, a mouse leukaemia virus once implicated as a possible cause of CFS. The virus has now been virtually eliminated as a possible cause.

Blind alley

"We looked as hard as we could for it, by several methods, but the search was negative," Fluge says. "We think suggestions it was XMRV [causing CFS] have turned out to be a blind alley, caused by contamination of samples."

Last month, one of the authors of the 2009 paper that implicated XMRV retracted his data from that study after acknowledging that the virus was present through contamination.

"XMRV is dead, a sad and disappointing story that raised a lot of false hopes for patients," says Shepherd. He adds that it is important not to raise hopes again by over-hyping the rituximab results. "We're still a long way

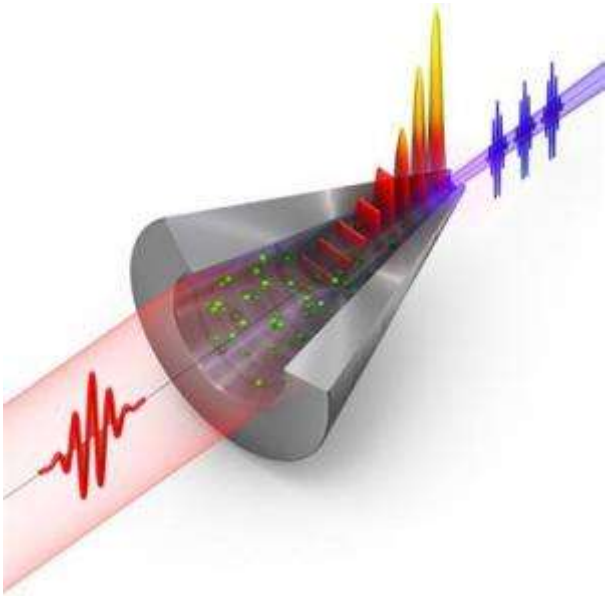
from making this drug more widely available, but if someone wants to mount a UK trial, we'd look at that," he said.

Encouraged by the extended remission of two of the people in the trial, the Norwegian researchers are now checking whether further, periodic doses of rituximab could permanently keep the symptoms of CFS at bay. Mella says it is possible that the five who saw no benefits from the trial might have done so eventually if they had received further doses.

Journal reference: *PLoS One*, in press

http://www.newscientist.com/article/dn21065-chronic-fatigue-syndrome-eased-by-cancer-drug.html

Nano Funnel Used to Generate Extreme Ultraviolet Light Pulses



Scheme of the generation of EUV light by the 3D nano funnel. The infrared light (shown in red) is incident at the entrance of the Xe (green depicted particles) filled nano funnel (shown as a half-cut). The surface plasmon polariton fields (wave pattern) concentrate near the tip of the structure. Extreme ultraviolet light (shown in purple) is generated in the enhanced fields in Xe and exits the funnel through the small opening, while the infrared light cannot penetrate the small opening and is back-reflected. (Credit: Christian Hackenberger)

ScienceDaily (Oct. 17, 2011) — If you want to avoid spilling when you are pouring liquids in the kitchen you may appreciate a funnel. Funnels are not only useful tools in the kitchen. Light can also be efficiently concentrated with funnels. In this case, the funnels have to be about 10.000-times smaller.

An international team of scientists from the Korea Advanced Institute of Science and Technology (KAIST) in Daejeon (South Korea), the Max Planck Institute of Quantum Optics (MPQ) in Garching (Germany), and the Georgia State University (GSU) in Atlanta (USA) has now managed to concentrate the energy of infrared light pulses with a nano funnel and use the concentrated energy to generate extreme ultraviolet light flashes. These flashes, which repeated 75 million times per second, lasted only a few femtoseconds. The new technology can help in the future to measure the movement of electrons with the highest spatial and temporal resolution.

Light is convertible. The wavelengths composing the light can change through interactions with matter, where both the type of material and shape of the material are important for the frequency conversion. An international team of scientists from the Korea Advanced Institute of Science and Technology (KAIST), the Max Planck Institute of Quantum Optics (MPQ), and the Georgia State University (GSU) has now modified light waves with a nano funnel made out of silver. The scientists converted femtosecond laser pulses in the infrared spectral range to femtosecond light flashes in the extreme ultraviolet (EUV). Ultrashort, pulsed EUV light is used in laser physics to explore the inside of atoms and molecules. A femtosecond lasts only a millionth of a billionth of a second.

Light in the infrared (IR) can be converted to the EUV by a process known as high-harmonic generation, whereby the atoms are exposed to a strong electric field from the IR laser pulses. These fields have to be as strong as the fields holding the atom together. With these fields electrons can be extracted from the atoms and

accelerated with full force back onto the atoms. Upon impact highly energetic radiation in the EUV is generated.

To reach the necessary strong electric fields for the production of EUV light, the team of scientists has now combined this scheme with a nano funnel in order to concentrate the electric field of the light. With their new technology, they were able to create a powerful EUV light source with wavelengths down to 20 nanometers. The light source exhibits a so far unreached high repetition rate: the few femtoseconds lasting EUV light flashes are repeated 75 million times per second.

The core of the experiment was a small, only a few micrometers long, slightly elliptical funnel made out of silver and filled with xenon gas. The tip of the funnel was only ca. 100 nanometers wide. The infrared light pulses were sent into the funnel entrance where they travel through towards the small exit. The electromagnetic forces of the light result in density fluctuations of the electrons on the inside of the funnel. Here, a small patch of the metal surface was positively charged, the next one negative and so on, resulting in new electromagnetic fields on the inside of the funnel, which are called surface plasmon polaritons. The surface plasmon polaritons travel towards the tip of the funnel, where the conical shape of the funnel results in a concentration of their fields. "The field on the inside of the funnel can become a few hundred times stronger than the field of the incident infrared light. This enhanced field results in the generation of EUV light in the Xe gas.", explains Prof. Mark Stockman from GSU.

The nano funnel has yet another function. Its small opening at the exit acts as "doorman" for light wavelengths. Not every opening is passable for light. If the opening is smaller than half of a wavelength, the other side remains dark. The 100 nanometer large opening of the funnel did not allow the infrared light at 800 nm to pass. The generated EUV pulses with wavelengths down to 20 nanometers passed, however, without problems. "The funnel acts as an efficient wavelength filter: at the small opening only EUV light comes out.", explains Prof. Seung-Woo Kim from KAIST, where the experiments were conducted.

"Due to their short wavelength and potentially short pulse duration reaching into the attosecond domain, extreme ultraviolet light pulses are an important tool for the exploration of electron dynamics in atoms, molecules and solids", explains Seung-Woo Kim. Electrons are extremely fast, moving on attosecond timescales (an attosecond is a billionth of a billionth of a second). In order to capture a moving electron, light flashes are needed, which are shorter than the timescale of the motion. Attosecond light flashes have become a familiar tool in the exploration of electron motion. With the conventional techniques, they can only be repeated a few thousand times per second. This can change with the nano funnel. "We assume that the few femtosecond light flashes consist of trains of attosecond pulses", argues Matthias Kling, group leader at MPQ. "With such pulse trains, we should be able to conduct experiments with attosecond time resolution at very high repetition rate."

The repetition rate is important for e.g. the application of EUV pulses in electron spectroscopy on surfaces. Electrons repel each other by Coulomb forces. Therefore, it may be necessary to restrict the experimental conditions such that only a single electron is generated per laser shot. With low repetition rates, long data acquisition times would be required in order to achieve sufficient experimental resolution. "In order to conduct experiments with high spatial and temporal resolution within a sufficiently short time, a high repetition rate EUV source is needed", explains Kling. The novel combination of laser technology and nanotechnology can help in the future to record movies of ultrafast electron motion on surfaces with so far unreached temporal and spatial resolution in the attosecond-nanometer domain.

Story Source:

The above story is reprinted from materials provided by **Max Planck Institute of Quantum Optics**.

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1. In-Yong Park, Seungchul Kim, Joonhee Choi, Dong-Hyub Lee, Young-Jin Kim, Matthias F. Kling, Mark I. Stockman, Seung-Woo Kim. **Plasmonic generation of ultrashort extreme-ultraviolet light pulses**. *Nature Photonics*, 2011; DOI: 10.1038/NPHOTON.2011.258

http://www.sciencedaily.com/releases/2011/10/111017092344.htm

Drug addicts switch to inject in economic decline

- 20 October 2011
- Magazine issue 2835.

DRUG users are more likely to reach for the needle when an economic downturn bites.

An analysis of figures from rehabilitation centres in France has revealed that as financial markets nosedived three years ago, some drug users stopped snorting or swallowing cocaine. They started injecting the drug instead, says Christian Ben Lakhdar at Lille Catholic University, France.

"Between 2007 and 2008, whilst salary growth rates were falling significantly, the proportion of injecting drug users rose by 1.7 per cent," he says (*International Journal of Drug Policy*, DOI: 10.1016/j.drugpo.2011.03.004).

He speculates that the switch is driven by cost, as less of a drug is needed to achieve a high when injected.

Whether or not Ben Lakhdar's hypothesis is correct, the results of his analysis suggest that economic hardship may encourage drug users to turn to riskier methods of dosing themselves that might expose them to infectious diseases - something he thinks should be addressed in future government health policies.

A return to economic growth could reverse the situation, though. "Theoretically, when the income of users increases, an addict may decide to return to inhaling," he says.

http://www.newscientist.com/article/mg21228353.800-drug-addicts-switch-to-inject-in-economic-decline.html

Seeing Through Walls: New Radar Technology Provides Real-Time Video of What's Going On Behind Solid Walls

Lincoln Lab researchers have built a system that can see through walls from some distance away, giving an instantaneous picture of the activity on the other side. (Credit: Lincoln Lab, MIT)

ScienceDaily (Oct. 18, 2011) — The ability to see through walls is no longer the stuff of science fiction, thanks to new radar technology developed at MIT's Lincoln Laboratory.

Much as humans and other animals see via waves of visible light that bounce off objects and then strike our eyes' retinas, radar "sees" by sending out radio waves that bounce off targets and return to the radar's receivers. But just as light can't pass through solid objects in quantities large enough for the eye to detect, it's hard to build radar that can penetrate walls well enough to show what's happening behind. Now, Lincoln Lab researchers have built a system that can see through walls from some distance away, giving an instantaneous picture of the activity on the other side.

The researchers' device is an unassuming array of antenna arranged into two rows -- eight receiving elements on top, 13 transmitting ones below -- and some computing equipment, all mounted onto a movable cart. But it has powerful implications for military operations, especially "urban combat situations," says Gregory Charvat, technical staff at Lincoln Lab and the leader of the project.

Waves through walls

Walls, by definition, are solid, and that's certainly true of the four- and eight-inch-thick concrete walls on which the researchers tested their system.

At first, their radar functions as any other: Transmitters emit waves of a certain frequency in the direction of the target. But in this case, each time the waves hit the wall, the concrete blocks more than 99 percent of them

from passing through. And that's only half the battle: Once the waves bounce off any targets, they must pass back through the wall to reach the radar's receivers -- and again, 99 percent don't make it. By the time it hits the receivers, the signal is reduced to about 0.0025 percent of its original strength.

But according to Charvat, signal loss from the wall is not even the main challenge. "[Signal] amplifiers are cheap," he says. What has been difficult for through-wall radar systems is achieving the speed, resolution and range necessary to be useful in real time. "If you're in a high-risk combat situation, you don't want one image every 20 minutes, and you don't want to have to stand right next to a potentially dangerous building," Charvat says.

The Lincoln Lab team's system may be used at a range of up to 60 feet away from the wall. (Demos were done at 20 feet, which Charvat says is realistic for an urban combat situation.) And, it gives a real-time picture of movement behind the wall in the form of a video at the rate of 10.8 frames per second.

Filtering for frequencies

One consideration for through-wall radar, Charvat says, is what radio wavelength to use. Longer wavelengths are better able to pass through the wall and back, which makes for a stronger signal; however, they also require a correspondingly larger radar apparatus to resolve individual human targets. The researchers settled on S-band waves, which have about the same wavelength as wireless Internet -- that is, fairly short. That means more signal loss -- hence the need for amplifiers -- but the actual radar device can be kept to about eight and a half feet long. "This, we believe, was a sweet spot because we think it would be mounted on a vehicle of some kind," Charvat says.

Even when the signal-strength problem is addressed with amplifiers, the wall -- whether it's concrete, adobe or any other solid substance -- will always show up as the brightest spot by far. To get around this problem, the researchers use an analog crystal filter, which exploits frequency differences between the modulated waves bouncing off the wall and those coming from the target. "So if the wall is 20 feet away, let's say, it shows up as a 20-kilohertz sine wave. If you, behind the wall, are 30 feet away, maybe you'll show up as a 30-kilohertz sine wave," Charvat says. The filter can be set to allow only waves in the range of 30 kilohertz to pass through to the receivers, effectively deleting the wall from the image so that it doesn't overpower the receiver.

"It's a very capable system mainly because of its real-time imaging capability," says Robert Burkholder, a research professor in Ohio State University's Department of Electrical and Computer Engineering who was not involved with this work. "It also gives very good resolution, due to digital processing and advanced algorithms for image processing. It's a little bit large and bulky for someone to take out in the field," he says, but agrees that mounting it on a truck would be appropriate and useful.

Monitoring movement

In a recent demonstration, Charvat and his colleagues, Lincoln Lab assistant staff John Peabody and former Lincoln Lab technical staff Tyler Ralston, showed how the radar was able to image two humans moving behind solid concrete and cinder-block walls, as well as a human swinging a metal pole in free space. The project won best paper at a recent conference, the 2010 Tri-Services Radar Symposium.

Because the processor uses a subtraction method -- comparing each new picture to the last, and seeing what's changed -- the radar can only detect moving targets, not inanimate objects such as furniture. Still, even a human trying to stand still moves slightly, and the system can detect these small movements to display that human's location.

The system digitizes the signals it receives into video. Currently, humans show up as "blobs" that move about the screen in a bird's-eye-view perspective, as if the viewer were standing on the wall and looking down at the scene behind. The researchers are currently working on algorithms that will automatically convert a blob into a clean symbol to make the system more end-user friendly. "To understand the blobs requires a lot of extra training," Charvat says.

With further refinement, the radar could be used domestically by emergency-response teams and others, but the researchers say they developed the technology primarily with military applications in mind. Charvat says, "This is meant for the urban war fighter … those situations where it's very stressful and it'd be great to know what's behind that wall."

Story Source:

The above story is reprinted from materials provided by **Massachusetts Institute of Technology**.

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1. T S Ralston, G L Charvat, J E Peabody. **Real-time through-wall imaging using an ultrawideband multiple-input multiple-output (MIMO) phased array radar system**. *Phased Array Systems and Technology (ARRAY), 2010 IEEE International Symposium*, 12-15 Oct. 2010 DOI: 10.1109/ARRAY.2010.5613314

http://www.sciencedaily.com/releases/2011/10/111018102703.htm

Forest loggers join world's biggest ecology experiment

- Updated 10:09 19 October 2011 by **Rowan Hooper**

Experimental control? *(Image: Rob M. Ewers/Imperial College London)*

If you can't beat 'em, join 'em. Ecologists from around the world are working with the very people who would seem their sworn enemies – rainforest loggers. A massive deforestation programme is going ahead anyway, so the aim is to exploit it to conduct one of the biggest ecological experiments in the world.

Yayasan Sabah – the Sabah Foundation, a Malaysian state-owned company – is felling 75,000 hectares of rainforest on the island of Borneo and converting it to lucrative palm oil plantation. A team led by Rob Ewers at Imperial College London is working with the loggers to make sure that the deforestation has a silver lining for ecological research. For them, some of the tree felling will be an experiment into the ecological effect of habitat fragmentation, and they hope it will give them clues on how to design landscapes to support multiple demands – ecological and commercial – at a minimal cost to the ecosystem.

"We're being pragmatic. You can bang a drum about fighting these companies but I would hope that we can learn more by working with them," says Ewers, who runs the Stability of Altered Forest Ecosystems project (SAFE).

Working to Ewers's experimental design, the loggers will leave patches of rainforest of different sizes, and at different distances from other patches of rainforest, to determine the effects of different levels of deforestation. The Borneo rainforest is a particularly biodiverse region, and is most famously home to the only Asian great ape, the orang-utan. Around 8000 hectares of the plantation will be given over to the experiment, starting in December.

