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Response ability

By G. Rendell May 17, 2010 9:16 pm

Several years before I came to work at Greenback, I had a job interview with the Marine Spill Response Corporation. The position in question had considerable authority; the salary would have represented quite a bump to my income. Still, as the interviews progressed I reached the conclusion that I didn't want the job. Whether my reticence came through or whether they felt me unqualified, I'll never know. What I do know is that they didn't make an offer, and I was relieved that they didn't.

Marine Spill Response, as the name implies, is all about responding to oil spills on water. When I first talked to them, their intended scope was worldwide; somewhere along the way, it seems to have been cut back to "US waters only". Funding came from the oil shipping companies, as I recall. The whole thing was triggered by the Exxon Valdez disaster. The only important article of faith seemed to be "never again".

What struck me, as I learned more about the company, was that they weren't likely to be able to achieve their stated objective. Not that they had bad people on board (so far as I could tell from an afternoon's interviewing), and not that their people weren't dedicated to the task. Rather, it was the organizational structure and strategy that made me uncomfortable. My previous experience in risk management had taught me that the old adage "an ounce of prevention is worth a pound of cure" undervalues prevention significantly. When triggering events are unpredictable and consequences are dire, prevention gets even more valuable. Yet the entire strategy of Marine Spill Response was based on cure. As fast a cure as possible, to be sure. A cure implemented with resources which are forward-positioned and staff which are well trained and under highest-priority contingency contract if not full-time on board. But cure, nonetheless.

The impression which quickly formed in my mind, hearing how the company was structured and operating contracts negotiated, was that the real intent behind Marine Spill Response was not to manage ecological risk, but rather to manage political risk. The two were not entirely unrelated -- the best way to manage the political risks inherent in an irate Congress was to be *seen* to be taking every reasonable step towards managing ecological risk -- but it was clear to me that politics was the dog, and ecology only the tail. Keeping the political risk under control is quite sufficient unless something actually goes wrong -- unless and until the ecology is, in fact, again threatened. And political risk can be managed for far less money than can reality. The Marine Spill Response Corporation was initially funded to the tune of about $800 million as I recall -- a not untidy sum of money, but (as the current situation in the Gulf of Mexico reminds us) far less than the cost of having to actually solve a problem.

The neat thing about political risks is that you only have to solve the ones your target audience perceives. No perception, no need to manage. No need to manage, no cost. No cost means higher profits. Higher profits mean bigger bonuses.

Oil production is always a tremendously destructive undertaking, particularly if there's water anywhere nearby. The lakes of Alberta. The Amazon basin. The Niger delta. Prince William Sound. The Gulf of Mexico. Oil production has imposed a huge penalty on people living and working in all of these places and more, yet the only ones to make the news are the ones which border the USA. And the only ones Congress gets upset about are the ones mentioned in the US press. And the press has a short attention span. And foreign correspondents are largely a thing of the past.

So BP has promised (not, to my knowledge, in writing) to pay the costs of damage. But "damage" is defined as meaning "on land"; oil only comes onshore from the surface of the water, the bulk of the oil from the Deepwater Horizon disaster is suspended below the surface, and BP is spreading dispersants

(detergents) to make sure that continues to be true. Not on the surface, doesn't get to shore. Doesn't get to shore, not visible and not damaging to the US. No damages means no costs. No cost means . . .

Once again, the active parties are managing the political risks not the ecological ones. In the BP case, a major ecological risk is creation of a huge low-oxygen "dead zone" in the Gulf of Mexico. Fish die. But no one owns the fish, so there's no tort created. No tort means no damages. No damages means no reparations. No reparations means no costs . . .

By none of which rambling do I mean for one instant to demean the people currently busting their humps to clean up BP's (and Transocean's, and Halliburton's) mess. Those folks, like the good people I met years ago at Marine Spill Response, are capable and dedicated and going all out I'm sure. What I mean to demean is the logic which, in full knowledge of an established pattern of managing only political risks, allows corporations which care about nothing but profits and decision-makers who care about nothing but bonuses to implement high-risk projects at the outer limits of technological capability. Do enough high-risk projects and at least one will, sooner or later, go bad. Work at the outer limits of technology and when things do go bad, there's no ability to recover.

If you're looking for the antithesis of sustainability, you need only look off the shores of Louisiana. And Mississippi. And Alabama. And Florida. And Texas. And Mexico. And Cuba.

http://www.insidehighered.com/blogs/getting_to_green

Mopping Up: From Hairballs to Penguin Transit

Oil spill cleanup remains a most primitive science, but it hasn't been for a want of experimentation. Here are seven methods that have met with varying success.

By Joan Melcher

As the crude continues to gush into the Gulf of Mexico from the deadly Deepwater Horizon oil well disaster, observers are barraged with snapshots of past cleanup tactics tried, tested or hopeful. So far, response to this disaster has tended more toward hope over help, as BP and U.S. Coast Guard efforts to date — using fire, dispersants, booms, absorbents and a massive dome designed to siphon the oil into a tanker sitting more than 5,000 feet above the wellhead — have not worked to any extent.

Meanwhile, 40 percent of the nation's wetlands lay in the oil slick's path, to say nothing of hundreds of miles of coastline in five states.

As the debacle slowly and painfully plays out, Miller-McCune.com takes a look at a few historical methods of countering oil spills — as well as some decidedly modern ideas that include the use of hairballs and raging rivers.

All this is tempered by something UC Berkeley's Robert Bea, a seasoned expert in oil spills, told our Melinda Burns last week about cleanups: "It's more sophisticated today, but it's the same damned thing. Unfortunately, we have not progressed very far since the miserable experiences of Santa Barbara and the Exxon Valdez."

Bomb the #$@! out of it

Not surprisingly, fire was one of the first containment methods tried on BP's Deepwater Horizon. Fighting fire with fire would seem to make sense (maybe). However, history has shown its use is often ineffective because it requires calm seas — as do many other recovery techniques like booms, skimmers and containment/recovery.

There are a few instances where fire has been quite effective, including a spill when the American tanker Odyssey sank off the Nova Scotia coast in 1988; a fire on the ship and the resultant burning of the estimated 132,000 tons of crude made shore cleanup unnecessary. (We won't talk about air cleanup.)