Plantation plans

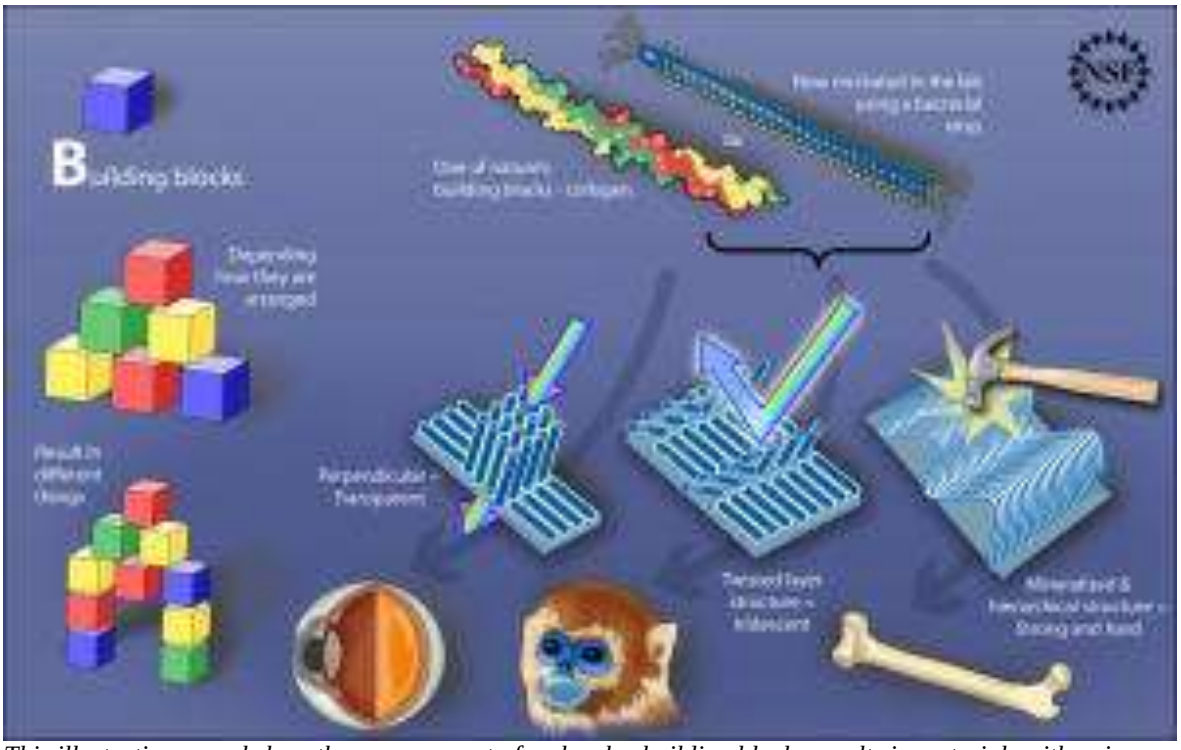
Coordinating the ecologists' experiments with the felling work is Glen Reynolds of the South-East Asia Rainforest Research Programme at Danum Valley Field Centre in the Malaysian state of Sabah on Borneo. Reynolds is also a member of the international Roundtable on Sustainable Palm Oil. "Yayasan Sabah has had long-standing plans to convert about 20 per cent of its 1-million-hectare area to plantations," he says. "This plantation – along with the existing Sabah Softwoods plantations – will get it to about the 20 per cent figure."

Andy Hector of the University of Zurich, Switzerland, runs the Sabah Biodiversity Experiment on forest restoration and says that the SAFE fragmentation project is part of wider ecological projects in Borneo. "Together with a 50-hectare permanent plot in the Danum valley conservation area and the Sabah Biodiversity Experiment, the SAFE project means that we can now study the entire gamut of land use in the region, from pristine forest to fragmented forest and restored forest, to oil palm plantation. It is vital that we work to understand this unique ecosystem while we have the chance."

Journal reference: *Philosophical Transactions of the Royal Society*, DOI: 10.1098/rstb.2011.0049

http://www.newscientist.com/article/dn21056-forest-loggers-join-worlds-biggest-ecology-experiment.html

Viruses Coaxed to Form Synthetics With Microstructures Akin to Those of Corneas, Teeth and Skin



This illustration reveals how the arrangement of molecular building blocks results in materials with unique properties, both in nature and in the laboratory. (Credit: Zina Deretsky, National Science Foundation)

ScienceDaily (Oct. 20, 2011) — Using a simple, single-step process, engineers and scientists at the University of California at Berkeley recently developed a technique to direct benign, filamentous viruses called M13 phages to serve as structural building blocks for materials with a wide range of properties.

By controlling the physical environment alone, the researchers caused the viruses to self-assemble into hierarchically organized thin-film structures, with complexity that ranged from simple ridges, to wavy, chiral strands, to truly sophisticated patterns of overlapping strings of material--results that may also shed light on the self-assembly of biological tissues in nature.

Each film presented specific properties for bending light, and several films were capable of guiding the growth of cells into structures with precise physical orientations.

Led by University of California at Berkeley bioengineer Seung-Wuk Lee and his student and lead author Woo-Jae Chung, the researchers published their findings in the Oct. 20, 2011, issue of *Nature*.

"We are very curious how nature can create many diverse structures and functions from single structural building blocks, such as collagens for animals and celluloses for plants," says Lee. "We have thought that periodic changes in cell activity--such as from day to night, or summer to winter--cause cells to secrete different amounts of macromolecules into confined and curved micro-environments, which might play critical roles in the formation of such sophisticated structures. We believe that biological helical nanofiber structures play a critical role in that process, yet for collagen and cellulose, it has proven quite difficult to engineer their chemical and physical properties to study their assembly process. Therefore, we have been looking for new, helical engineering materials."

The fundamental unit of the novel films is the bacteria-hunting virus, M13. In nature, the virus attacks *Escherichia coli* (*E.coli*), but in bioengineering laboratories, the virus is emerging as a nanoscale tool that can assemble in complex ways due to its long, slender shape and its chiral twist.

"Fortunately," adds Lee, "M13 also possesses an elegant helical surface that makes it a best fit for this study."

In the Berkeley laboratory, the viruses are suspended in a buffered salt solution, into which the engineers dip a thin substrate onto which the viruses can adhere.

By varying the speed at which they withdrew the substrates from the virus-rich solution, the concentration of viruses in the solution, and the ionic concentration, the researchers were able to craft three distinct categories of films.

The simplest film consisted of alternating bands of filaments, with the viral filaments in each band oriented perpendicular to the filaments in the adjacent band. Created using a relatively low concentration of viruses in the starter solution, the bands formed as the substrate rose out of the liquid with a repeated stick-slip motion.

To create films at the next hierarchical level of complexity, the researchers increased the concentration of viruses in the solution, which added more physical constraints to each filament's movement within its environment. As a result, the filaments bunched together into helical ribbons, with a handedness at a broader scale than the handedness of each individual virus.

With even higher concentrations-and in some experiments, greater substrate-pulling speed-the withdrawal yielded ever more complex, yet ordered, bundles of filaments that the researchers referred to as "ramen-noodle-like."

"Nature can dynamically change environmental variables when building new tissues to control an assembly process," adds Chung, the first author. "The beauty of our system is that we can do the same. By altering various parameters we drive assembly towards specific structures in a controlled manner. We can even make different structures on the same substrate."

By varying their techniques, the researchers altered the physical environment for the viral filaments, ultimately forcing the viruses to align into the highly specialized structural films. Each film is different, as expressed by differences in color, iridescence, polarity and other properties.

In one expression of those differences, structures built using faster-pulled substrates yielded patterns that reflected ever-shorter wavelengths of light--50 microns per minute yielded material that reflected light in the orange color range of the spectrum (600 nm), while 80 micrometers per minute yielded blue light (450 nm). The process was precise, allowing the researchers to tune the films to various wavelengths and colors, and induce polarization.

The researchers believe the hierarchical nature of the structures reflects the hierarchical growth patterns of similar biomolecules in nature, processes that result in chiral materials, like collagen, expressing themselves as the building blocks of a cornea in one level of self-assembly and the building blocks of skin tissue at a more complex level. Such self-assembly yields stunning macroscale structures--for example, skin tissue that appears blue on birds and blue-faced monkeys is actually not expressing the light absorption from blue pigment, but the blue light scattered by complex arrays of chiral, molecular building blocks.

"We strongly believe that our novel approach to constructing biomimetic 'self-templated', supramolecular structures closely mimics natural helical fiber assembly," says Lee. "One important reason is that we not only

mimicked the biological structures, but we also discovered structures that have not been seen in nature or the laboratory, like the self-assembled 'ramen-noodle structures' with six distinct order-parameters."

In addition to crafting novel biomolecular films with unique traits, the researchers also demonstrated that the films can serve as biological substrates. The team was able to grow sheets of cells that were oriented based on the texture of such substrates, with one variation incorporating calcium and phosphate to create a biomaterial similar to tooth enamel.

"This novel, self-templating, biomaterials assembly process could be used in many other organic and inorganic materials to build hierarchical structures to tune optical, mechanical and even electrical properties from nano to macro scales," adds NSF Biomaterials program director Joseph Akkara, who helped fund the project. "The reported approaches could be used to investigate mechanisms for diseases such as Alzheimer's, which is caused by amyloid aggregation in our brain tissues. More broadly, the breakthroughs could potentially yield scientific impacts in the area of tissue regeneration and repair."

Story Source:

The above story is reprinted from materials provided by **National Science Foundation**.

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Journal Reference:

1. Woo-Jae Chung, Jin-Woo Oh, Kyungwon Kwak, Byung Yang Lee, Joel Meyer, Eddie Wang, Alexander Hexemer, Seung-Wuk Lee. **Biomimetic self-templating supramolecular structures**. *Nature*, 2011; 478 (7369): 364 DOI: 10.1038/nature10513

http://www.sciencedaily.com/releases/2011/10/111020105908.htm

Hubris came before the Times Atlas's fall

- 15:01 18 October 2011 by **Mark Monmonier**

Hubris? *(Image: The Times Comprehensive Atlas of the World)*

Greenland's ice sheet in full retreat? Most definitely, according to a press release from HarperCollins, eagerly touting the 2011 edition of its *Times Comprehensive Atlas of the World*. Before anyone could compare old and new versions of the "Canada and Greenland" plate, the firm announced that its cartographers "had to erase 15 per cent of Greenland's once-permanent ice cover". The culprit, of course, was climate change.

Climate scientists reacted quickly. They knew the claim was wrong and feared a further backlash from the "climategate" dust-up of late 2009, when hacked email accounts at the University of East Anglia in Norwich suggested that researchers were cherry-picking data to support dubious theories of global warming. In that case, close scrutiny of the emails indicated that it was the hackers, not the researchers, who were spinning the evidence.

So gun-shy atmospheric scientists and glaciologists were keen to pounce on an obvious cartographic misstatement that might reflect negatively on their efforts.

Journalists eagerly joined the fray and promptly dubbed it "Atlasgate". With all of the evidence on the scientists' side, Collins Geo – the HarperCollins imprint responsible for the atlas – offered a feeble explanation that smacked of finger-pointing. Its double-page reference map had been based on information from the US National Snow and Ice Data Center, Collins Geo said. The data centre quickly distanced itself from the project.

Apparently Collins Geo had misinterpreted the data, and this was used to compare the flawed map with an earlier counterpart from 1999 for the press statement that caused all the fuss. The National Snow and Ice Data Center, it became clear, would never have endorsed a 15 per cent shrinkage.

Mega-glitch

How does this kind of mega-glitch happen? An explanation lies partly in Collins Geo's apparent decision to produce the map in house. If that was the case, the firm might have avoided its embarrassment with the

obvious quality-assurance step of sending page proofs to carefully chosen experts. Appropriate scientists seldom decline invitations to serve as reviewers.

Another explanation lies in the inherent persuasiveness of any map with a crisp appearance, a prestigious pedigree and the imprimatur of a large, well-known publishing house – traits that not only confer clout in the cartographic marketplace but invite overconfidence and hubris. Clearly the *Times Atlas* enjoys the prestige of *The Times* newspaper as well as a long-standing association with the venerable John Bartholomew cartographic enterprise, a hallowed Edinburgh, UK, firm that HarperCollins acquired in the late 1980s.

It seems likely there was a belief that external review was unnecessary. Moreover, it seems that none of the publisher's marketing mavens compared their provocative God's-eye view with competing treatments on readily accessible scientific websites or Google Earth.

Hubris is not too strong a word to explain HarperCollins's predicament. A press release promising "concrete evidence of how climate change is altering the face of the planet forever" invites critical scrutiny by mainstream climate scientists as well as the self-proclaimed sceptics who are ever eager to pounce on overreaching pronouncements by the former. In Atlasgate, the pro-warming community, which outnumbers naysayers by perhaps 50 to 1, wasted no time in trashing the HarperCollins map. Sceptics never had an opportunity to cast themselves in their preferred role of the cautious challenger resisting a bloated, politically biased scientific establishment.

Small-scale, highly generalised topographic maps like those offering broad-brush coverage of fickle, fragile or seasonally variable features such as shallow inland seas and glaciers are a challenge for map authors striving for timeliness and accuracy. A *New York Times* blog about Atlasgate acknowledged that coastal ice can be particularly difficult to map on a broad scale because the ice margin is constantly dancing backward and forward. Even so, HarperCollins's claim that "15 per cent of the permanent ice cover… has melted away" can hardly be ascribed to the positional uncertainty of a low-resolution map.

Diplomatic minefield

Publishers of world atlases are leery of another capricious phenomenon: the thickets of geopolitical testiness and diplomacy. In the mid-1990s Microsoft Corporation committed a blunder when a new version of its operating system asked users to select a time zone by clicking on a tiny world map that violated India's take on its border with Pakistan. Quickly noticed by India's map police, the discrepancy precipitated a recall of 200,000 copies of Windows 95 – all because eight out of 800,000 pixels were the wrong colour.

Place names can be equally touchy: South Korea strongly prefers "East Sea" to "Sea of Japan", and Iran has lobbied map publishers to hold the line against Saudi Arabia and its neighbours, who are anxious to replace "Persian Gulf" with "Arabian Gulf".

I have had first-hand experience of this cartographic pickiness. As one of three editors of the *Perthes World Atlas*, also marketed as the *Cambridge World Atlas*, I recently heard of a complaint that a colour scheme inspired by the Olympic rings perpetuated racist stereotypes. In selecting coloured backgrounds for index maps and lists of countries by continent, our designer had used yellow for Asia, brown for Africa and red for North America, while Europe – with a long history of industrial pollution – was coded green. A small matter, perhaps, but a clear warning that cartographic symbols and place names can be a minefield for unwary mapmakers.

In the Perthes example, five years passed before anyone complained. Would HarperCollins's glacial anomaly have been so widely condemned without the provocative press release? Most certainly not. Even so, map

collectors might develop a fondness for the 2011 edition and its famously flawed plate. Like accidentally erroneous stamps and coins, the Atlasgate version offers a unique and intriguing story.

***Mark Monmonier**, a geographer at Syracuse University, New York, is author of How to Lie with Maps and editor of Cartography in the Twentieth Century, a million-word encyclopedia funded by the US National Science Foundation and due for publication in 2014*

http://www.newscientist.com/article/dn21058-hubris-came-before-the-times-atlass-fall.html

Face-To-Face With an Ancient Human

Scanning the skull is done with a laser surface scanner, and the resulting information is loaded into a computer programme. After her programming, Ms Barber could convert the digital construct into a plastic model and then shape muscle, skin and features in clay. (Credit: Jenny Barber)

ScienceDaily (Oct. 20, 2011) — A reconstruction based on the skull of Norway's best-preserved Stone Age skeleton makes it possible to study the features of a boy who lived outside Stavanger 7 500 years ago.

"It is hoped that this reconstruction is a good likeness and that, if someone who knew him in life had been presented with this restoration, they would hopefully have recognised the face," says Jenny Barber, an MSc student at the University of Dundee in Scotland.