Of the 120 oceanic oil spills reported by the Mariner Group, the first use of fire occurred when the *Torrey Canyon* ran aground off Cornwall, England, in 1967, releasing 860,000 barrels of oil.

After an ineffective bout using detergents to disperse the oil, the Royal Navy and Air Force later "dropped 62,000 pounds of bombs, 5,200 gallons of petrol, 11 rockets and large quantities of napalm" on the supertanker to sink it and burn off oil. The limeys also rained 1,000-pound shells on it.

The tanker refused to sink and a particularly high spring tide snuffed out the fire. Later it was reported that a quarter of the 42 bombs dropped by the Fleet Air Arm failed to hit their mark, an achievement derided by the British populace.

With the oil slick heading to the French coast of Normandy, the Navy bombed again and succeeded in submerging the Torrey Canyon. However, as has often been the case, human attempts to contain, recover or disperse the oil were to little avail. The BBC reported the oil was "finally dispersed by favorable weather, but not before 70 miles of Cornish beaches were seriously contaminated and tens of thousands of seabirds killed."

Recover, recover, recover

The most attractive idea is to recover the oil while it's still in the ocean, but that's seen scant success over the years. The French gave it a good go when the Maltese tanker *Erika*, loaded with heavy fuel oil, broke into two parts and sank 40 miles off the Brittany coast in 1999.

After high seas made a comedy of errors out of cleanup attempts with skimmers and booms, the recovery team — with boats provided by France, The Netherlands, Germany and the United Kingdom — was able to direct-pump oil into five recovery boats. They captured 1,100 of about 20,000 tons. A report released after the spill noted that even though the amount recovered was relatively small, collecting 1 ton of oil in the sea meant 10 to 20 tons of oiled debris does not wash ashore. Another positive, so to speak, was the post-*Erika* realization that single-hulled tankers were a clear and present danger, and should be phased out.

The oil-spill team seemed so intent on recovery that accounts of other cleanup activities are scanty, other than the fact that more than 100 miles of Brittany's coastline were contaminated, some 100,000 seabirds were killed — a record at that time — and a government institute warned volunteers cleaning oil-cloaked beaches that they risked developing cancer.

Bald is beautiful

The sense of helplessness and despair that arises from an oil spill may have an outlet this time. There's actually something people living far from the spill can do to help.

Need a haircut? Is your dog's coat in need of a trim? Time to sheer that sheep in your back yard? Bag that hair and ship it to Matter of Trust, a San Francisco-based nonprofit that since 1998 has been turning donations of pet fur, human hair and wool waste into oil-absorbing hair mats and containment booms. The containment method for the hair in the booms is even politically correct — recycled pantyhose.

Matter of Trust announced it is receiving "hundreds of thousands of pounds of hair" packages — many of them from hair salons and dog grooming operations — from every U.S. state as well as from Canada, the United Kingdom, France, Spain, Germany and Brazil. And the nonprofit is setting up warehouses in Alabama, Mississippi, Louisiana and Florida so that volunteers can help stuff the hair into tubes and booms.

Some may belittle this low-tech solution, but that overlooks a key aspect of hair: Hair booms and mats qualify as adsorbents (as opposed to absorbents). Adsorbent materials pick up and retain liquid without swelling and have a good record in oil cleanups, at least in small applications. Their inherent nimbleness could make them a natural for protection of wetlands.

Social networking for a cause
Another potential for citizen-activism arises through an Internet software application that uses a "crowdsourcing" technology originally developed to track violence in Kenya.

The Louisiana Bucket Brigade has employed the technology, called Ushahidi (which means "testimony" in Swahili), to motivate citizens in the Gulf Coast to report fallout from the BP spill. Intrepid citizen observers can report sightings of oil sheen on the water or oil onshore, along with information in a series of categories including odor, health effects, marine wildlife and birds, and even solutions.

Reports and locations are entered on interactive maps, which themselves tell a story. A blog post on e.politics notes that the information may eventually be cross-referenced with satellite imagery and data on water quality and other measurements taken by scientists working in the Gulf. Writer Colin Delany notes the information gathering will allow more people to contribute to the policy debate because "every data point on the map will represent a real (rather than a theoretical or anticipated) effect of the spill."

A recent visit to the site revealed 229 reports.

Use that resource
Talk about getting involved! Look at the Indians who inhabited the California coast and Channel Islands, just west of Miller-McCune's home of Santa Barbara. The local Chumash Indians obviously weren't drilling deep offshore wells or crewing supertankers to deliver their energy, but ongoing natural seepages of oil and natural gas — sometimes described as a "permanent natural oil spill" — had long washed goo onto area beaches. In words that could be cribbed by reporters off Louisiana right now, explorer George Vancouver, among the first Europeans in the area, wrote, "The sea had the appearance of dissolved tar floating on its surface, which covered the sea in all directions."

The Chumash made lemonade from the lemons, and used the oil tar as a base for paint, in artwork, to waterproof their baskets and canoes and to roof their homes. Later, settlers used it to grease their wagons and farm machinery, for tarring roofs and for illumination. In oil-spill speak, this would be termed recovery.

Even oil companies got into the reuse act with these seeps. In 1992, ARCO (now part of BP), Mobil and several other drillers created steel-and-concrete pyramids to plunk over the leaks (is this sounding familiar?) to capture and funnel seeping natural gas out of the atmosphere and into someone's stove. The effort hasn't been economical, but it does allow the oil companies some wiggle room with air pollution regulators.

There are no reports of hippies using oil washed onshore from the 1969 oil spill off the Santa Barbara coast in similarly constructive ways. But that catastrophic spill brought all sides and sects together in a single effort to rescue oiled birds and animals. The economic/cultural divide was bridged, at least for a few weeks — no small task on any coastline.

Oh, and the spill and its aftermath also are credited with spawning the environmental movement.

Penguin rehab
The sight of oil-drenched pelicans and penguins is the worst nightmare of an oil company PR person — and for good reason. People can sympathize with fishermen who have lost their livelihood and they may become angry about inept attempts to carry out risk management plans, but they get downright livid about

the consequences of oil spills on their feathered and finned friends — especially when news photos show the baleful looks from the doomed.