She has scientifically rebuilt the face of the strong and stocky Viste Boy, who lived in the Vistehola cave near Stavanger, so that people can now look him right in the eye.

Ms Barber is studying forensic art, an unusual discipline embracing such elements as human anatomy and identification in order to recreate the appearance of an actual person.

This modelling method is primarily employed to assist police investigations, and is little known or used in Norway. But the country's most extensive reconstruction of a Stone Age skeleton has now been achieved.

Complete Discovered in 1907, the Viste Boy represents the most complete Norwegian Stone Age skeleton and the third oldest human remains ever found in the Norway.

His dark-coloured skull and bones are currently on display in a glass case at the Archaeological Museum on the University of Stavanger (UiS).

Analyses show that the Viste Boy was approximately 15 when he died. He stood a bit less than 1.25 metres tall and probably lived in a group of 10-15 people.

From their studies of rubbish in and around Vistehola, the archaeologists determined that this clan ate fish -- mostly cod -- as well as oysters, mussels, cormorants, elk and wild pig.

They also thought that the teenager might have been sickly, which would explain his early death.

Woman The oldest of Norway's known skeletons from the Stone Age belonged to a woman and was discovered at Søgne near Kristiansand in 1994. Her skull has been dated to 8 600 years ago.

She was the subject of Norway's first and hitherto only reconstruction of such ancient bones, which was exhibited at the University of Oslo's Museum of Art History in 1997.

This model was based on data from a series of skull X-rays, which allowed specialists at University College in London to build a three-dimensional recreation.

But reconstruction techniques are steadily improving, and the model of the Viste Boy reproduces his features differently than with the Søgne woman.

"The goal has been to create something as similar as possible to the original," explains Ms Barber. "That's what facial reconstruction is all about -- identification and recognition of a unique person."

Scanned She has scanned the skull belonging to the long-dead youth with a laser surface scanner, which provided accurate data on his anatomy.

The cranium had suffered some damage, so the most complete side was duplicated. To support her work, Ms Barber also drew on a digital copy of the skull of another 15-year-old boy.

Nevertheless, the final anatomy corresponds to all intents and purposes with the original bone.

After her programming, Ms Barber could convert the digital construct into a plastic model and then shape muscle, skin and features in clay.

The clay bust formed the basis for a negative mould, with the finished product then cast in plastic resin and fibreglass. Eyes, ears and other details were finally painted or added.

Deformity Ms Barber's work revealed that the Viste Boy had scaphocephaly ("boat-head"), a congenital deformity which makes the skull long and narrow. She left the modelled head hairless to show this.

"The fact that the boy had scaphocephaly is a medical detail we hadn't observed before," says Mads Ravn, head of research at the Archaeological Museum.

He is very enthusiastic about the job Ms Barber has done, and points to similar work at Denmark's Moesgård Museum to reconstruct the Grauballe Man -- a body recovered from a Danish bog.

He turned out to have a very protruding jaw and close-set eyes, which prompted the theory that he was an executed outcast or criminal, rather than a rich man sacrificed to the gods.

It was also clear that -- like the Tollund Man, another "bog body" -- resembled many contemporary Danes.

The work done by Ms Barber on the Viste Boy also demonstrates that the stocky lad was no weakling.

"This reconstruction indicates that he must have been muscular, quite simply a robust person," she observes. "So it's not certain that he was sickly, as people have thought.

"The bone analysis doesn't bear out such a diagnosis, and he has no other deformities that we know of other than the scaphocephaly."

Great Apart from the more scientific findings, such as the scaphocephaly and the good muscles, Mr Ravn thinks it is great to be able to look such a remote forefather in the eye.

"Just imagine, we can get an idea of how the oldest Norwegian man looked."

He is also very pleased at the opportunities this reconstruction opens up for the museum.

"Our challenge in older archaeology is to present the finds in a good way. Ms Barber's work has given us a fantastic chance to convey flesh and blood through a very ancient relic."

The project is part of the Scientific Archaeological Laboratory research programme at the UiS, which emphasises lab work in cooperation with the museum's Department of Education and Visitor Service.

Ms Barber herself stresses the educational aspect as an important motivation for her work.

"People are drawn to faces. The Viste Boy will probably attract attention in a future exhibition at the museum, bringing the story of Vistehola, the Viste Boy and the other people who lived there more alive for visitors."

She adds that facial reconstruction has been used for educational purposes by museums in many parts of the world, but is not used to any great extent at Norwegian institutions.

Story Source:

The above story is reprinted from materials provided by **The University of Stavanger**. The original article was written by Karen Anne Okstad (Translation by Rolf Gooderham).

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http://www.sciencedaily.com/releases/2011/10/111020084819.htm

Solar lows caused extreme European winters
15:46 10 October 2011

Chelsea Whyte, reporter

2010 saw the coldest November temperature in the UK since 1985, in Llysdinam, Wales *(Image: Rex Features)*

The link between extreme winter weather in North America and Europe - including the cold spells of the last three years - and the 11-year solar cycle is growing stronger.

Last year, **New Scientist** reported that physicists suspected events in the stratosphere linked solar activity to extreme winters in the UK.

Climate scientists at the UK Met Office have done a new analysis of fluctuations in the Sun's UV radiation, which reinforces that link and suggests a mechanism for how solar activity may affect seasonal weather. The team emphasise that their findings do not suggest a link to long-term global warming.

The researchers used satellite measurements to show that fluctuations in solar UV radiation are five times as large as previously thought.

When they plugged the data into the Hadley Centre computer model - one of the leading models of the world climate - they were able to show how these fluctuations affect regional weather.

The BBC's Richard Black explains it nicely:

UV is absorbed in the stratosphere, the upper atmosphere, by ozone. So in the quiet bit of the solar cycle, when there is less UV to absorb, the stratosphere is relatively cooler.

The Hadley Centre model shows that the effects of this percolate down through the atmosphere, changing wind speeds, including the jet stream that circles the globe above Europe, North America and Russia.

The net change is a reduced air flow from west to east, which brings colder air to the UK and northern Europe and re-distributes temperatures across the region.

"Our research confirms the observed link between solar variability and regional winter climate," Sarah Ineson, the lead author on the study, told International Business Times. "It's more than just coincidence, there's a real correlation between ultraviolet levels and meteorological variables."

The authors emphasize that cooler temperatures in Northern Europe are accompanied by warmer ones further south, resulting in no net overall cooling. "It's a jigsaw puzzle, and when you average it up over the globe, there is no effect on global temperatures," Adam Scaife, head of the UK Met Office's Seasonal to Decadal Prediction team, told BBC News.

The UV measurements could lead to better forecasting. "While UV levels won't tell us what the day-to-day weather will do, they provide the exciting prospect of improved forecasts for winter conditions for months and even years ahead. These forecasts play an important role in long-term contingency planning," Ineson told Reuters.

The scientists emphasised that several other factors, such as declining levels of sea ice and El Nino, may have played a role in the unusually chilly winters, reports The Independent, which quotes Ineson as saying: "There are a lot of different factors that affect our winter climate. However, the solar cycle would probably have been acting in a way that gave us those cold winters."

The weather seen around the Atlantic from 2009 to 2011 backs up the finding, but the scientists will further confirm their work with solar UV measurements taken over a longer period.

Journal reference: *Nature Geoscience*, DOI: 10.1038/ngeo1282

http://www.newscientist.com/blogs/shortsharpscience/2011/10/solar-lows-cause-extreme-europ.html

Stranded Dolphins Exhibit Bubbles, and Ability to Recover

A common dolphin is examined by ultrasound after stranding alive on Cape Cod, Mass. (Credit: Image under NOAA Stranding Agreement with International Fund for Animal Welfare (IFAW). Photo by IFAW)

ScienceDaily (Oct. 19, 2011) — Scientists know that the blood and tissues of some deceased beaked whales stranded near naval sonar exercises are riddled with bubbles. It is also well known that human divers can suffer from bubbles-induced decompression sickness, also known as the bends. What researchers know comparatively little about is how living marine mammals handle the compression of lung gas as they dive deep and then resurface.

Now, in a study published online in the *Proceedings of the Royal Society B*, a team that includes researchers from the Woods Hole Oceanographic Institution (WHOI) has confirmed that bubbles do form in live, stranded dolphins. But in many cases, those animals are able to "manage" those bubbles and can resume relatively normal lives of swimming and diving in the ocean.

"Evidence suggests that live dolphins that have been stranded have bubbles that appear not clinically significant," said Michael Moore, a senior research specialist in biology and director of the WHOI Marine Mammal Center.

The multi-institutional research team, led by Sophie Dennison of the Marine Mammal Center in Sausalito Ca., performed ultrasound scans on 22 live stranded and capture-release dolphins. The researchers examined the liver, kidneys, eyes, and blubber-muscle interface.

They found gas in the kidneys of 21 of the live stranded dolphins and in some liver veins of two of the animals. Nine then died or were euthanized, and the presence of bubbles was corroborated by computer tomography and necropsy examinations. Of the remaining 13 that were released, 11 did not re-strand.

The researchers said that off-gassing of supersaturated blood and tissues was the most likely origin for the gas bubbles. "In contrast to marine mammals repeatedly diving in the wild, stranded animals are unable to recompress by diving, and thus may form bubbles," they report in their paper. "Since the majority of beached dolphins released did not re-strand, it also suggests that minor bubble formation is tolerated and will not lead to clinically significant decompression sickness."

The results, Moore said, "suggest that dolphins are possibly managing bubbles routinely to avoid decompression sickness, also known as the bends. Humans likewise manage 'silent bubbles.'" Only a minority of human divers that get bubbles, he added, get the bends.

Moore said it was the observation of bubbles in deceased beaked whales that led to the current study. "In routine decompression, the animal exhibits normal physiology and experiences few bubbles," he said. "But acoustic stressors, such as sonar, seem to change normal bubble management."

"Beaked whales are stranding atypically when exposed to sonar," Moore said. "The beaked whale mortality events have led the current generation of marine mammal physiologists to revisit the question of how marine mammals manage the issue of lung gas being compressed as they dive deeper," he said. "Above the depth of alveolar collapse, a depth at which the gas-exchange surface of the lung is no longer inflated, increasing pressure with depth can cause gases to dissolve in the body; the gases then come back out of solution as they resurface. If this decompression is uncontrolled, bubbles can form. In humans such bubbles can cause joint pain that is relieved by 'bending' limb joints -- hence the popular name. It was thought that marine mammals were immune to such problems, but the beaked whale cases reopened this assumption to fresh scrutiny."

Moore said the study, which was funded by the U.S. Office of Naval Research and the International Fund for Animal Welfare (IFAW), is but one piece to the puzzle of possible effects of how human or environmentally induced changes to ocean conditions might affect the health and behavior of dolphins. Nevertheless, he said, "We have shone a bit more light on bubbles in marine mammals."

Story Source:

The above story is reprinted from materials provided by **Woods Hole Oceanographic Institution**.

Note: ScienceDaily reserves the right to edit materials for content and length. For original reprint permissions, please contact the source cited above.

Journal Reference:

1. S. Dennison, M. J. Moore, A. Fahlman, K. Moore, S. Sharp, C. T. Harry, J. Hoppe, M. Niemeyer, B. Lentell, R. S. Wells. **Bubbles in live-stranded dolphins**. *Proceedings of the Royal Society B: Biological Sciences*, 2011; DOI: 10.1098/rspb.2011.1754

http://www.sciencedaily.com/releases/2011/10/111019191332.htm

Keeping a lid on your digital DNA

- 16 October 2011 by **Jacob Aron**

GENETIC sequencing will soon be cheap enough for everyone to have a digital copy of their own genome. But that also means someone could hack your hard drive or mobile device and gain access to it. If you thought having your email hacked was bad, wait until some digital ne'er-do-well makes off with the information they need for a paternity test. Encrypting the data is the obvious solution, but how?

In the decade or so since researchers first sequenced the human genome, the cost of doing so has fallen from a hundred million dollars to a few thousand. Consumer software that can do anything from testing your genetic compatibility with a partner to solving paternity disputes won't be far behind.

It would not be difficult to encrypt your DNA details to prevent them getting into the wrong hands, but the data would still need decrypting if you wanted it to be tested. That could expose it to unwanted scrutiny.

That's why Emiliano De Cristofaro and colleagues at the University of California, Irvine, have come up with a cryptographic technique that lets you hand over genetic information for testing while still keeping your genome private. They used a method called homomorphic encryption, which allows you to analyse encrypted data and then decrypt the result to give the same answer as would come from analysing the unencrypted data. This would essentially mean someone could examine a digital genome without ever seeing its contents.

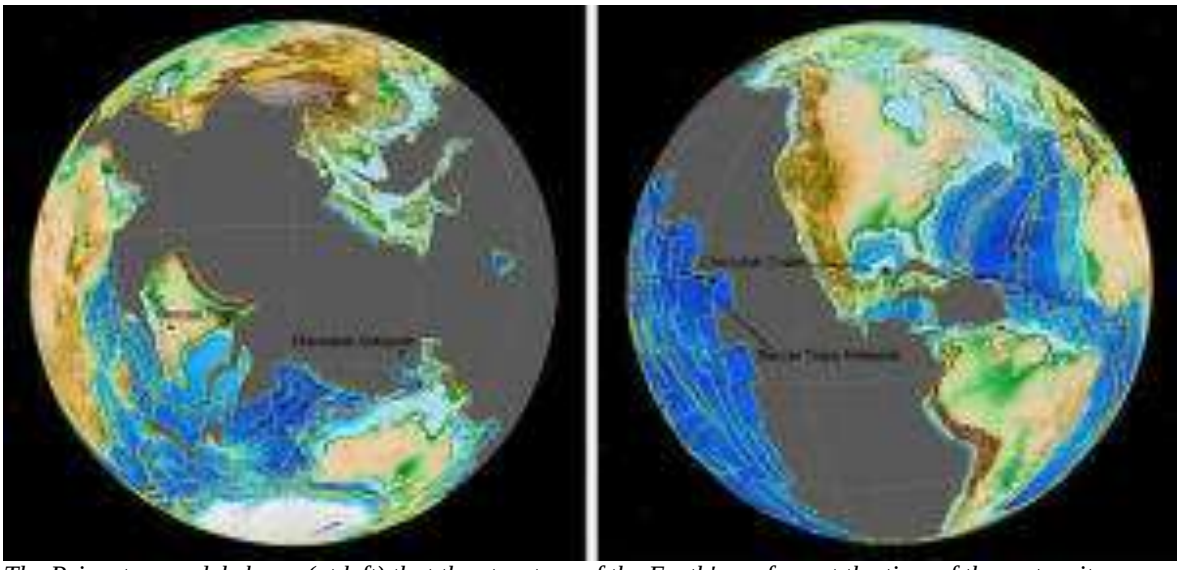
The only problem is that this would require a whole genome to be analysed, and homomorphic encryption is slow in dealing with large amounts of data - a full genome weighs in at around 3 gigabytes. De Cristofaro estimates that comparing two genomes in this way would take about 10 days.

To speed things up, the team has harnessed some of the tricks used in genetic testing. For example, a technique called RFLP uses enzymes to cut DNA strands anywhere a particular sequence appears. This produces fragments of varying length, the comparison of which gives the result of the test. The researchers replicated this method digitally and were able to perform a secure digital paternity test in a fraction of a second - even when running the software on a Nokia N900 smartphone. This means genetic apps can't be far off, De Cristofaro says. The team is presenting the research this week at the ACM Conference on Computer and Communications Security in Chicago.

"Anyone could have their DNA sequenced and carry it on a portable device," says Juan Troncoso-Pastoriza of the University of Vigo in Spain, who previously developed a way to securely search for short strings of DNA. But he warns that cryptography might not be enough: people will also need to be educated about the risks of sharing genetic information. "It's like social networks - it's incredible what people disclose," he says.

http://www.newscientist.com/article/mg21228346.500-keeping-a-lid-on-your-digital-dna.html

Fallout of a Giant Meteorite Strike Revealed in New Model



The Princeton model shows (at left) that the structure of the Earth's surface at the time of the meteorite impact that caused the Chicxulub crater in Mexico would have placed the Deccan Traps in India far west of the crater's antipodal point, instead of directly opposite of the impact. Correspondingly, the model shows (at right) that the meteorite struck far east of the antipodal point for the Deccan Traps, which are remnants of large volcanoes thought to have contributed to the mass extinction event at the end of the Cretaceous period. The model also revealed that the Chicxulub impact, when the Earth's surface and shape are considered, would have likely been too small to cause the Deccan Traps. (Credit: Images by Conor Myhrvold)

ScienceDaily (Oct. 19, 2011) — Seeking to better understand the level of death and destruction that would result from a large meteorite striking Earth, Princeton University researchers have developed a new model that can not only more accurately simulate the seismic fallout of such an impact, but also help reveal new information about the surface and interior of planets based on past collisions.