In 1994, a Chinese bulk carrier, the *Apollo,* sank off South Africa's Cape of Good Hope, killing all 36 crew members and dumping 2,400 tons of particularly nasty, viscous fuel oil into the sea. As that oil made its way to Dassen and Robben islands, ecological domains of the threatened jackass penguin, the first response was to get the birds out of harm's way.

An estimated 10,000 penguins were ushered onto waiting ships and helicopters and transported to the rehabilitation site of the South African National Foundation for the Conservation of Coastal Birds; when SANCCOB could take no more, two air force bases joined the effort. The penguins were cleaned, fed and allowed to swim daily. No reports emerged as to the effectiveness of group therapy as compared to individual therapy but some six weeks later the rehab of the drenched penguins was declared a success.

The first of the birds were released and found their way back to their nests on the island. But the jackasses may have wondered if they had fallen off the wagon in 2000 when another bulk carrier, the Treasure, holding about 1,400 tons of oil, sank off the coast of Cape Town, this time washing straight onto Robben Island. An estimated 20,000 penguins were rehabilitated after this catastrophe.

Mississippi to the rescue

This may be one of the most creative concepts to emerge in the unremarkable annals of oil spill response: use one disaster to fight another. Recent flooding in Tennessee, Kentucky and Mississippi has swelled the Ohio River, which merges with the Mississippi River in southern Illinois.

And all that water is going somewhere. Carrying flows from 41 states, the iconic Mississippi barrels south to empty its contents into the Mississippi River Delta Basin at an average rate of about 470,000 cubic feet per second. Predictions are that the river will peak at New Orleans on Sunday at about 14 feet, far above the average flow, but short of flood stage. Could that flow of water be used to stave off an oil slick and protect coastal wetlands?

Louisiana officials, working with the Army Corps of Engineers, think it's worth a shot. They've opened several spillways to allow the water from the Mississippi and Atchafalaya rivers to serve as a buffer against oil encroaching on the delta and other coastal areas. The big one — the Bonnet Carre Spillway — could be opened if the river reaches 12.5 feet above sea level in New Orleans.

Considering natural causes seem to have a better rate of success than the long and often sad parade of human attempts, we say, let the river flow.

http://www.miller-mccune.com/science-environment/mopping-up-from-hairballs-to-penguin-transit-15914/?utm_source=Newsletter109&utm_medium=email&utm_content=0518&utm_campaign=newsletters

What About Spilled Oil That Doesn't Reach Shore?

Scientists studying 'natural' oil spills fear for a sea floor about to be overwhelmed by detritus from the BP spill in the Gulf of Mexico.

By Marcia Meier

Scientists say the sea floor may be overwhelmed by the mucks from the BP oil spill in the Gulf of Mexico. (Engineering and the Sciences at UCSB)

As the oily goo from the massive spill in the Gulf of Mexico begins to come ashore, the immediate concern is for the devastating effects it will have on the shore birds and sea life in the coastal regions. But what of the long-term effects on the ocean itself?

David Valentine, a biologist with the University of California, Santa Barbara, worries as much about the effects of the hundreds of thousands of gallons of crude settling on the sea floor, where much of the gushing oil is likely to settle.

While the obvious immediate danger is to the coastal areas — and oil has already started to wash up on island beaches at the Breton National Wildlife Refuge and other areas off the Mississippi and Louisiana coasts — Valentine said there should be equal concern for the shallow shelf waters and, ultimately, the deep-sea floor.

Valentine has been studying oil deposits in the Santa Barbara Channel off the California coast for more than 10 years, focusing on the organisms that eat petroleum and tars that seep naturally out of the channel

floor. More than 100 barrels (or 4,200 gallons) of oil a day ooze from seeps just 2 miles offshore, and much of it ends up on Santa Barbara's beaches. It's been described as a "permanent natural oil spill."

Valentine and his co-investigator, Chris Reddy of Woods Hole Oceanographic Institute in Massachusetts, two years ago reported the discovery of microscopic creatures that eat oil on the sea floor.

"It takes a special organism to live a half mile deep in the earth and eat oil for a living," Valentine said. "It's actually a whole consortium of organisms — some that are eating the oil and producing intermediate products, and then those intermediate products are converted by another group to natural gas."

This illustration shows the route traveled by oil leaving the sub-seafloor reservoir as it travels through the water column to the surface and ultimately falls back to the seafloor. The oil remaining after weathering falls in a plume shape onto the seafloor where it remains in the sediment. Click to enlarge. (Jack Cook, Woods Hole Oceanographic Institution)

Also, because the deep ocean is an anaerobic environment, and very cold, the breakdown process is much slower than would happen with, for example, bioremediation, where organisms that eat oil are sprayed on slicks to break them down naturally. (Take a look at a look at the work of environmental microbiologist Terry Hazen here.)

But the spill in the Gulf of Mexico is on a scale that overwhelms the organisms that would typically digest it, Valentine explained.

"It's really a matter of amount, of how much ends up depositing on the sea floor. You've got micro-organisms that are capable of consuming components of the oil, but they are finicky. They're not a magic bullet by any sense, and they act on their own time frame."

In the case of the Gulf spill, there's too much oil, and it's happened too fast.

"It's just overwhelming the capacity of biology to deal with it. The longer the oil stays afloat, the better off it's going to be," Valentine said.

In addition to the oil's impact, he worries about the potential effects of the surfactant — essentially a detergent — that is being sprayed on the slicks and pumped into the Gulf to break up the oil. Because the surfactant's chemical makeup is a proprietary mixture, its exact makeup is not known, and Valentine worries how those chemicals will affect coastal wildlife and sea life over time.

One result of using dispersants is that thicker blobs of oil may be created extending under the surface, making tracking the oil far more difficult.

"It's going to be a very interesting fallout pattern that comes from that. We need to know where. The beach is the place you really don't want it. The next place you don't want it is the shallow shelf. The place most people don't care about is the deep water. I care about the organisms there that are likely to be impacted."

The deep ocean is home to a rich assortment of organisms and creatures, including mussels, snails, crabs, shrimp, fish and large sea worms. Many live around deep-sea vents where extremes of temperature and pressure create difficult environments. How those colonies of life would be affected by blankets of thick crude is unknown.

"It certainly has the potential to impact the critters of the deep ocean. It may not have a big economic impact, but it will affect the ecosystems," Valentine said.

Oil is made up of thousands of different hydrocarbons that can break down by the action of light, bacteria or oxygen into chemicals such as aldehydes, ketones or sulfur compounds. They can also become acids, and many are potentially toxic, Valentine said.

Valentine also studies methane hydrates, a solid ice that forms when methane contacts cold water under the intense pressure of the deep ocean. Methane hydrates are the reason that British Petroleum engineers encountered problems over the weekend while placing a collection tower over the ruptured pipeline. Methane hydrates are stable at low temperatures and high pressure, as at the ocean floor, but they coagulate — kind of like cholesterol in your veins — and in this case they simply clogged up the top of the containment structure, Valentine explained.

As soon as BP put the tower in place, the hole at the top of the tower became plugged, casting doubt on whether that proposed fix is viable. Meanwhile, the oil continues to spew out of the ruptured pipeline at a rate of about 5,000 barrels, or about 210,000 gallons, per day. At between 150 and 180 degrees Fahrenheit, it's like a blistering Jacuzzi jet shooting into the open ocean, Valentine said.

Until someone figures out how to harness it, the devastation will continue, Valentine said.

"The reality is it could certainly go for months or even years."

http://www.miller-mccune.com/science-environment/what-about-spilled-oil-that-doesnt-reach-shore-15830/

Oil Cleanup Cure May Be Worse Than Disease

Despite the agony of watching oil-sodden waters lap at pristine shores, our ham-fisted cleanups can do more harm than good, experts say.

By Melinda Burns

As oil from the massive BP spill in the Gulf of Mexico creeps toward land, experts say cleanup efforts can do more harm than good. (Wikipedia.org)

Irving Mendelssohn, a Louisiana wetland ecologist, knows what won't work if and when the oil slick in the Gulf reaches his marshy coastline.

Unfortunately, he's not sure what will.

"The most important thing is that you don't send hundreds of people walking into the wetlands, pushing that oil into the soil," he said. "You can't have people stomping around in their boots. And you don't want machines like tractors pushing the oil into the soil. That would definitely kill the vegetation."

All other "remediations" are problematic, too, Mendelssohn said. As a professor at Louisiana State University who specializes in the effects of oil on wetlands, he's been advising the National Oceanic and Atmospheric Administration on cleanup of the massive slick edging toward the mainland. The oil has now reached the sandy beaches of Louisiana's barrier islands, even as crews struggle to contain more than 200,000 gallons of oil gushing every day from BP's exploded Deepwater Horizon rig in the Gulf of Mexico.

Bioremediation, or breaking down the oil with bacteria, wouldn't work well in Louisiana because the coastal wetlands are flooded with water, Mendelssohn said. Setting the marshes on fire or flushing them

with low-pressure hoses could be effective in plots of 20 or 30 acres, he said, but those methods aren't feasible in larger areas.

"Would you want to burn hundreds of thousands of acres?" Mendelssohn asked. "That's a tremendously hard call."

There are no good cleanup options for the orange-colored slick the size of Delaware, just as there were none for the Exxon Valdez tanker spill off Alaska in 1989, the Amoco Cadiz tanker spill off Brittany, France, in 1978, or the platform blowout in the Santa Barbara Channel in Santa Barbara, Calif., in 1969.

Robert Bea, a University of California, Berkeley, professor of civil environmental engineering who spent nearly 60 years in the oil business, was sent as a troubleshooter to all of those and several dozen more onshore and offshore spills.

In Santa Barbara, he recalled, people tried to mop up the black tide on the beaches with paper towels and bales of straw. "It's more sophisticated today, but it's the same damn thing. Unfortunately, we have not progressed very far since the miserable experiences of Santa Barbara and the Exxon Valdez."

In the sensitive marshes of the California's Bay-Delta 35 years later, Bea said, workers used buckets to scoop up the mess from a 60,000-gallon pipeline oil spill.

"We killed the marsh," he said.

Along the coast of Brittany, some of the salt marshes there are still recovering from being trampled after the Amoco Cadiz accident, in which the supertanker split in two, spilling 68 million gallons of oil. Other marshes were bulldozed and the topsoil was carted away, leaving areas below water unable to regenerate. Effectively, studies show, the excavated marshes will never come back, while untreated areas are doing fine.

The Exxon Valdez spill, totaling 11 million gallons of oil, is still the largest in the U.S. and arguably one of the worst anywhere in terms of the environmental damage it caused. It covered more than 1,300 miles of wild coastline along Alaska's Prince William Sound with black sticky goo.

John Robinson, a Santa Barbara resident who was NOAA's scientific adviser on the Exxon Valdez spill, recalled this week how he advised the U.S. Coast Guard to use high-pressure hoses to blast steaming hot water on the rocky shores of Alaska. It enabled the cleanup workers — 11,000 in all — to push the oil back into the ocean where it was corralled and skimmed off behind booms. But it "cooked" everything in sight.

Robinson said he feared that if the oil was not removed, it would swirl around and cause damage elsewhere.

"In the end, it was proven pretty clearly that we did the wrong thing," he said. "We were approaching sterilization of the coast with that kind of equipment. It turned out to be a mistake. This kind of aggressive cleanup does nothing but delay the eventual recovery that nature is going to do anyway."

It turns out that driving oily sand below the tide line, where many plants and animals had escaped the spill, the blasts of hot water only made matters worse, according to a report by NOAA in 1991.

"Sometimes, the best thing to do in an oil spill is nothing," the report concluded.

The public, however, wants a reason to hope. In a 1993 report, the state of Alaska said that benefits to fishing and tourism outweighed the disruptions of the Exxon Valdez cleanup. Officials were willing to accept some damage in return for removing as much oil from shore as fast as possible, the report said.

And in a 10-year study on the effects of the spill, Bowdoin College researchers concluded that 90 percent of the plants and animals in the Exxon Valdez spill zone had recovered by mid-1990, in part because of the cleanup and in part because of natural forces.

Even the heavily oiled and treated shorelines of Prince William Sound have proved to be quite resilient: They appear today much as they did before the spill. At the same time, according to NOAA, deposits of oil linger underground, mussels are still contaminated, and once-rich clam beds have not yet recovered.