Princeton researchers created the first model to take into account Earth's elliptical shape, surface features and ocean depths in simulations of how seismic waves generated by a meteorite collision would spread across and within the planet. Current projections rely on models of a featureless spherical world with nothing to disrupt the meteorite's impact, the researchers report in the October issue of *Geophysical Journal International*.

The researchers -- based in the laboratory of Jeroen Tromp, the Blair Professor of Geology in Princeton's Department of Geosciences -- simulated the meteorite strike that caused the Chicxulub crater in Mexico, an impact 2 million times more powerful than a hydrogen bomb that many scientists believe triggered the mass extinction of the dinosaurs 65 million years ago. The team's rendering of the planet showed that the impact's seismic waves would be scattered and unfocused, resulting in less severe ground displacement, tsunamis, and seismic and volcanic activity than previously theorized.

The Princeton simulations also could help researchers gain insight into the unseen surface and interior details of other planets and moons, the authors reported. The simulations can pinpoint the strength of the meteorite's antipodal focus -- the area of the globe opposite of the crater where the energy from the initial collision comes together like a second, smaller impact. The researchers found this point is determined by how the features and composition of the smitten orb direct and absorb the seismic waves. Scientists could identify the planet or moon's characteristics by comparing a crater to the remnants of the antipodal point and calculating how the impact waves spread.

Lead author Matthias Meschede of the University of Munich developed the model at Princeton through the University's Visiting Student Research Collaborators program with co-authors Conor Myhrvold, who earned his bachelor's degree from Princeton in 2011, and Tromp, who also is director of Princeton's Institute for Computational Science and Engineering and a professor of applied and computational mathematics. Meschede describes the findings as follows:

"We have developed the first model to account for how Earth's surface features and shape would influence the spread of seismic activity following a meteorite impact. For the Earth, these calculations are usually made using a smooth, perfect sphere model, but we found that the surface features of a planet or a moon have a huge effect on the aftershock a large meteorite will have, so it's extremely important to take those into account.

"After a meteorite impact, seismic waves travel outward across the Earth's surface like after a stone is thrown in water. These waves travel all the way around the globe and meet in a single point on the opposite side from the impact known as the antipode. Our model shows that because the Earth is elliptical and its surface is heterogeneous those waves travel with different speeds in different areas, changing where the waves end up on the other side of the world and the waves' amplitude when they get there. These waves also are influenced by the interior. The effect on the opposite side is a result of the complete structure.

"We began by asking whether the meteorite that hit the Earth near Chicxulub could be connected to other late-Cretaceous mass-extinction theories. For example, there's a prominent theory that the meteorite triggered huge volcanic eruptions that changed the climate. These eruptions are thought to have originated in the Deccan Traps in India, approximately on the opposite side of the Earth from the Chicxulub crater at the time. Because North America was closer to Europe and India was closer to Madagascar during the Cretaceous period, however, it seemed questionable that the Deccan Traps were at the Chicxulub impact's antipode.

"Regarding the mass extinction, we saw from our measurements that a Chicxulub-sized impact alone would be too small to cause such a large volcanic eruption as what occurred at the Deccan Traps. Our model shows that the antipodal focusing of the seismic wave from such an impact was hugely overestimated in previous calculations, which used a spherical-Earth model.

"The Earth's maximum ground displacement at this point has been calculated to be 15 meters, which is extreme. The first outcome of our model was that this is reduced by a large amount to about three to five meters. On the spherical model, all the waves come together at exactly one point and, as a result, have a huge amplitude. We found the waves are disturbed by surface features and take on a more ragged structure, meaning less energy is concentrated at the antipode.

"But our results go beyond Chicxulub. We can, in principle, now estimate how large a meteorite would have to have been to cause catastrophic events. For instance, we found that if you increase the radius of the Chicxulub meteorite by a factor of five while leaving its velocity and density the same, it would have been large enough to at least fracture rocks on the opposite side of the planet. Our model can be used to estimate the magnitude and effect of other major impacts in Earth's past. A similar model could be used to study other examples of antipodal structures in the solar system, such as the strange region opposite the gigantic Caloris Basin crater on Mercury.

"Also, such a model can help examine the interior of a moon or planet by comparing the size of the crater to the amount of antipodal disruption -- you only need two pictures, basically. One could correlate a certain impact magnitude with the observed antipodal effect -- which is dependent on the object's surface features -- and better understand the heterogeneity of the surface by how the energy was distributed between those two points. That can reveal information about not only the surface structure of the body at the time of the impact, but also the interior, such as if the planet has a hard core."

This research was supported by the National Science Foundation and the German Academic Exchange Service.

Story Source:

The above story is reprinted from materials provided by **Princeton University**. The original article was written by Morgan Kelly.

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http://www.sciencedaily.com/releases/2011/10/111019173406.htm

Twitter may influence the spread of disease

- 16:19 17 October 2011 by **Debora MacKenzie**

The northern hemisphere's flu season will soon be here. If you are getting vaccinated and tweet it, will your followers follow you to the doctor's surgery – or are they the sort of people who have an appointment booked already?

Researchers in the US have mined Twitter to map who tweets for and against flu vaccination, and found that the results parallel the prevalence of vaccination. Now they want to find out whether Twitter just reflects attitudes to vaccination or helps to spread them.

Marcel Salathé of Penn State University in University Park, Pennsylvania, collected 478,000 tweets referring to flu in late 2009, when vaccination for the swine flu pandemic became available in the US. A team of students categorised 10 per cent of the tweets as for, against or neutral about vaccination. Then these tweets were used to create a computerised screening test that classified the rest.

Each tweet carried data on the region it came from. The team found that vaccination rates were lower in areas where tweets tended to be more negative about vaccination, and vice versa.

Such mapping could help target health information campaigns, says Salathé. "If we know where people are particularly misinformed, then we know where we should do a better job at informing."

Echo chambers

Salathé is also using Twitter to track several other health problems, including obesity, for which social attitudes may influence their spread.

The flu tweets flowed in "echo chambers", mainly between people who agreed with each other. Salathé is now trying to work out whether that's because people talk to people who think like them, or think like people they talk to. He is developing new statistical tools to tease this out of Twitter data. "Preliminary analysis shows it is very likely that negative opinions of vaccination are contagious on online social networks," he says.

That could be bad news as the number of people who refuse to be vaccinated grows. Twitter is a rich source of data for mapping these attitudes, says Salathé. Efforts to change hearts and minds may or may not work, "but if you don't even know where your problem is, you're never going to solve it".

Journal reference: *PLoS Computational Biology*, DOI: 10.1371/journal.pcbi.1002199

http://www.newscientist.com/article/dn21055-twitter-may-influence-the-spread-of-disease.html

Solving the Mysteries of Short-Legged Neandertals

Sheep. The researchers decided to study different types of bovids -- a group of mammals including gazelles, antelopes, goats and sheep -- since these animals live in warm and cold environments on both flat and hilly terrain. (Credit: © rparys / Fotolia)

ScienceDaily (Oct. 19, 2011) — While most studies have concluded that a cold climate led to the short lower legs typical of Neandertals, researchers at Johns Hopkins have found that lower leg lengths shorter than the typical modern human's let them move more efficiently over the mountainous terrain where they lived. The findings reveal a broader trend relating shorter lower leg length to mountainous environments that may help explain the limb proportions of many different animals.

Their research was published online in the *American Journal of Physical Anthropology* and will appear in print in the November issue.

"Studies looking at limb length have always concluded that a shorter limb, including in Neandertals, leads to less efficiency of movement, because they had to take more steps to go a given distance," says lead author Ryan Higgins, graduate student in the Johns Hopkins Center of Functional Anatomy and Evolution. "But the other studies only looked at flat land. Our study suggests that the Neandertals' steps were not less efficient than modern humans in the sloped, mountainous environment where they lived."

Neandertals, who lived from 40,000 to 200,000 years ago in Europe and Western Asia, mostly during very cold periods, had a smaller stature and shorter lower leg lengths than modern humans. Because mammals in cold areas tend to be more compact, with a smaller surface area, scientists have normally concluded that it was the region's temperature that led to their truncated limbs compared to those of modern humans, who lived in a warmer environment overall.

However, Higgins' group adds a twist to this story. Using a mathematical model relating leg proportions to angle of ascent on hills, he has calculated that Neandertals on a sloped terrain would have held an advantage while moving compared to their long-legged cousins, the modern humans. Because the area Neandertals inhabited was more mountainous than where modern humans tended to live, the researchers say that this assessment paints a more accurate picture of the Neandertals' efficiency of movement as compared to humans. "Their short lower leg lengths actually made the Neandertals more adept at walking on hills," explains Higgins.

But the group didn't stop there. "In our field, if you want to prove an adaptation to the environment, like mountains leading to shorter leg lengths, you can't just look at one species; you have to look at many species

in the same situation, and see the same pattern happening over and over again," says Higgins. "We needed to look at other animals with similar leg construction that existed in both flat and mountainous areas, as Neandertals and humans did, to see if animals tended to have shorter lower leg length in the mountains."

The researchers decided to study different types of bovids--a group of mammals including gazelles, antelopes, goats and sheep--since these animals live in warm and cold environments on both flat and hilly terrain. The group took data from the literature on bovid leg bones and found that they fit the pattern: mountainous bovids, such as sheep and mountain goats, overall had shorter lower leg bones than their relatives on flat land, such as antelopes and gazelles, even when they lived in the same climates.

Investigating closely related bovids brought this trend into even sharper relief. Most gazelles live on flat land, and the one mountainous gazelle species examined had relatively shorter lower legs, despite sharing the same climate. Also, among caprids (goats and sheep), which mostly live on mountains, the one flat land member of the group exhibited relatively longer lower legs than all the others.

"Biologists have Bergman's and Allen's Rules, which predict reduced surface area to body size and shorter limbs in colder environments," says Higgins. "Our evidence suggests that we can also predict certain limb configurations based on topography. We believe adding the topic of terrain to ongoing discussions about limb proportions will allows us to better refine our understanding of how living species adapt to their environments. This improved understanding will help us better interpret the characteristics of many fossil species, not just Neandertals."

Funding for this research was provided by the Johns Hopkins Center of Functional Anatomy and Evolution.

This study was completed by Ryan Higgins and Christopher B. Ruff, Ph.D., also of the Johns Hopkins Center of Functional Anatomy and Evolution.

Story Source:

The above story is reprinted from materials provided by **Johns Hopkins Medicine**.

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http://www.sciencedaily.com/releases/2011/10/111019172103.htm

Iris scanner could tell your race and gender

- 18 October 2011 by **Lakshmi Sandhana**

Magazine issue 2834

A man, definitely *(Image: Ian Waldie/Getty Images News)*

IRIS images may soon be able to do more than just verify your identity - they may confirm your race and gender too.

The iris controls the size of the pupil and gives a person's eyes their colour. It grows into a complex and unique pattern as a fetus develops and remains the same throughout a person's life. This fact has been successfully exploited in iris-based biometric systems, which work on the principle that each iris is completely different to any other.

But that is not strictly true, as Kevin Bowyer at the University of Notre Dame in South Bend, Indiana and his colleagues have found. They have developed a system that can pick out similarities between irises, instead of differences. Initial tests show it can distinguish between people of two different racial backgrounds and shows promise in determining gender.

"You might assume that there is no similarity in iris texture," says Bowyer, "but you would be wrong."

In a typical iris scan, a camera snaps an image of a person's eye while it is bathed in near-infrared light. Software identifies the iris portion of the eye, and then analyses 1024 sample regions, looking for patterns in the way the delicate filaments of tissue, known as the stroma, reflect light. This unique information is then used to generate a code of binary numbers.

Bowyer's team's method adds a layer of complexity. For each of the sample regions, their software identifies features such as lines or spots in the stroma, and saves that information. It also records how brightness varies across each region.

This richer set of attributes allowed the researchers to train an algorithm to look for common features among irises of known ethnicity and gender. When they turned the system on a database of unknown irises of 1200 people, it predicted whether a person was Chinese or Caucasian with over 90 per cent accuracy, and correctly

identified gender 62 per cent of the time. The team will present the research next month at the IEEE International Conference on Technologies for Homeland Security in Waltham, Massachusetts.

The reason for the low success rate in predicting gender, Bowyer says, is because the team have not yet fully worked out which textural features of the iris correspond to gender. He says that the fact that the results are better than chance means it should be possible to improve the system's ability to determine gender. The team has also not yet tested the system on people with other or more complex ethnic backgrounds.

Aside from making it difficult for people to fabricate a false identity in which they have a different gender or race, the method could speed up searches within large iris databases by reducing the data subset to be searched. It would also be possible to count the number of people belonging to different ethnic backgrounds coming into a country without recording their identity.

"It is interesting work that does fly a bit in the face of conventional thinking," says Vijayakumar Bhagavatula of Carnegie Mellon University in Pittsburgh, Pennsylvania. Iris patterns are generally considered to be highly random; even a person's left and right iris are different. Still, he says, "in the absence of an established biological connection between iris pattern and gender or ethnicity, there is no way to know if the features being used by Bowyer are the 'best' ones to use. There may be other features that give better prediction rates."

The iris code

Today, most commercial iris-recognition systems use an algorithm developed by John Daugman of the University of Cambridge and patented worldwide in 1992.

Daugman's insight lay in computerising a process to mathematically analyse the random patterns visible within the iris image to create a binary code called an iris code. This code is so individual to a person - even identical twins have different iris codes - that only 70 per cent of it needs to match for an iris comparison to be considered successful. The chance of a greater than 70 per cent match between two irises is less than 1 in 10 billion.

http://www.newscientist.com/article/mg21228346.000-iris-scanner-could-tell-your-race-and-gender.html

Fiery Volcano Offers Geologic Glimpse Into Land That Time Forgot

The first scientists to witness exploding rock and molten lava from a deep sea volcano, seen during a 2009 expedition, report that the eruption was near a tear in the Earth's crust that is mimicking the birth of a subduction zone. (Credit: NSF/NOAA)

ScienceDaily (Oct. 19, 2011) — The first scientists to witness exploding rock and molten lava from a deep sea volcano, seen during a 2009 expedition, report that the eruption was near a tear in Earth's crust that is mimicking the birth of a subduction zone.

Scientists on the expedition collected boninite, a rare, chemically distinct lava that accompanies the formation of Earth's subduction zones.

Nobody has ever collected fresh boninite and scientists never had the opportunity to monitor its eruption before, said Joseph Resing, University of Washington oceanographer and lead author of an online article on the findings in Nature Geoscience. Earth's current subduction zones are continually evolving but most formed 5 million to 200 million years ago. Scientists have only been able to study boninite collected from long-dead, relic volcanos millions of years old.

Resing was chief scientist on the expedition, funded by the National Oceanic and Atmospheric Administration and the National Science Foundation, that pinpointed the location of the West Mata volcano, erupting 4,000 feet (1,200 meters) below the surface in the Southwest Pacific Ocean.

"Everything about the eruption itself -- how fast, how intense, the ratio of lava to explosive fragments, the amount and composition of gas released -- is new to us," said co-author Kenneth Rubin, University of Hawaii geologist. "Plus, having a young, fresh occurrence of this very rare rock type to study gives us the opportunity to examine subtle chemical and mineralogical variations in a pristine specimen."

At subduction zones the oceanic crust on one tectonic plate slides beneath another, producing abundant volcanism and contributing heat, gases and mineral-laden fluids to ocean waters. Scientists have long studied the impact of subduction zones on geological and geochemical cycles. To puzzle out how subduction zones form and evolve they study inactive contemporary marine volcanos that do not produce boninite and they collect and study boninite lavas collected on land and examine cores collected from the deep sea.