Robinson said his own experience has made him a skeptic. When the Exxon Valdez cleanup was in full swing, he fought for nine areas — totaling less than a mile of coast — to be set aside and not cleaned. Within a few years, he said, "It was clear that the areas that had not been cleaned were faring a lot better in terms of their recovery. The areas that were cleaned were in much worse shape."

As the head of NOAA's Hazardous Materials Response Team, which he founded in 1976, Robinson oversaw about 100 oil spill cleanups. "I can't think of any good example where a cleanup has been anything other than useless. It causes more damage than not doing anything at all. Once the genie gets out of the bottle, there's no getting it back in. That seems to be proving itself once more in New Orleans."

Bea is more of an optimist, even as he notes that cleanups typically capture only 10 percent of spilled oil.

"If you don't do anything, you don't learn anything," he said.

Of course, it's best to keep the genie in the bottle, Bea said. In 2002, he wrote a study urging oil companies to adopt a system of organizational checks and balances to guard against accidents at deepwater rigs.

Right now in the Gulf, more than 8,000 workers are attempting to contain the spill and prevent it from reaching the mainland, and another 2,500 are on call. Nearly 300 boats are assisting in cleanup efforts. More than 30 miles of floating booms have been laid along the Gulf Coast, and 10 staging areas have been set up onshore. To date, nearly 2 million gallons of watery oil have been recovered.

Just how bad the spill will be onshore depends on how much oil moves in, how much it has weathered or degraded over time and how long it stays. Wetland plants can survive a light oiling. But if the plants get coated every time the tide comes in, Louisiana will likely lose large pieces of its coast to the spill, Mendelssohn said.

"What is really frightful and very scary is, when the plants die, the top 12 inches of soil where the roots are will start to die and collapse like a balloon," Mendelssohn said, adding that when the soil loses volume, it sinks, giving rise to excessive flooding. New seeds cannot re-establish, he said, and "before you know it, you have land loss."

Louisiana has 40 percent of the remaining wetlands in the lower 48 states. Even before the spill, the state was losing wetlands to storms and erosion at the rate of 25 square miles per year.

"When the Louisiana wetlands are affected," Mendelssohn said, "it's both a regional and a national impact."

http://www.miller-mccune.com/science-environment/oil-cleanup-cure-may-be-worse-than-disease-15722/

Data from many drug trials for stroke go unpublished

Clinically useful data may lie buried, researchers say.
By Janet Raloff
Web edition : Thursday, April 22nd, 2010
A+A Text Size

Each year, some 15 million people suffer a stroke, the sudden interruption of blood supplies to the brain; it's usually due to ischemia, the blockage of arteries. Yet important details from roughly one in five drug trials for the acute treatment of this (far and away the most common type of stroke) have never entered the public domain, a new study finds.

The masked data come from 125 trials that together involved more than 16,000 participants and tests of 89 different drugs.

Burying trial data – whether intentional or not – "sets aside the altruism of participants" to become guinea pigs for the greater good, says study author Peter Sandercock, a neurologist specializing in stroke. At least as importantly, he maintains, it "potentially biases the assessment of the effects of therapies and may lead to premature discontinuation of research into promising treatments."

His team at the University of Edinburgh, Scotland, investigated many hundreds of trials. Although some date back to the 1950s, Sandercock observes that trials of therapies for this type of stroke didn't really take off until the 1980s. (Research on the less-common hemorrhagic stroke still awaits its heyday, he says.) What this means is that most trials surveyed in the new study will have taken place in recent decades.

After compiling a list of all known trials, the researchers scoured databases and journal archives for evidence that details and outcomes had been made publically available. And indeed, most trials were eventually described in peer-reviewed journals. Although these reports might have had deficiencies, Sandercock acknowledges, such citations were deemed to constitute that a trial had been "fully" published.

But many drug trials that were mentioned in press clippings or conference abstracts appeared to have no corresponding journal article. Other trials with similarly untraceable data had been briefly alluded to only in press releases, perhaps by participating hospitals or funding sources. In all of these instances, the Edinburgh team pored over the literature to find possible investigators associated with the trials, and then contacted them, sometimes repeatedly, asking whether their data had ever been formally published.

Unless they learned otherwise, they now assume the trial was never formally published. And that the raw data or report to funding agencies probably languish within the files of some hospital – or maybe sit boxed in some researcher's attic.

The nondisclosure of data from such long and costly trials likely traces to a host of reasons, including a medical-publishing system that prizes novel and/or dramatic data, even if they might not represent the best or statistically strongest findings. That said, even data from small, weak or poorly designed trials should be made publically available, Sandercock argues. If journals pass on publishing these or the authors lose interest when hypotheses don't pan out, there should be alternative outlets for the data, he says.

Some findings might hint at ineffective therapies that should be retired from service even if they are inexpensive and widely used.

Other stats or observations might point to possible risks deserving further follow-up. For instance, the new study uncovered mortality data associated with 22 unpublished trials that turned up 636 deaths. "No

information was available on whether the experimental drug had contributed to any of those deaths," Sandercock allows. But most physicians would like to know whether there were any common features that tended to distinguish those who succumbed, such as age, gender, weight, severity of initial stroke, or accompanying illnesses such as diabetes.

Details of the Edinburgh analysis were published online April 22 in *Trials*.

Responding to an editorial

It's hardly the first study to find that the data from many clinical trials languish or become buried. It's not even the first such study focusing on stroke trials. But it is the most comprehensive.

I asked Sandercock what prompted his delving into the tedious morasse. And he pointed to a 2008 commentary in *Practical Neurology* by Kameshwar Prasad on the public health implications of delays in the publication of findings from clinical trials. In it, Prasad pointed to questions about trials involving two drugs for acute ischemic stroke: piracetam and fraxiparine. Early trials of each drug suggested they worked (although in piracetam's case, possibly only in a subgroup of treated individuals).

But a followup trial of piracetam began in 1998. And as of the publication date of Prasad's editorial, no journal had published clues to whether the new trial confirmed the initial one's findings. And that, argued the New Delhi-based neurologist, "raises the suspicion that the results may be neutral of unfavourable to pircetam. If this is true, patients with stroke are receiving an ineffective and potentially harmful treatment."

Moreover, he asserted, because this drug is used primarily in developing countries, like India, where people don't tend to have insurance, poor patients may be needlessly shelling what little money they have for no medical gain. Which would certainly compound the human tragedy, he says.

In the case of fraxiparine, the initial trial that suggested it worked involved 312 patients and was published in the *New England Journal of Medicine*. Which means it got a lot of attention. A far larger trial failed to confirm the drug's promise, Prasad said. But sketchy details of its findings were published in abstract form only – in 1998 – and to this day remain off the radar screen of most neurologists. "Hence," Prasad concluded, "thousands of patients with acute ischaemic stroke continue to incur the risks and costs associated with the use of this drug without any certainty at all that it improves their outcome."

Sandercock had read Prasad's commentary shortly before medical student Lorna Gibson approached him looking for a research project to tackle. Sandercock suggested she comb through the Cochrane Stroke Group website, an archived repository of publically available information on stroke treatments – including press releases or newspaper clippings mentioning trials planned or in progress.

Gibson accepted the challenge, and the new study was off and running. The Edinburgh group extended its investigation to other databases as well. And in the end, Gibson identified 940 clinical trials that seemed to fit the bill. Further checking would indicate that some didn't. They might have involved the wrong type of stroke or had other problems that took them out of contention.

Despite all that, her group showed that some 20 percent of all trials seemed to remain unpublished.

Not just lost data, but a huge "waste"

And such a finding points to a massive waste. Not only of time, but also of money and patients' good will, argue Iain Chalmers of the James Lind Initiative in Oxford, England, and Paul Glasziou of the University of Oxford's Centre for Evidence-Based Medicine. Last year, the pair published their own commentary in the *Lancet* that examined the causes and degree of waste that can occur at every stage in a clinical trial.

It starts when researchers decide what to study. And it often is not the most pressing issue affecting patients with a particular disease, they note. Nor even focuses, necessarily, on diseases affecting the most people. Which might not be a big deal if financing for such trials were not tight, restricting how many will ultimately be conducted. Some studies also suffer from serious design problems – ones that will compromise the value of or ability to interpret whatever they turn up. Then there's the issue of whether a trial's findings will get published. And if they do, whether they are presented in a way that does not seriously bias their interpretation, rendering them "unusable."

The bottom line: Together, these problems compound the magnitude of waste. Immensely. It's certainly Glasziou conclude, "that the dividends from tens of billions of dollars of investment in research are lost every year because of correctable problems." And while their analysis focused on problems with clinical trials, they said "we believe it is reasonable to assume that the problems also apply to other types of research."

Even climate impacts...
As an interesting addendum, Chalmers sent me an email yesterday indicating that the issue of waste extends well beyond dollars, pounds Sterling, or even rupies. He pointed to a pollution estimate published last year in the *British Medical Journal* that suggested carbon-dioxide emissions associated with the average randomized medical trial comes to 78.4 metric tons.

Responding to the implications of that assessment, Chalmers and Glaziou fired back a letter pointing out that "This carbon cost occurs whether or not a trial is published. Every year an estimated 12,000 trials which should have been fully reported are not. Hence under-reporting of trials wastes just under a million tonnes of carbon dioxide annually (the equivalent of carbon emissions from about 800,000 round trip flights between London and New York)."

Okay, that number is a back-of-the-envelope calculation. But it does reinforce that there are many ways to tally the costs of not publishing trial data. And they're all large.

http://www.sciencenews.org/view/generic/id/58533/title/Data_from_many_drug_trials_for_stroke_go_unpublished

Motivating Students Via Mental Time Travel

How do you get kids to do their homework? Help them shape a positive but realistic image of themselves as successful adults.

By Tom Jacobs

The key to getting kids to do their homework involves helping them shape a positive but realistic image of themselves as successful adults. (Luca di Filippo / istockphoto.com)

Why do so many teens lack the necessary motivation to rigorously focus on their schoolwork? To quote William Shakespeare — whom your seventh-grader should be studying right now, rather than instant-messaging her friends — the problem may be in their mind's eye.

That's the conclusion of a new study by two University of Michigan researchers, who find a link between schoolwork, grades and the vision kids have of themselves as happy, successful adults.

They report some middle school students see themselves becoming doctors or lawyers — professions that require a good education — while others have visions of becoming movie stars or sports heroes. Overwhelmingly, those in both categories express the intention of going to college, but guess which ones do the actual work required to get there and succeed?

Writing in the *Journal of Experimental Social Psychology*, Mesmin Destin and Daphna Oyserman describe two experiments conducted in Detroit-area middle schools. In the first, 266 eighth-graders in a poor, predominantly black district were asked to think about the job they think they envision themselves having as an adult. The answers were compared with their grade point averages and the amount of time they spent doing homework.

While nearly nine out of 10 said they expected to go to college, only 46 percent reported having an "education-dependent adult identity," the researchers write. Members of that minority "were more likely to invest current effort in schoolwork than those who did not, and these efforts paid off in better grades."

Why bother to study if you see yourself as a future NBA star or a winner on *American Idol?*

In the second experiment, 295 seventh-graders were shown one of two graphs. The first "showed a step-wise increase in median earnings by level of education." The second "showed median earnings in Michigan and the very high earnings of top actors, athletes and musicians." All were then given the option of doing an extra-credit assignment.

The results were not subtle. Those who saw the chart linking wages with education were eight times more likely to complete the optional task.

To Destin and Oyserman, this "demonstrates the power of subtle cues" to help students connect work done today with a successful future. Such "small interventions" (to use the researchers' term) can pay major dividends.

Kids, in other words, are much like adults: They're not going to work hard unless they envision some sort of payoff. This research suggests that rather than berating them for bad grades, it'd be far more productive to help them shape that vision and understand the direct connection between effort today and success tomorrow.

http://www.miller-mccune.com/culture-society/motivating-students-via-mental-time-travel-15122/

Science Comes to the Rescue of Lab Rats

Scientists at Tel Aviv University are bioengineering tissues that can take the place of lab rats, saving untold lives.

By Elisabeth Best

Scientists, using stem cells, are creating tissues that can take the place of lab rats, saving untold lives. (Filo / istockphoto.com)

One of PETA's more outré facets is its staunch opposition to animal testing, especially that done in a regulatory capacity. PETA president Ingrid Newkirk has been quoted saying, "Even if animal research resulted in a cure for AIDS, we'd be against it."