"West Mata lies above the subducting Pacific plate and is part of the rapidly expanding Lau Basin, which is bounded by Samoa, Tonga and Fiji," Resing said. "The large bend at the northern end of the Tonga trench produces a tear in the Pacific plate and creates unusual lavas that usually only form at very young subduction zones."

Conditions are right for boninite to form, there's lots of seawater released from subducting rock that mixes into relatively shallow mantle that has previously melted, causing the mantle to remelt at high temperatures. Boninite lavas are believed to be among the hottest from volcanos that erupt on Earth.

"What makes this exciting is how uncommon these eruptions of boninite are, both now and in the past," Rubin said. "Locked within the boninite is critical information about the rates and magnitudes of subduction-zone magmatism and global geochemical cycles."

The scientists writing in *Nature Geoscience* think the release of gaseous water, carbon dioxide and sulfur dioxide from the slab is the reason the eruption was so explosive. No one realized such energetic eruptions happened so deep, Resing says. Streams of red and gold lava 35 feet long shot through the water and lava-skinned bubbles some three feet across emerged.

West Mata, which the scientists estimate has been erupting for at least three years, and eight other elongated volcanoes that overlap each other in the northeast Lau Basin sit within one of the most magmatically active areas on Earth, Resing says.

"The basin may prove an important place to study submarine volcanic eruptions in relation to early stages of subduction," he said.

Rubin and Robert Embley, with NOAA's Pacific Marine Environmental Laboratory, Newport, Ore., and co-author on the paper, will return to the area in November for further study and to try to determine if the volcano is still actively erupting.

"Observing the eruption in real time was a rare and special opportunity because we know so little about how submarine volcanic activity behaves," Embley said. "This is one of only a handful of 'glimpses' of the process we've had to date and is the first time we've actually observed natural submarine 'earthlight' from the glowing magma."

Resing's UW appointment is through NOAA and the Joint Institute for the Study of the Atmosphere and Oceans based at the UW. Other co-authors from the UW and the joint institute are Marvin Lilley, David Butterfield and Nathaniel Buck. Other co-authors are from NOAA-Pacific Marine Environmental Laboratories, Oregon State University, ETH Zurich, Marine Biological Laboratory, Woods Hole Oceanographic Institutions, Monterey Bay Aquarium Research Institute, University of Tulsa, Oregon Health & Science University and Portland State University.

The project was funded by NSF, NOAA and the David and Lucile Packard Foundation.

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http://www.sciencedaily.com/releases/2011/10/111019170404.htm

Himalayas could become the Saudi Arabia of solar

- 17:33 18 October 2011 by **Chelsea Whyte**

Magazine issue 2835.

Fantastic light, just waiting to be tapped *(Image: Colin Monteath/Hedgehog House/Minden Pictures/NGS)*

Think of solar arrays and you'll probably picture panels under blistering desert heat – but we may be able to get more energy from solar panels on snow-capped mountains.

Kotaro Kawajiri at the Massachusetts Institute of Technology mapped solar irradiance across the globe in collaboration with colleagues in Japan. They found that some of the highest levels of sunlight can be found in the Himalayas and the Andes: at altitude, less light is lost to the atmosphere.

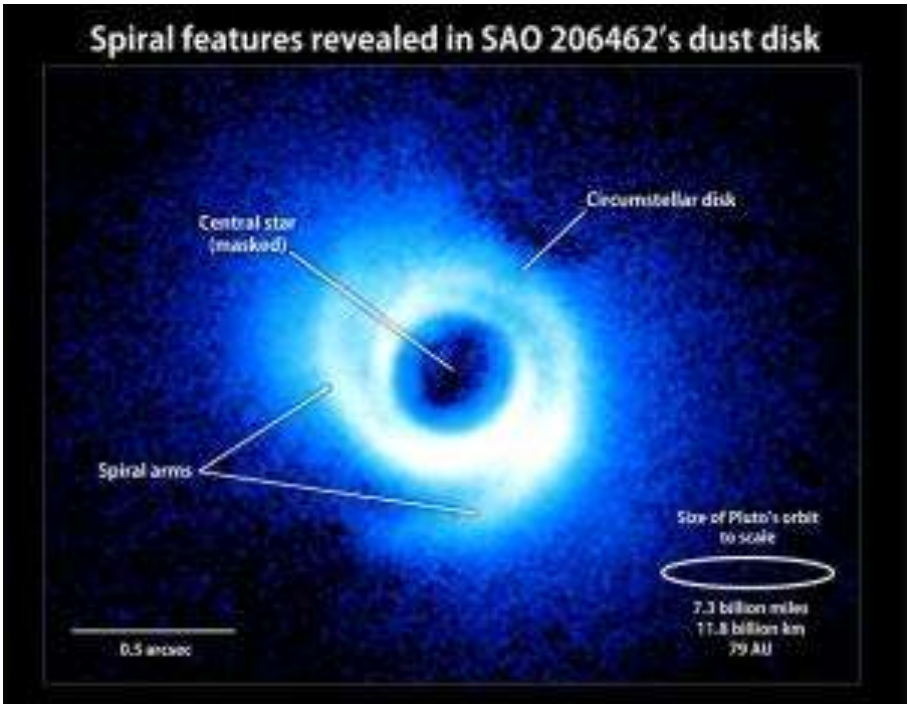
There's another reason why high-altitude solar power makes sense. At temperatures of around 40 °C, 13 per cent of the energy solar panels would normally produce is lost to heat. The cold air at high-altitude keeps the panels cool and efficient, says Kawajiri.

Keith Barnham, a photovoltaics researcher at Imperial College London, says cold climates may be the new frontier in solar. "There are a lot of underdeveloped regions and communities living high up in the foothills of the Himalayas that could benefit from solar energy," he says.

Journal reference: *Environmental Science and Technology*, DOI: 10.1021/es200635x

http://www.newscientist.com/article/dn21061-himalayas-could-become-the-saudi-arabia-of-solar.html

Spiral Arms Hint at Presence of Planets: High Resolution Image of Young Star With Circumstellar Disks Verifies Predictions



Two spiral arms emerge from the gas-rich disk around SAO 206462, a young star in the constellation Lupus. This image, acquired by the Subaru Telescope and its HiCIAO instrument, is the first to show spiral arms in a circumstellar disk. The disk itself is some 14 billion miles across, or about twice the size of Pluto's orbit in our own solar system. (Credit: NAOJ/Subaru)

ScienceDaily (Oct. 19, 2011) — A new image of the disk of gas and dust around a sun-like star has spiral-arm-like structures. These features may provide clues to the presence of embedded but as-yet-unseen planets.

"Detailed computer simulations have shown us that the gravitational pull of a planet inside a circumstellar disk can perturb gas and dust, creating spiral arms. Now, for the first time, we're seeing these features," said Carol Grady, a National Science Foundation (NSF)-supported astronomer with Eureka Scientific, Inc.

The newly imaged disk surrounds SAO 206462, a star located about 456 light-years away in the constellation Lupus. Astronomers estimate that the system is only about 9 million years old. The gas-rich disk spans some 14 billion miles, which is more than twice the size of Pluto's orbit in our own solar system.

"The surprise," said Grady, "was that we caught a glimpse of this stage of planet formation. This is a relatively short-lived phase."

A near-infrared image from the National Astronomical Observatory of Japan shows a pair of spiral features arcing along the outer disk. Theoretical models show that a single embedded planet may produce a spiral arm on each side of a disk. The structures around SAO 206462 do not form a matched pair, suggesting the presence of two unseen worlds, one for each arm. However, the research team cautions that processes unrelated to planets may also give rise to these structures.

"What we're finding is that once these systems reach ages of a few million years, their disks begin to show a wealth of structure--rings, divots, gaps and now spiral features," said John Wisniewski, a collaborator at the University of Washington in Seattle. "Many of these structures could be caused by planets within the disks."

Grady's research is part of the Strategic Exploration of Exoplanets and Disks with Subaru (SEEDS), a five-year-long near-infrared study of young stars and their surrounding dust disks using the Subaru Telescope atop Mauna Kea in Hawaii. The international consortium of researchers now includes more than 100 scientists at 25 institutions.

"These arm-like structures have been predicted by models, but have never before been seen," said Maria Womack, program director for the division of Astronomical Sciences at NSF. "It is the first observation of spiral arms in a circumstellar disk, and an important test for models of planetary formation."

Story Source:

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http://www.sciencedaily.com/releases/2011/10/111019170256.htm

iPhone keylogger can snoop on desktop typing

- 17:13 18 October 2011 by **Jacob Aron**

(Image: Daniel Reiter/STOCK4B)

Get into the office, sit down at the computer and lay your cellphone on the desk – a ritual that millions play out every morning, but one that could reveal more than you expect. Security researchers have discovered they can detect the vibrations caused by using a computer keyboard and read off what is being typed simply by placing a smartphone with a keylogging app on the desk nearby.

Patrick Traynor and colleagues at the Georgia Institute of Technology in Atlanta were able to use the motion sensors inside an iPhone to read keystrokes from a keyboard 5 centimetres away with up to 80 per cent accuracy.

The sensors don't recognise the vibrations of particular individual keys, but for consecutive pairs of keystrokes they can tell whether the keys are on the left or right of the keyboard and how close together they are. This information is then matched to a dictionary to recreate the typed word. For example, the word "canoe" breaks down into four pairs: "CA", "AN", "NO" and "OE". The first pair is classified as left-left-near, the second is left-right-far, and so on.

The resulting patterns aren't unique to a particular word, but they are good enough to reconstruct a message when you already know something about its contents. The team tested their algorithm on a dictionary of 799 words such as "mayor" and "ballot" gathered from news articles about an election in Chicago. The algorithm provided its best guesses for matching patterns to words, identifying the correct word as a first guess 40 per cent of the time and as one of the top five guesses 80 per cent of the time. "Context can help us figure out what was really typed when mistakes are made," says Traynor – and a human attacker could fill in the blanks by making their own guesses.

Easy hacking

This kind of eavesdropping was already possible by monitoring the sound of typing, but apps are not normally allowed to access a handset's microphone without the user's permission. Motion sensors are less well

protected, in part because it was assumed they couldn't be used maliciously. That would make it easy for an attacker to hide a monitoring system inside an innocent-looking app. "The sampling rate of the accelerometers is so low that, before this work, it was not clear that they could be used to capture this kind of valuable data," says Traynor.

It's possible that manufacturers should revise their assessment, as motion sensors can also reveal what is being typed on the phone's own keyboard. Until that happens, what can you do to protect yourself from snooping?

Traynor says it's unlikely that this kind of attack will become common in mobile malware, but there is an easy fix if you're worried: "One of the simplest protections is to move your phone over 2 feet [60 centimetres] from the keyboard," he says, as the attack's accuracy quickly drops off with distance. Another option would be to invest in a stone-topped desk, which would prevent vibrations from travelling.

Markus Kuhn, a computer scientist at the University of Cambridge, says the attack is an interesting idea but the need for a specifically tailored dictionary limits its usefulness. "It puts the attack very much at the James Bond end of the spectrum," he says. "This will require an expert spending an enormous amount of time tweaking things in order to get a result out."

http://www.newscientist.com/article/dn21059-iphone-keylogger-can-snoop-on-desktop-typing.html

Herzliya's 'anti-biennial' challenges the norms of the art world

Museum of Contemporary Art's 'Second Strike', which opens Monday October 10, explores the relationship between the political and the aesthetic.

By Ellie Armon Azoulay Tags: Israel culture

Peter Buggenhout ’s outdoor sculpture of ruins at the Biennial.

Photo by: Peter Buggenhout

The third Herzliya Biennial of Contemporary Art, which opens Monday, challenges every expectation of the urban biennial art event: It does not strive for grandiose dimensions, it does not boast virtuoso works that celebrate art, and as a whole, it is not a celebration at all.

"Second Strike," curated by Ory Dessau, appears to reverse traditional roles and resists imposing its thesis on the artists whose work it features. They in turn dismantle the proposed thesis and continuously reconstruct it all over again, differently each time.

Herzliya has been sleepy in the days leading up to the biennial opening. Scattered about the city are signs announcing the event, and the difference between this biennial and the previous one is evident in the works of the Picnic group, which focused on a colorful, visual celebration.

The name of the new exhibition, "Second Strike," takes its inspiration from a concept that emerged during the Cold War. It refers to the ability of a country surprised by a nuclear strike to respond with a nuclear strike of its own, despite the destruction that spreads as a result. The concept, Dessau explains, "carries within it the potential for mutual destruction, whose very possibility creates a balance of fear that has the power to halt the use of nuclear weapons ahead of time and prevent any other kind of attack as well."

Dessau delved deeply into the museum's space in a way that makes the familiar space unfamiliar, and moreover, dictates a planned circuit to the visitor. The facts presented in the exhibition do not translate the concept into a direct artistic act and are not clearly interconnected, but they do have a cumulative effect. Dessau reiterates that the works do not tend toward political activism or accepted social practices. He suggests the idea of metonymic art that swings back and forth between the factual and historical.

Nearly all the artists featured in the exhibit have worked previously with Dessau, some of them more than once. It is clear that the long relationship and the trust built up over the years contributed to the perspective of the artists, the exhibition and the curator, as well as to Dessau personally, deepening his understanding of their works.

Propaganda vs. propaganda

The first work that visitors encounter upon entering the Herzliya Museum of Contemporary Art is Christoph Buchel's large video installation in a black space. It shows a parade of hundreds of soldiers in Iran whose movements form a Star of David, the letters "U.S.," a swastika and missiles aimed at them.

Dessau specifically opens with a concrete look at an actual balance of fear, but the work is more complex: Buchel uses a video clip filmed in Tehran, and available on the Israeli Foreign Ministry's website. It was uploaded there as a form of propaganda meant to counter the anti-Zionist propaganda in Iran.

Gil Marco Shani's work, featured near Buchel's, is one of the biennial's surprises. Shani installed a carefully done and masterful installation like the one he did at the legendary 2003 "Helena" exhibition. The architectural installation simulates an existing environment that is not concrete but rather generic, an association to a term coined by Hannah Arendt, "the banality of evil."

Shani has not created a work like this in some time, mainly because of budgetary reasons. If a good biennial is significant, it is undoubtedly due to its ability to enable the production of large works of this kind.

Other works created specially for the exhibition are by Eran Nave, Michal Helfman, Adam Rabinowitz, Avi Nevo, Peter Buggenhout and others.

Another notable work in the exhibition is a piece by Zvi Goldstein that spans two rooms: One features a sound piece that fills the entire space, in which many speakers are installed. Each speaker simultaneously emits a voice reading a different passage from Goldstein's book, "Room 205." Together, they create a total cacophony. The other room features a display of images, including images of Goldstein's travels from his home city of Jerusalem to various African countries.

Ruti Nemet, who has been living in Los Angeles for several years, and who rarely exhibits in Israel, presents a few new works in which drawings are superimposed on photos that serve as ready-made backgrounds of sorts. It combines pastoral, but also cruel, scenes from nature, showing animal corpses and archival images of important local historical and political figures (from 1948, for example).

A crisp expanse

Some of the works are installed in public spaces, but unlike in previous Herzliya biennials, Dessau refused to meld with the urban fabric. Instead of an integrative approach, he explains, "the exhibition seeks to place in the city a network of enclosed expanses that are simultaneously inside and outside, in the periphery and in the center."

For example, he demonstrates "the work by Peter Buggenhout, which I commissioned especially for this event."

"Buggenhout placed the ruins of a building on the surface of a 12-meter tow," he explains. "He positioned the tow in a parking lot on Ben-Gurion Street, the city's main thoroughfare. The situation created is one of something that is out of place, evidence of destruction that was not removed. The content of the work, the physicality of it, its dimensions and location, appear stuck like a bone in the throat of public order. Presenting

such a work in a remote city in Western Europe is one thing, but featuring it in Israel, where the public space is in any case crisp, and whose legitimacy and correctness is not fully resolved, is another matter."

Next to the municipal synagogue, 300 meters from Buggenhout's sculpture, stands a work by Ravit Mishli. A Star of David-shaped, iron construction coated in large jewels, it can only be described as an almost pagan display, certainly when it is located next to a house of prayer belonging to an anti-pagan religion. This work then becomes an act of heresy.