A new study from Tel Aviv University should give the organization's supporters something to cheer about: It's possible that animal testing, which is required for health and medical products, could be done using tissue generated from stem cells (hold off for a second, other pressure groups) and not living creatures.

The research by professor Amit Gefen of Tel Aviv University could put lab rats out of work (and harm's way).

His investigation of fat cells, published in *Tissue Engineering*, suggests that tissue needed for experiments can be produced using fat, skin, bone and muscle cells. Gefen uses adult rat stem cells to create the tissues he needs for his own work on the mechanical properties of pressure ulcers.

He argues that using engineered tissues might even be more efficient than using those from living animals. The model he and his team have created is very reliable, he says, and he predicts that as few as 5 percent of the animals used in labs today will need to be sacrificed in the future.

"Drugs make our lives better, and basic science is needed to push new drugs through clinical trials," Gefen observed in a release. "But there is no doubt that an untold number of animals are sacrificed in the laboratory setting — both in basic research and in applied conditions when testing particular molecules."

He is currently working to develop a new tool that investigates fat accumulation in cells and weight loss drugs. The devices he has built so far include one that tells doctors the amount of stress placed on a person's foot, buttox or other soft tissues. Another measures the amount of sensation remaining in a diabetic limb.

Gefen says his team can now build a number of simplified living tissues "quite readily" and keep them alive. They are genetically identical to each other (and similar to the biological tissue of the animal they come from) and allow environmental factors to be well-controlled, making it easier for scientists to reproduce their experiments than it is when they use live animals.

He hopes that one day, models can be created based on human tissue, but acknowledges that it may take years to make this a reality.

Still, his research thus far suggests that animal rights activists might not have to choose between lab rats and sick kids after all.

http://www.miller-mccune.com/science-environment/science-comes-to-the-rescue-of-lab-rats-14750/

Chimps 'feel death like humans'

Chimpanzees deal with death in much the same way as humans, studies suggest.

Scientists in Scotland filmed a group of chimps grooming and caressing an elderly female who died, and remaining subdued for several days afterwards.

Other researchers saw females carrying around the bodies of their dead offspring. Both studies are reported in the journal Current Biology.

The scientists say this suggests other species, particularly apes, are more like humans than we might think.

" **We found several similarities between the chimpanzees' behaviour toward the dying female and their behaviour after her death, and some reactions of humans** "
James Anderson Stirling University

"Several phenomena have at one time or another been considered as setting humans apart from other species: reasoning ability, language ability, tool use, cultural variation, and self-awareness, for example," said James Anderson from Stirling University, who led the research team looking at the death of the elderly female.

"But science has provided strong evidence that the boundaries between us and other species are nowhere near to being as clearly defined as many people used to think.

"The awareness of death is another such psychological phenomenon."

Keeping close

Staff at Blair Drummond Safari and Adventure Park in Stirlingshire used video cameras to document the death of a terminally ill female named Pansy, believed to be more than 50 years old.

When she became lethargic in the days leading up to her death, other members of the group became quieter than usual and stayed with her at nights, grooming her more than they did normally.

After her death, her daughter stayed near the body for an entire night, even though she had never slept on that platform before.

All of the group were subdued for several days afterwards, and avoided the place where she had died, spending long hours grooming each other.

In the second study, led by scientists at Oxford University, two mothers living in the wild at the Bossou site in Guinea were seen to carry around the bodies of their dead offspring - one of them for nearly 10 weeks.

This behaviour has been seen once before at the site, in 1992; and the researchers suggest it may be learned.

During the period, the babies' bodies slowly mummified as they dried out. The bereaved mothers used tools to fend off flies.

Religious beliefs

"Our observations confirm the existence of an extremely powerful bond between mothers and their offspring which can persist, remarkably, even after the death of the infant," said Oxford's Dora Biro.

"They further call for efforts to elucidate the extent to which chimpanzees understand and are affected by the death of a close relative or group-mate.

"This would both have implications for our understanding of the evolutionary origins of human perceptions of death and provide insights into the way chimpanzees interpret the world around them."

Chimpanzees and humans share about 99% of their DNA, and are so closely related that some academics have suggested they should be given rights similar to human rights.

Dr Anderson suggests the treatment of death marks another similarity.

"We found several similarities between the chimpanzees' behaviour toward the dying female and their behaviour after her death, and some reactions of humans when faced with the demise of an elderly group member or relative, even though chimpanzees do not have religious beliefs or rituals surrounding death," he said.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8645283.stm

Published: 2010/04/26 18:19:57 GMT

Site chosen for super-telescope

By Jonathan Amos
Science correspondent, BBC News

Europe has chosen the place it wants to build the world's biggest optical telescope.

The observatory will be constructed on Cerro Armazones, a 3,000m-high mountain in Chile's Atacama Desert.

The E-ELT (European Extremely Large Telescope) will have a primary mirror 42m in diameter.

Astronomers say the next-generation observatory will be so powerful it will be able to image directly rocky planets beyond our Solar System.

It should also be able to provide major insights into the nature of black holes, galaxy formation, the mysterious "dark matter" that pervades the Universe, and the even more mysterious "dark energy" which appears to be pushing the cosmos apart at an accelerating rate.

E-ELT - BIGGEST EYE ON THE SKY
- Basic design completed in 2006; detailed work now under way
- Main mirror consists of 984 segments; each is 1.45m wide
- Final image requires use of four further - but smaller - mirrors
- Latest optics techniques correct for atmospheric distortions
- Construction could start in 2011; likely cost is one billion euros

Final go-ahead for the E-ELT is expected at the end of this year.

The European Southern Observatory (Eso) organisation which is managing the project says it hopes the telescope can be operational by 2018.

The estimated cost is in the region of a billion euros.

The decision on the E-ELT site was taken by the ESO Council after several years of study at competing locations that included other places in Chile, and in the Canary Islands, Spain.

Cerro Armazones is just 20km from Cerro Paranal, where Eso operates its Very Large Telescope facility - a suite of interconnected optical telescopes that includes four units with primary mirrors measuring 8.2m. E-ELT is therefore about five times the width of today's best optical telescopes (antennas for radio telescopes are still very much bigger).