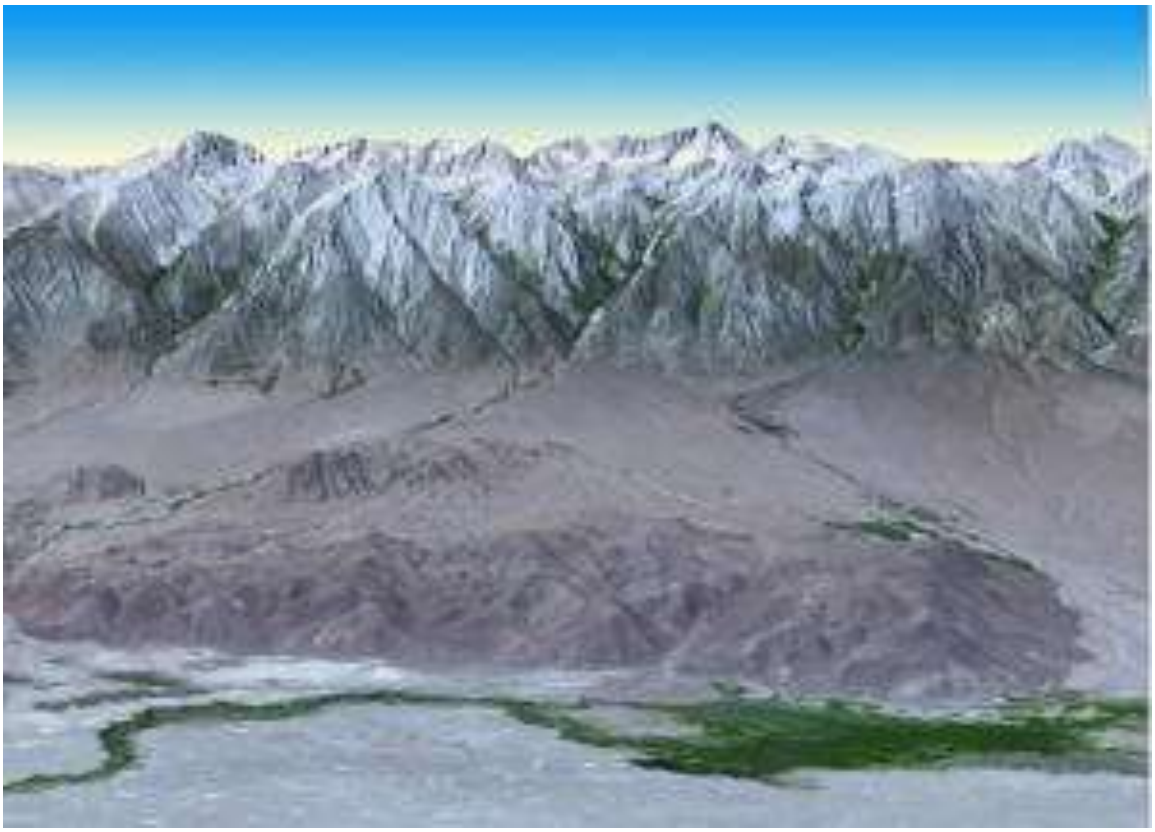
The current biennial, given its name and most of the works it features, appears to be an anti-biennial. It is apocalyptic, disturbing and threatening.

Dessau explains: "Immediately after I got the job, and when I realized, and in effect also worked toward, the fact that this would not be a purely Israeli exhibition - Israelis after all do not see beyond themselves in anything - I decided that doing an exhibition that was entirely a celebration and the appearance of normality meant doing something that was incorrect, false. The ground is burning, after all, but more than that, the historical conditions in which we live are a resource that is worth using and should be used. And perhaps something in the structure of the concepts that comprise this installation make it possible to say something about contemporary art and about its relationship to itself and to the world. That is the goal. The result is something between a mid-sized biennial and a group exhibition posing as a theme exhibition."

Dessau adds that what motivates him in this exhibition, as it has in previous exhibitions, is "an unresolved connection between the political and the aesthetic, between art as a reflection of historical circumstances and art as an alternative, independent world."

http://www.haaretz.com/culture/arts-leisure/herzliya-s-anti-biennial-challenges-the-norms-of-the-art-world-1.389107

NASA, Japan Release Improved Topographic Map of Earth



At 14,505 feet (4,421 meters) in elevation, California's Mt. Whitney, located in the Sierra Nevada Mountains on the west side of Owens Valley, is the highest point in the contiguous United States. (Credit: NASA/GSFC/METI/ERSDAC/JAROS, and U.S./Japan ASTER Science Team)

ScienceDaily (Oct. 19, 2011) — NASA and Japan released a significantly improved version of the most complete digital topographic map of Earth on Oct. 17, produced with detailed measurements from NASA's Terra spacecraft.

The map, known as a global digital elevation model, was created from images collected by the Japanese Advanced Spaceborne Thermal Emission and Reflection Radiometer, or ASTER, instrument aboard Terra. So-called stereo-pair images are produced by merging two slightly offset two-dimensional images to create the three-dimensional effect of depth. The first version of the map was released by NASA and Japan's Ministry of Economy, Trade and Industry (METI) in June 2009.

"The ASTER global digital elevation model was already the most complete, consistent global topographic map in the world," said Woody Turner, ASTER program scientist at NASA Headquarters in Washington. "With these enhancements, its resolution is in many respects comparable to the U.S. data from NASA's Shuttle Radar Topography Mission, while covering more of the globe."

The improved version of the map adds 260,000 additional stereo-pair images to improve coverage. It features improved spatial resolution, increased horizontal and vertical accuracy, more realistic coverage over water bodies and the ability to identify lakes as small as 0.6 miles (1 kilometer) in diameter. The map is available online to users everywhere at no cost.

"This updated version of the ASTER global digital elevation model provides civilian users with the highest-resolution global topography data available," said Mike Abrams, ASTER science team leader at NASA's Jet Propulsion Laboratory in Pasadena, Calif. "These data can be used for a broad range of applications, from planning highways and protecting lands with cultural or environmental significance, to searching for natural resources."

The ASTER data cover 99 percent of Earth's landmass and span from 83 degrees north latitude to 83 degrees south. Each elevation measurement point in the data is 98 feet (30 meters) apart.

NASA and METI are jointly contributing the data for the ASTER topographic map to the Group on Earth Observations, an international partnership headquartered at the World Meteorological Organization in Geneva, Switzerland, for use in its Global Earth Observation System of Systems. This "system of systems" is a collaborative, international effort to share and integrate Earth observation data from many different instruments and systems to help monitor and forecast global environmental changes.

ASTER is one of five instruments launched on Terra in 1999. ASTER acquires images from visible to thermal infrared wavelengths, with spatial resolutions ranging from about 50 to 300 feet (15 to 90 meters). A joint science team from the United States and Japan validates and calibrates the instrument and data products. The U.S. science team is located at JPL.

NASA, METI, Japan's Earth Remote Sensing Data Analysis Center (ERSDAC), and the U.S. Geological Survey validated the data, with support from the U.S. National Geospatial-Intelligence Agency and other collaborators. The data are distributed by NASA's Land Processes Distributed Active Archive Center at the U.S. Geological Survey's Earth Resources Observation and Science Center in Sioux Falls, S.D., and by ERSDAC in Tokyo.

Users of the new version of the ASTER data products are advised that while improved, the data still contain anomalies and artifacts that will affect its usefulness for certain applications.

Data users can download the ASTER global digital elevation model at: https://lpdaac.usgs.gov/ or http://www.ersdac.or.jp/GDEM/E/4.html .

For more information about ASTER, visit: http://asterweb.jpl.nasa.gov/ . For more information on NASA's Terra mission, visit: http://www.nasa.gov/terra .

JPL is managed for NASA by the California Institute of Technology in Pasadena.

Story Source:

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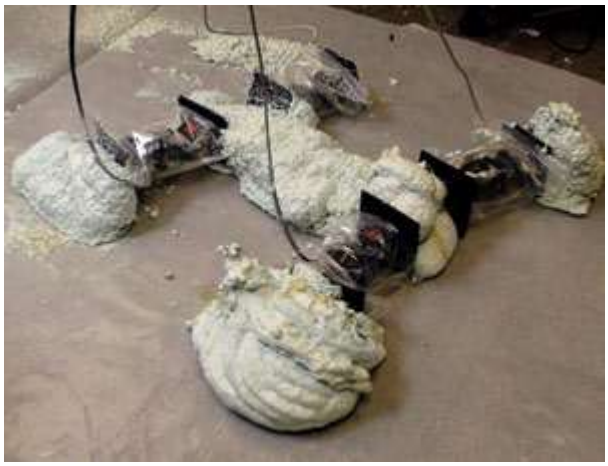
http://www.sciencedaily.com/releases/2011/10/111019162245.htm

Robot builds its own body from sprayable foam

- 19 October 2011 by **MacGregor Campbell**

Magazine issue 2834.



Foambot *(Image: School of Engineering and Applied Science, University of Pennsylvania)*

LIKE a sculpture that springs to life, a new type of robot makes its own body parts using spray-on foam. Such a design could one day be useful in situations in which the exact type of robot needed is not known beforehand, such as space exploration or reconnaissance.

Created by Shai Revzen and colleagues at the University of Pennsylvania Foambot consists of a wheeled "mothership" platform along with several simple joint modules capable of powered bending and flexing. The platform has an on-board supply of chemical reagents and a spray nozzle; when mixed, the reagents expand into hard urethane foam. First the remote-controlled platform arranges the modules on the floor and then it sprays the foam to connect them into the required form.

Software then analyses the orientation of the powered joints and devises a coordination scheme to animate the resulting bot.

Revzen says the system would be useful for situations in which robots need to navigate unforeseen obstacles. A snake-like body might be better for crawling around rocks, for example, while a quadruped might be better at traversing open ground. Since Foambots can return to the mothership to be modified, they could be used to deal with an array of tasks.

http://www.newscientist.com/article/mg21228346.600-robot-builds-its-own-body-from-sprayable-foam.html?full=true&print=true

Salman Rushdie is not afraid

He thinks 'Game of Thrones' is dumb, bemoans the lack of good modern novels and believes terrorism is dying out; over 20 years after fleeing for his life from an Iranian-issued fatwa, novelist Salman Rushdie is still unafraid to speak his mind.

By Gidi Weitz

Salman Rushdie. 'We live in a society in which people are allowed to tell their story, and that is what I do.'

Photo by: Visual Studios

New York. One fine evening a few weeks ago, the writer Salman Rushdie walked, unattended by bodyguards, to the site of the 9/11 memorial. "It was very strange to walk into that space after ten years," the 64-year-old recalls as we sit in the offices of the Wiley literary agency in the center of New York. "I remember post-9/11, many journalists from all over saying to me, 'Ah, now we understand what happened to you.' And I responded, 'Really? That's what it took for you to take note?!' But in some way that was the moment at which these things, like the attack on 'The Satanic Verses' or the persecution of other people in different places, suddenly became a big thing."

A few years ago, someone brought a smile to Rushdie's lips. What's worse, he asked him: living in hiding for years with a death sentence hanging over you, or being asked thousands of times what it's like to live with a death sentence hanging over you? "It's pretty close," the writer replied ironically. Since the beginning of 1989, when the aged and dying Iranian dictator Ayatollah Khomeini issued a death sentence against him for having blasphemed Islam in his 1988 novel "The Satanic Verses," Rushdie has been not only an Indian surname of Muslim origin but a generic name for the family of those hunted by fundamentalist Islam. The writer Magdi Allam, who had the temerity to publish a book in which he attacked Islam, was dubbed "the Italian Rushdie" by the media and required bodyguards. Similarly, Ayaan Hirsi Ali, who spoke out against the violent suppression of women in Muslim society, was labeled "the Dutch Rushdie" - she had to flee Holland because of threats to her life. Those are only two members of a growing family. "There is a Rushdie everywhere," Salman says.

Why is it always Muslims? Why didn't Martin Scorsese have to run for his life after making "The Last Temptation of Christ"? Why does no one want to murder Woody Allen for making fun of Jews?

"There is a widespread difficulty in the Muslim world, which has to do with how the people are taught about examining their own history. A whole range of stuff has been placed off limits. The meaning of that material is dictated by religious people, not historians and scholars. If you believe that the [Quran] is the uncreated word of God, then sociology, politics and economics have nothing to do with it; but if you believe it is a text that arose in a certain place as a result of particular social, economic and political pressures, then you explicate it in a different way.

"The problem was that I learned to look at it like that from my father, and that was crossing a boundary into heavily defended territory. The question is who has power over the story. The response of anybody interested in liberty is that we all have a say and the ability to have an argument is exactly what liberty is, even though it may never be resolved. In any authoritarian society the possessor of power dictates, and if you try and step outside he will come after you. This is equally true of Sovietism, of China and of Iran, and in our time it has happened a lot in Islam. The point is that it's worse when the authoritarianism is supported by something supernatural.

"What happened to me got extra attention because it happened in England, to a writer who writes in English, not in Arabic. But people in Egypt and Saudi Arabia and elsewhere are killed and jailed for many of the same things as me, and that draws much less attention. For a long time, what I tried to say is that it is not only me: look at what is happening there."

Are you a free person today, one who can walk about without bodyguards?

"Yes. It's been like that for ten years now."

Are you still afraid?

"No. We live in a frightened time and people self-censor all the time and are afraid of going into some subjects because they are worried about violent reactions. That is one of the great damaging aspects of what has happened in the last 20 years. Someone asked me if I was afraid to write my memoirs. I told him: 'We have to stop drawing up accounts of fear! We live in a society in which people are allowed to tell their story, and that is what I do.' I am a writer. I write books."

Yesterday's story

Even though the existential threat was formally lifted, Islamic extremists still wanted Rushdie's head, among them Iranians who vowed that they would sell a kidney to finance the writer's assassination. In 2007, when he was awarded a knighthood by Britain, the governments of Pakistan and Iran summoned British representatives to voice vigorous protests. Demonstrations were held in some cities in Pakistan, in which people shouted "Death to Rushdie" and burned him in effigy. In 2008, as part of an exhibition of manuscripts and translations of the Quran, held in the great mosque in the center of Tehran, a coffin for Rushdie was displayed (along with a second coffin, draped with the Israeli flag). As with a hunted animal, the consciousness of being persecuted honed Rushdie's senses. In the first decade of the new century the acclaimed writer, who had been in hiding all through the last decade of the previous century, became an apocalyptic prophet who foresaw the terrorist attacks of Bin Laden and his ilk.

In his novel "Fury," published a few months before September 11, 2001, Rushdie described America reeling under a terrorist onslaught. In 2004, shortly before the horrific attack on the Madrid commuter train, Rushdie warned that it would not be long before Europe, too, became a target for mass terror. Presently, however, in

the wake of the Arab Spring, Rushdie appears to be optimistic. "The age of terror might be coming to an end," he says.

Muslim protesters burning an effigy of Rushdie in Bangkok, Thailand, in 1989.

Photo by: AP

How so? Were you moved by the Arab Spring?

"What has happened everywhere, to varying extents, is that the uprisings haven't been about religion but about secular things like liberty and economic betterment. They are not religious struggles. It is very exciting, because the Arab uprisings seem to discredit the terrorist Al-Qaida ideology and pave the way for a better way of doing things. If you actually want to change your world, there is a better way of doing it than blowing yourself up. What we have seen is the incredible courage of many young people in these areas doing an old-fashioned thing called direct action: you stand up and change your country. You don't have to put on a suicide belt or any of those bullshit things. Some of these countries may not end up where they want to be, it's going to be a tough battle. But already it shows that the ideology of the terrorists feels like yesterday's story."

You once wrote that Islam needs to be reformed. What did you mean?

"It's not so much about reforming Islam as it is about reforming Islamic societies. You can't have modern states based on ideas which have been out of date for a thousand years. If they don't start to adapt to the new world, they will continue to be economically poor and incompetent and authoritarian. They will be basket cases, and there isn't a successful economy there. Even with the oil, all they have is the oil, nothing else. At the time I remember people saying it was overly optimistic or Westernized nonsense, but to me what these uprisings are showing is that this is what people want. "They want to be able to share in the conversation about their societies. And they want a degree of personal freedom which has been denied them for generations. You can see that what they want is to have a voice in the shaping of their society, they want personal freedom, they want jobs. In order to generate jobs and to have an economy that functions, you have to create a modern state. That is what I was talking about, and now it seems it may be something they think, too. But it's obvious that you can't run a modern state along the principles of the seventh century."

Why is the revolutionary wave bypassing Iran?

"I think the two big problems are Iran and Saudi Arabia. The uprisings are not happening in Iran because there is greater repression in Iran. It is not the mullahs anymore, it is the Revolutionary Guard. Hillary Clinton said last year that there is a fear that Iran has gone from a religious to a military state. The repression has reached a level of brutality that makes it very difficult for people. If what happened in Tahrir Square were to happen in Iran, they would just machine-gun everyone."

Like what happened in Syria?

"Worse than Syria. I always thought that Iran, Saudi Arabia and Syria would be the hardest places for the new world to come into being, even though that is what everybody wants, other than the hardliners."

The new wave: Celebrating the Arab Spring in Egypt's Tahrir Square.

Photo by: AP

Will Iran collapse in the end?

"I'm not a prophet, but I always thought it was natural for dictatorships to fall. I remember in 1989, two months before the fall of the Berlin Wall, had you said it was going to happen no one would have believed you. The system seemed powerful and unbreakable. Suddenly overnight it blew away like dust. It was shown to be so weak and rotten from within. We live in an age in which change, when it comes, occurs at an incredible speed."

Recently, Rushdie and other writers - among them his good friend David Grossman - urged the United Nations to condemn Bashar Assad's murderous crackdown in Syria. I asked him whether he truly believes intellectuals have a part to play in the political game. "It depends where," he replied. "I think that in the countries where freedom is most in danger, in which the political sphere is most volatile, the views of intellectuals become more important. Why should China be afraid of Ai Weiwei as a painter? But because so few people speak up there, those who do become dangerous. "What people like David [Grossman] and Amos Oz have done is also heroic. David, especially after his personal tragedy. We have known each other for a long time. He is a great writer and also a great journalist. He handles fiction and nonfiction with equal subtlety and skill. He is a moral person who has the ability to rise above the personal and still talk in a civilized way. Many people whose child was killed would speak angrily, but violence breeds violence. For him to have a larger heart and a larger worldview was incredible, breathtaking."

Intellectuals have also done nonsense. Michel Foucault, for example, glorified Khomeini.

"Intellectuals are not saints, and can sometimes be very stupid indeed. In the United States, it is very difficult for intellectuals to have an impact on society, whereas in Europe it is more possible. I never knew Foucault. I met Jacques Derrida several times and he had a level of personal vanity which distorted the way he expressed himself. When you look at events, things look chaotic and shapeless, but there is a strong human need for form and shape. What intellectuals can offer amid the shapelessness of the everyday is a sense of 'how to look,' so that you can begin to discern shape and form. They can be fools, but they are about finding meaning and about understanding the world you live in."

The magical, horrible Oz

Salman Rushdie, who is very affable and positively brims with humor, was born in Bombay [now Mumbai] in June 1947, two months before India and Pakistan gained independence. The partition of British India swirls traumatically in his books. His family, whose origins lie in Kashmir, was part of the Muslim minority that remained in India as it emerged bleeding into the world in the form of an independent state. In his fictional masterpiece "Midnight's Children" (1981), Rushdie locates himself, in the character of the narrator, as having been born together with the children of midnight - the intermediate hour between Pakistan's creation and India's independence. Midnight's children were gifted with divine sparks and extraordinary powers, powers that were emasculated during the state of emergency proclaimed by Prime Minister Indira Gandhi in the 1970s.

Rushdie's family bore a liberal orientation. His mother, Negin Bhatt, was a teacher; his father, Anis Ahmed Rushdie, a lawyer who became an industrialist, was prone to fits of rage and was very fond of alcohol. In an essay Rushdie wrote about the film version of "The Wizard of Oz," he described his father as being "prone to explosions, thunderous rages, bolts of emotional lightning, puffs of dragon-smoke." In short, he was the great, magical, horrible Oz. In time, he noted, he understood that his father had been a good man but a bad wizard.

He wrote his first book, "Over the Rainbow" - inspired by "The Wizard of Oz" - when he was ten. It was a portent of his flirtation with cinema - in recent years he has taken part in more than 40 films and television programs, mostly playing himself. In adolescence, Rushdie was sent to a private school in England, where for the first time he felt the supercilious gaze of the white man. The experience of migration, nonbelonging and wandering would become central motifs in his writing. Blurring the boundaries between fantasy and realism would perhaps help him overcome the underlying anxiety of being an outsider. In 1968, after completing his master's degree in history at Cambridge, Rushdie earned a living by working as a copywriter for David Ogilvy's advertising agency. Ogilvy, he wrote years later, "immortally instructed us that 'the consumer is not a moron, she is your wife.'"

He published his first novel, "Grimus," which attracted little attention, in 1975. He used the advance he received, 700 pounds, to travel in his homeland, India, for as long as the money lasted. It was on that journey that the epic "Midnight's Children" was conceived, bringing him international recognition and the prestigious Booker Prize.

After the book's publication, his father refused to speak to him for months. Ahmed Sinai, the father character in the novel, is, like Rushdie's father, an embittered, raging alcoholic. However, in 1984, three years after its publication, the novel plunged Rushdie into a far more public quarrel: with Prime Minister Indira Gandhi. It was Rushdie's first experience of a battle over the boundaries of freedom of expression. The second experience would almost cause his death.

In "Midnight's Children," whose plot interweaves the conflicted history of the subcontinent, Rushdie was severely critical of the violent emergency regime that Mrs. Gandhi introduced in the 1970s. Among other themes, Rushdie described the monstrous sterilization plan which the "Widow" (as Gandhi is referred to in the

book) concocts, as part of which the reproductive organs of many Indians, including those of 'midnight children,' are removed and afterward fried "in an iron skillet, soft unspeakable somethings spiced in turmeric, coriander, cumin and fenugreek... the pungent inescapable fumes of what-had-been-excised, cooking over a low, slow fire."

Yet it was not this horrific passage but a marginal paragraph that outraged the Indian prime minister: "It has often been said that Mrs. Gandhi's younger son Sanjay accused his mother of being responsible, through her neglect, for his father's death; and that this gave him an unbreakable hold over her, so that she became incapable of denying him anything." Indira Gandhi, whose father was India's first prime minister, Jawaharlal Nehru (she acquired the name Gandhi through marriage and was not related to Mahatma Gandhi), sued Rushdie for defamation of character over this passage. After negotiations, the sides reached a compromise and the offending 43 words were deleted from all editions of the book after 1984. As part of the settlement, Gandhi declared that this was her sole complaint against Rushdie and the book. "Her willingness to make such an admission felt to me like an extraordinary validation of the novel's portrait of those Emergency years," Rushdie wrote in an article marking the book's 25th anniversary. A few weeks after the two reached the out-of-court agreement, Gandhi was assassinated by her Sikh bodyguards.

Rushdie with first wife Clarissa Luard.

Photo by: Getty Images

What happened to India, whose spiritual father preached nonviolence but became a brutal and corrupt nuclear power?

"All of us who love India are concerned. The level of corruption is extraordinary. There isn't a place in the political system where you can look and say, 'That's where the integrity is,' or 'That's where the good guys are.' There's no good guys. Some are worse than others. And now, with the possibility of the Gujarat chief minister, Narendra Modi, becoming a prime ministerial candidate - I mean, he is by any standards a fascistic leader. Meanwhile, there is a growing assault on intellectual liberties of all kinds, whether it's academic - where Hindu extremists are rewriting history to try and falsify the past and erasing a large part of the Muslim history of India - as well as physical attacks on art galleries, movie theaters, books and libraries. Having grown up in a tolerant and secular India, deeply committed to democracy, which [Mahatma] Gandhi and Nehru tried to create, it is hard to see the country falling away from those standards."

Yet, isn't the economic miracle which India is undergoing meant to create a middle class that will strengthen democracy?

"It used to be that 10 percent of the population were wealthy and 90 percent were destitute. Now you have the same 10 percent of super rich, then a 10 percent middle class, which is doing fine, and finally 80 percent destitute. So it has trickled down a little bit. But really, the gulf between the incredible wealth being generated and the poverty which has always been there is getting ever bigger. That creates instability, resentment and allows forms of violence to arrive into the narrative. I speak as somebody who deeply loves the country; it is my home country. And yet when I go there I just worry all the time. This is not the India that I think about when I think about India."

When McEwan sneezes

Next year will see the release of the film version of "Midnight's Children," directed by the Indian-born Canadian filmmaker Deepa Mehta. "It's the first time that one of my books has been filmed," Rushdie notes. "It's a very dangerous and difficult task to make any book into a film. There are so many examples of failures, of good books turned into very poor movies. Many of my friends had books turned into films and I don't think they have been exceptional films. Ian McEwan only has to sneeze and they make a movie of it, but I'm not sure if any of those films have been really outstanding.

"There are some exceptions, though. For example, at Emory University in Atlanta I taught a course in the 'best case scenario,' when a really exceptional book gets turned into an exceptional film. I taught Visconti's film 'The Leopard,' based on the book by [Giuseppe di] Lampedusa, where both the film and the book are masterpieces. 'The Age of Innocence' by Martin Scorsese, after Edith Wharton's novel, is another good example. The film version of Gunther Grass' novel 'The Tin Drum,' made by Volker Schloendorff, was also very good."

Rushdie wrote the screenplay for "Midnight's Children" and is closely following the making of the film. "There are two reasons for that," he explains. "First, it was clear that if I didn't help, it would be very hard to get the money to do it. In this economic climate it has been so hard to raise money in the independent sector. The other reason is that it's already been 30 years since the book was published, so I can look at it from a different perspective now and be less attached. Also, since I wrote it, I can also be the person who can be the most disrespectful to the text. To make a two hour movie out of a 600-page book, you need to be very disrespectful, you have to tear the text apart."

Rushdie seems to be more excited about the film than he is over publishing a new novel. "Now we are cutting and editing; shooting is finished," he says. "I've seen all the material and the one thing I can say is that the cinematography looks breathtaking. It looks like we spent $150 million, but we spent only $10 million. It looks like 'The Deer Hunter' or 'Apocalypse Now,' which is astonishing for the very tight budget we have."

Is your writing influenced more by literature or the cinema?

"It's tough to answer that - maybe it's 50-50. Cambridge in the mid '60s was an amazing time for cinema. There was a tiny movie theater that showed foreign films with subtitles. I got my education in that building; now it's a coffee shop. One week they screened the new Fellini movie, then Bergman, Kurosawa, then the new Godard movie. You would go to the cinema and your eyes would open really wide and you would be shown ways of thinking and seeing which were revolutionary. The sudden great explosion of moviemaking worldwide really affected me. People who like my books always said that the books are very visual and the ones who didn't like them say the same, that they're too visual. "I was born and brought up in Bombay, a big movie city and a very visual place. Some of my family were involved in the Bombay movies, which no one called Bollywood in those days. Two of my aunts were actresses and one uncle wrote screenplays. In a pre-TV time you grew up in a world where the movie theater was a very important place. The absence of TV made us the last real movie generation."

More recently, television series have become perhaps the most significant of all forms of creativity. Do you think there is a qualitative difference between them and novels? Did you see "The Sopranos" or "The Wire"?

"Everybody loves 'The Wire' and I think it's okay, but in the end it's just a police series. I love 'The Sopranos.' 'Deadwood,' which didn't last long, was a series I liked a lot; it had more filthy language than I've ever heard on television anywhere in my life, but it was brilliantly written. I like some of what is on now, like 'Breaking Bad' and 'Dexter.'

"I mean, there is always a lot of junk; most novels published are bad novels, most plays put on are bad plays, most movies that come out are bad movies and that is also true of TV. Nineteen times out of 20 you fall asleep. There was a series called 'Game of Thrones' which was very popular here in the United States, a post-Tolkien kind of thing. It was garbage, yet very addictive garbage - because there's lots of violence, all the women take their clothes off all the time, and it's kind of fun. In the end, it's well-produced trash, but there's room for that, too.

"I watched all that because if I am going to work in this field, I need to know what it is going on. I have been making myself have whole-series marathons to get the point of how it goes. I will soon start writing my little series."

Fatwa times

Here is a story that could easily be adapted into an imagination-firing television series. On February 14, 1989, a few minutes before 2 P.M., an Iranian announcer read a fatwa (an Islamic judgment) which had been handed down by Ayatollah Khomeini: "In the name of Allah ... I would like to inform all intrepid Muslims in the world that the author of the book 'Satanic Verses,' which has been compiled, printed, and published in opposition to Islam, the Prophet, and the Quran, and those publishers who were aware of its contents, are sentenced to death. I call on all zealous Muslims to execute them quickly, where they find them, so that no one will dare to insult the Islamic sanctity." A multi-million dollar reward was promised to non-Muslims who would carry out the sentence, and was subsequently doubled.

Rushdie's first reaction to this was to light up a cigarette. Years after kicking the habit, he went back to smoking. Four days after the fatwa was issued, he tried to clarify himself like a dam in the face of a tsunami. He publicly expressed his regret over "the distress the publication has occasioned to the sincere followers of Islam." To which Khomeini retorted: "Even if Salman Rushdie repents and becomes the most pious man of all time, it is incumbent on every Muslim to employ everything he has got, his life and wealth, to send him to Hell." Rushdie went into hiding. The British government provided the writer and his family with personal security.

"The Satanic Verses," a hard-to-digest labyrinthine allegory, was published in late 1988. It contains the familiar Rushdie mix of fantasy and realism. The story opens with a plane, en route from India to London,

crashing. There are two survivors: film star Gibreel Farishta and Saladin Chamcha, the man of a thousand voices. The story moves through different levels of time and one of its themes is the alienation of Muslim immigrants in London. Other sections deal with the origins of Islam. Of the range of characters depicted by Rushdie, the eye of Muslims was drawn mainly to Mahound, the representation of Mohammed and the object of biting satire.

In one passage, Rushdie describes a brothel in which the courtesans play the role of Mahound's wives (it is clear from the text that Mahound would be very angry if he knew about this service). In another section, Rushdie is scornful of the suffocating ring of commandments and prohibitions in which the followers of religions are caught: "In those years Mahound - or should one say the Archangel Gibreel? - should one say Al-Lah? - became obsessed by the law. Amid the palm trees of the oasis, Gibreel appeared to the prophet and found himself sprouting rules, rules, rules, until the faithful could scarcely bear the prospect of any more revelation, Salman said, rules about every damn thing. If a man farts let him turn his face to the wind, a rule about which hand to use for the purpose of cleaning one's behind."

The reactions were furious. "The Satanic Verses" was banned in many countries, including India, Bangladesh, Sudan and others. In Pakistan the book was the object of a stormy demonstration ("Liquidate the heretic," the inflamed demonstrators called) in which six people were killed. An English imam burned copies of the book in front of his mosque. One person was killed and dozens injured in a demonstration against Rushdie in Kashmir. Publishing houses around the world received explicit threats against printing the "abomination." The imam of Brussels was murdered after stating that in his view the death sentence against the gifted author should not have been issued. But it was the Iranian spiritual leader Khomeini who delivered the most crushing blow to Rushdie.

Today, Rushdie can talk about the deep geopolitical streams that placed him on the wrong side of the story. "After Khomeini's defeat in the Iran-Iraq war, toward the end of his life," Rushdie says, "he looked for a way to rally the troops and revive the revolution. I guess I had the bad luck to come at that point. I think Khomeini was a tactically brilliant politician and saw this opportunity to revive a flagging revolution in Iran." Khomeini died four months after issuing the fatwa against Rushdie, but his successors did not revoke the death sentence. Iranian President Hashemi Rafsanjani claimed that "The Satanic Verses" was no less than "an organized and planned effort" by the British, French, German and American undercover services.

The fugitive writer moved from one safe house to another at the behest of Scotland Yard; in the first four months following the fatwa, Rushdie slept in 56 different beds. According to media reports, six detectives watched over him 24 hours a day in three shifts. Rushdie's life became a nightmare. He compared life under the fatwa to "a bad Salman Rushdie novel. And, believe me, it's a very dreadful thing to be stuck in a bad novel." His friend, the writer Ian McEwan, joined the effort and for a short time hid Rushdie in his cottage in the Cotswolds, in central England. In 1989, after the fatwa was issued, four bombs went off outside bookstores in England that were selling the book, and stormy demonstrations continued against Rushdie around the world. "It's interesting how you can find yourself by chance at the center of things, and even more an event that defines the period in which you live," he says.

The death decree triggered an unprecedented international crisis. Member states of the European Union recalled their ambassadors from Tehran. Britain broke off diplomatic relations with Iran and paid for part of Rushdie's protection. However, demonstrations against the book by Muslims in Britain continued. Arab professors of Islamic culture appeared on panel debates on British television to declare that they were ready to carry out the death sentence. The singer Yusuf Islam - known as Cat Stevens before he converted to Islam in 1977 - stated in one such discussion that Rushdie deserved to die. British Airways refused to accept Rushdie as a passenger, fearing the plane would be blown up in midair. A Pakistani film portrayed the writer as a pro-Israel alcoholic who murders Muslims. British censorship prevented the film's screening, but Rushdie, always a fierce advocate of freedom of expression, demanded that it be shown. In the summer of 1989, a bomb

exploded in central London, destroying two floors of a hotel. Years later, it turned out that a young man on a mujahideen mission to assassinate Rushdie had been preparing a bomb when it accidentally went off.

Elements of the grotesque were also not lacking in the period of hiding. At one point, the British security services urged Rushdie to wear a wig when he went out. "Even your best friends won't recognize you," they promised him. A short outing under the hairpiece during which total strangers recognized him induced Rushdie to go back to his original hair style.

In July 1991, the book's Japanese translator was murdered. In the same month, its Italian translator was attacked by a man claiming to be an Iranian who tried to force him to divulge Rushdie's whereabouts. When the book appeared in a Polish version, the translator's name was kept secret. In Israel, too, the name of the translator, Moshe Hanaami (Singer), was not revealed until after his death in 1994. In Britain a few more attempts were made to burn bookshops that sold the novel. "That is justified under the precepts of Islam," Muslim clerics said.

On Christmas Eve, 1990, Rushdie met with Muslim moderates at a place of hiding, and afterward a statement was published in which Rushdie affirmed "the two central tenets of Islam - the oneness of God and the genuineness of the prophecy of the Prophet Mohammed." Shortly afterward, Rushdie published an article titled "Why I have embraced Islam," in which he clarified to some extent the confusion in the wake of what was perceived as a denial of his book. Although he was "raised in an atmosphere of what is broadly known as secular humanism," he wrote, religion for him meant only Islam. He described the noise generated by "The Satanic Verses" as a "family quarrel." Rushdie later regretted these statements, but the truth is that even this constrained attempt at penitence did not aid him.

In July 1993, 37 people died when a hotel was burned down in Sivas, Turkey, during a demonstration held there against a public reading of passages from "The Satanic Verses." All the fatalities were guests or workers of the hotel, most of the former writers and intellectuals who were taking part in a literary festival at the site. Rushdie said bitterly that Western countries were not acting forcefully enough to get the threat to his life removed and were allowing Tehran to proceed with its campaign of terror against him and against everyone who had anything to do with the book. He continued to live on the run, constantly switching addresses, surrounded by a phalanx of bodyguards.

In October 1993, the book's Norwegian publisher, William Nygaard, was shot and seriously injured. The following month, a meeting Rushdie had with U.S. President Bill Clinton stirred Muslim outrage, prompting Clinton to declare a few days later, "I respect the religion [Islam] and I respect the culture enormously, so I mean no disrespect to the people who have that religious faith."

Do you ever think about those who paid with their lives because of the book?

"Yes. Many people suffered. People got killed and many people almost got killed. People might think that because I didn't get killed no one was trying to kill me. No one remembers anymore. We live in an age of short-term memory, and it started a long time ago, in 1989."

Toward the end of the long nightmare decade, the threats against Rushdie's life began to subside. This followed a statement by Iranian President Mohammad Khatami that Iran was no longer going to seek the writer's death. The declaration was made as part of a package aimed at normalizing relations between Britain and Iran.

In 2000, Rushdie moved from London to New York. The British press reported that a few celebrities had left a Manhattan restaurant when they spotted Rushdie dining there, for fear of being in the company of an ex-No.1 wanted individual. Recently, Rushdie has completed a voluminous autobiography which deals

extensively with the fatwa period. It is due for publication next year. "For a long time there were many things I couldn't say, because they were confidential and involved the time when there was police protection," he notes. "There was a level of danger then. So now it is a relief to be able to say: here is what happened.

"I went through that experience and then wanted to go forward. Not go back and relive the whole thing. I wasn't in the mood to do it for a long time. Then suddenly, I just changed my mind. I realized that there was an interesting story, a story which has resonances which are still very much with us. Having done it, I am pleased with it as a piece of writing. I didn't want it to feel like a confession or journal. I wanted it to feel like a book by me. You read Garcia Marquez's autobiography and it feels like a book by him. I wanted it to feel equal, not like some sort of lesser confessional tale. Apart from finding the voice and the manner, I also feel like it's taken the monkey off my back, so in future, if someone asks me about my past I can just tell them to read the book. I wanted to draw the line under a stage of my life."

A few weeks ago, a reporter from a British tabloid asked Rushdie who he would like to play him on the screen if the memoirs are filmed. "Johnny Depp," he replied without hesitation, "we are very similar." The reporter immediately published the scoop. "It was a joke," Rushdie says with a smile. "My son, who works in public relations, told me not to make jokes with tabloid journalists because they don't get it."

Back to the fire

Rushdie's latest novel, "Luka and the Fire of Life," was published in 2010. Aimed at younger readers and at adults who are young at heart, it is dedicated to Milan, the author's 14-year-old son from his third wife, Elizabeth West. (Rushdie has been married and divorced four times, most recently to the Indian model and actress Padma Lakshmi.) "Luka" is effectively a continuation of "Haroun and the Sea of Stories" (1990), which Rushdie wrote during his period of hiding and dedicated to his first son, Zafar. That story tells how a boy named Haroun sets about saving his father, the storyteller Rashid Khalifa, who has lost his storytelling ability, and on the way encounters magical and frightening realms.

In the new book, too, a boy, Luka - Haroun's younger brother - embarks on a mission to save his father, who has now fallen into a deep sleep. Luka sets out in the company of a creature who totally resembles his father on a challenging quest to a magical land in order to steal the Fire of Life.

Why is the saving of a parent by his son a recurring motif in both books?

"I think it's because children rescue their parents every day. I wanted in both books to have the idea that the parent is in an unsafe place somehow, being in danger, but the danger is different. This time round it really just arose out of the situation with my son, my younger son. I was already 50 years 0old when he was born. When you are an older father you think about wanting to be around for your children when they grow up, you want to watch them grow up and bring them into adulthood. You want them to have a father. And that question is more present at my age than if you have a child when you are 25. That was the natural engine for the story.

"It was existential. In the case of Haroun, he loses his gift of telling stories, but in this case it's actually about the possibility of losing his life. It actually becomes about life and death. I wanted the book, like 'Haroun,' to have a light and playful voice, but underneath that I wanted something real that it's talking about. And that was what came naturally, given the relationship with my son."

There is a huge difference between the loving father in "Luka" and the character of the raging father in "Midnight's Children."

"When you are younger you write from the point of view of a child, you see the world looking up toward the adult word. When you become a parent, your perspective reverses and you look at it as a parent, not as a child. I was aware of it happening around the time I had my first son - he is now 32, so around 30 years ago - when I realized that I was seeing things differently. He was born more or less around the same time I published 'Midnight's Children.' So it wasn't overnight but gradually, as the business of being a father takes over. You begin to see the world differently and to understand your parents in a way that you never did."

You stop blaming them?

"Yes, because you see that being a parent is very difficult and that you make mistakes the whole time, so you begin to have more compassion for your parents."

And you forgive them?

"Yes. I think it is obvious to anyone who has read my books that I had quite a difficult relationship with my father. I mean, he drank too much and so on and so forth, but now I don't feel any of that resentment, anger or opposition that was between us. Not at all. I understand him and I understand how much of him is in me."

You wrote this book at your son's request?

"Yes, initially because he didn't think it was fair that his brother had a book and he didn't. In both cases I showed them the book, the first 30-40 pages, to make sure it was along the right lines. In this case, I was worried about the 'death' character because it was quite dark, but I discovered that this was actually his favorite character. So I thought, this kid has a little bit of a dark side so I might be able to push it a little bit.

"The intimacy of writing a book to please one person is a special thing and I enjoyed that aspect. Many children's books have been written for a specific person. The two 'Alice' books, for example, were written for a real person. You find by writing for a specific person you have a wider appeal; I think it is because it makes the children specific. Alice in 'Alice in Wonderland' is not just a routine pretty little girl, she had a distinct character, she is opinionated and orders people around, and I thought that this was a girl the author knew. In the Winnie the Pooh stories, A.A. Milne was writing for his son, and if you think about 'Peter Pan,' J.M. Barrie had these five children and was making up the stories to please those children."

Yet, computer games and gods from various mythologies are very prominent in your new book, and these are two areas in which death almost does not exist.

"That's right. I thought, on the one hand you have human life, there's only one and you can't have another one. And then Luka goes into this world where there is a very different idea of life - life is something you have a thousand of, so you can lose almost a whole thousand but you can collect more. So life becomes a much cheaper currency. I wanted the book to show this contrast between two ideas of the value of life. One in which you spend it all the time because, who cares, there's lots more; and the other in which it's incredibly precious because there's only one and it matters. And of course the one whose life matters is Luka's father, which makes it even more important."

Isn't it dangerous to fool young people with the delusion of eternity?

"No, I think young people are not easily fooled. I think they have a very clear distinction in their mind between fiction and reality. I don't think children run away from the big subjects. You don't have to give children only escapist fantasy; you can give them very dark material. You can see that books for young people talk about drug addiction, sexual harassment, crime and poverty. Young people read those books with great

pleasure. Children are now shockingly grown-up with everything they know, so you treat them as the people they are and not as the idealized child, and they respond to it." W

This story is by:

- Gidi Weitz

http://www.haaretz.com/weekend/magazine/interview-salman-rushdie-is-not-afraid-1.389961

Chatbots fail to convince judges that they're human

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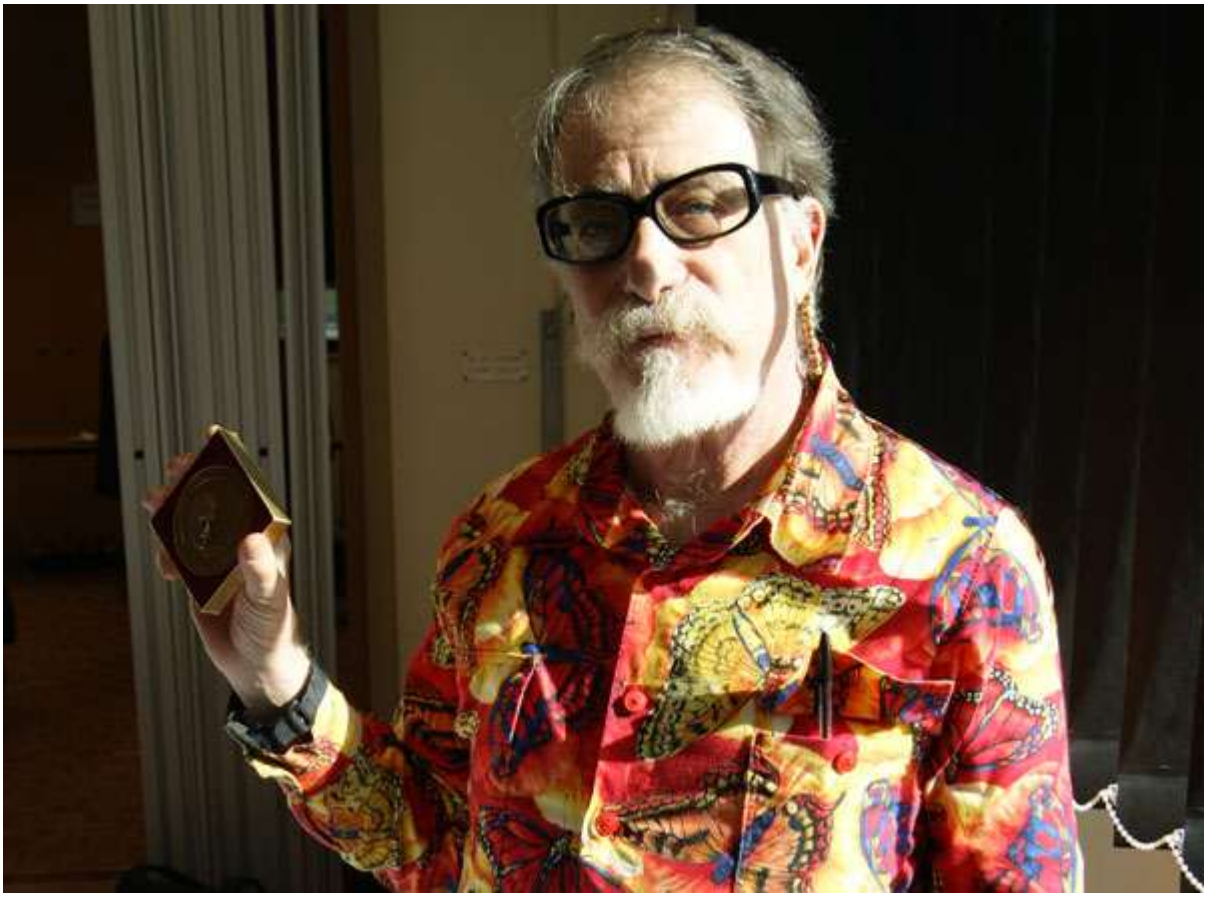
Paul Marks, senior technology correspondent



Hugh Loebner with the bronze award, picturing Alan Turing *(Image: Paul Marks)*

A chatbot called Rosette won the $4000 annual Loebner Prize in Artificial Intelligence at the University of Exeter yesterday - but once again none of the four chatbots that were competing managed to convince any of the judges that they were human.

After computer pioneer Alan Turing in 1950 posited the notion that machines might one day be thought of as "thinking", the competition attempts to find a computer program whose chat responses are indistinguishable from a human's. They are nowhere near it.

Every year since 1991, the prize's founder, Hugh Loebner, has asked four judges to sit at computer terminals where they can talk to a both a human (who's hiding in another room) and a chatbot - but they are not told which is which. It's up to the judges to decide which is the person and which is the software and then rate the chatbots on how good they are at human mimicry. A chatbot has only seemed more human than a human once in the competition's history - but that, says Loebner, only occured when one human volunteer decided to behave like an early chatbot, skewing the results.

This year I was one of the judges, alongside Exeter computer scientist Anthony Galton, University of Sheffield AI expert Noel Sharkey and *How It Works* technology writer Jonny O'Callaghan. I found all the entrants to be extremely disappointing: the chatbot's identity was evident after only three or four lines of chat (sometimes less) and they often came up with irrelevant, off-the-wall responses. First place went to Rosette by Bruce Wilcox, second went to Adeena Mignona's Zoe, third to ChipVivant by Mohan Embar and finally Tutor, by Ron Lee, came last. All the programmers are based in the US.

Conspicuous by its absence in the final was the increasingly impressive CleverBot, a chatbot which is learning how to converse like a human from crowdsourced online conversations.

Developer Rollo Carpenter, of Dawlish in the UK, rues entering a less-capable, cut-down version of Cleverbot (which was easier to download) in the Loebner prize's selection round, which saw it finish outside the top four headed for the final. The cutdown version, he says, could not cope with a certain unexpected style of question that the full version could easily have handled.

It may be time to move on from the traditional text-based, linguistics-centred Turing test in any case, says Galton. He's proposing a computer intelligence test that takes into account the contribution the human vision system makes to intelligence. You can try it out here.

http://www.newscientist.com/blogs/onepercent/2011/10/turing-test-chatbots-kneel-bef.html