Like Paranal, Armazones will enjoy near-perfect observing conditions - at least 320 nights a year when the sky is cloudless. The Atacama's famous aridity means the amount of water vapour in the atmosphere is very limited, reducing further the perturbation starlight experiences as it passes through the Earth's atmosphere.

Coming up with a workable design has been a challenge. It is impossible to make a monolithic mirror on such a scale and so the primary reflecting surface will be composed of 984 hexagonal segments, each 1.45m in size.

The E-ELT will thus be able to gather 15 times more light than the largest optical telescopes operating today. It will also provide images 15 times sharper than those from the Hubble Space Telescope.

The huge telescope is one of the major projects listed on a roadmap of research infrastructures that Europe feels it needs to fulfil its scientific goals over the next 20 years.

Other facilities range from high-powered laser systems through to a plan to construct the world's most advanced polar ice-breaker.

Jonathan.Amos-INTERNET@bbc.co.uk

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8645511.stm

Published: 2010/04/26 20:47:08 GMT

Chocolate 'linked to depression'

People who regularly eat chocolate are more depressive, experts have found.

Research in Archives of Internal Medicine shows those who eat at least a bar every week are more glum than those who only eat chocolate now and again.

Many believe chocolate has the power to lift mood, and the US team say this may be true, although scientific proof for this is lacking.

But they say they cannot rule out that chocolate may be a cause rather than the cure for being depressed.

In the study, which included nearly 1,000 adults, the more chocolate the men and women consumed the lower their mood.

Those who ate the most - more than six regular 28g size bars a month - scored the highest on depression, using a recognised scale.

None of the men and women were on antidepressants or had been diagnosed as clinically depressed by a doctor.

'Mood food'

Dr Natalie Rose and her colleagues from the University of California, San Diego, say there are many possible explanations for their findings, and that these need to be explored.

It may simply be that people who are depressed crave chocolate as a "self-treatment" to lift mood, or depression may drive the craving without any beneficial effect.

"Alternatively, analogous with alcohol, there could be short-term benefits of chocolate to mood with longer-term untoward effects," they told the journal.

Chocolate could even be a direct cause of depression, the researchers added.

Bridget O'Connell, of the mental health charity Mind, said: "The way we feel and what we eat can be closely related, and many people will be familiar with craving particular foods or comfort eating when they are stressed, under pressure or depressed.

"However, as this study shows, more research is needed to determine exactly what the relationship between chocolate and our mood is."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8644016.stm

Published: 2010/04/27 02:36:25 GMT

'Pick the right veg' for health

Obvious choices of fruit and vegetables are not necessarily the healthiest, say researchers.

According to US experts, making simple swaps like eating sweet potatoes instead of carrots and papaya rather than oranges could make a difference.

Foods, like raspberries, watercress and kale, are richer in phytonutrients which may help prevent disease, they told a US meeting.

UK nutritionists said a balanced diet is essential to good health.

The British Nutrition Foundation warned that relying on eating a few select food types to boost health was ill-advised and said there was no such thing as a "superfood".

" **No one food can give you everything you need** "
Dr Emma Williams of the British Nutrition Foundation

Experts recommend five portions a day of fruit and veg in a healthy diet.

Plant foods are known to contain "phytonutrient" chemicals that can protect the heart and arteries and prevent cancers.

But the most popular varieties may not be the best, according to US researchers.

They analysed data from US health surveys of people's dietary habits to look at the most common sources of phytonutrients.

They found that for 10 of the 14 phytonutrients studied, a single food type accounted for two-thirds or more of an individual's consumption, regardless of how much fruit and veg they ate overall.

Carrots were the most common source of beta-carotene, oranges and orange juice the most common source of beta-cryptoxanthin, spinach the most common source of lutein/zeaxanthin, strawberries the most common source of ellagic acid and mustard the biggest provider of isothiocyanates.

However, for each of these phytonutrients there was a richer food source available.

Richer foods

Switching from carrots to sweet potatoes would nearly double beta-carotene intake, say the researchers.

Similarly papaya contains 15 times more beta-cryptoxanthin than oranges, while kale has three times more lutein/zeaxanthin than spinach.

Raspberries have three times more ellagic acid than strawberries and one cup of watercress contains as much isothiocyanate as four teaspoonfuls of mustard.

Study leader Keith Randolph, who is a technology strategist for the supplement company Nutrilite, said: "These data highlight the importance of not only the quantity but also the significant impact the quality and variety of the fruits and vegetables you eat can have on your health."

Dr Emma Williams of the British Nutrition Foundation said: "They are right that some foods are richer sources of phytonutrients.

"But at the end of the day, to be healthy you need to make sure you have a varied and balanced diet.

"No one food can give you everything you need."

The findings were presented at the 2010 Experimental Biology conference in Anaheim, California.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8645104.stm

Published: 2010/04/27 02:43:11 GMT

Chilli peppers 'help pain relief'

Studying chilli peppers is helping scientists create a new type of painkiller which could stop pain at its source.

A team at the University of Texas says a substance similar to capsaicin, which makes chilli peppers hot, is found in the human body at sites of pain.

And blocking the production of this substance can stop chronic pain, the team found.

They report their findings in the Journal of Clinical Investigation.

Capsaicin is the primary ingredient in hot chilli peppers which causes a burning sensation.

It does this by binding to receptors present on the cells inside the body.

Similarly, when the body is injured, it releases capsaicin-like substances - fatty acids called oxidized linoleic acid metabolites or OLAMs - and these, via receptors, cause pain, the researchers have found.

Blocking pain

Dr Kenneth Hargreaves, senior researcher at the Dental School at the University of Texas, and his team next set out to see if they could block these newly discovered pain pathways.

Lab work on mice showed that by knocking out a gene for the receptors, there was no sensitivity to capsaicin.

Armed with this knowledge they set about making drugs to do the same.

Dr Hargreaves said: "This is a major breakthrough in understanding the mechanisms of pain and how to more effectively treat it.

"We have discovered a family of endogenous capsaicin-like molecules that are naturally released during injury, and now we understand how to block these mechanisms with a new class of non-addictive therapies."

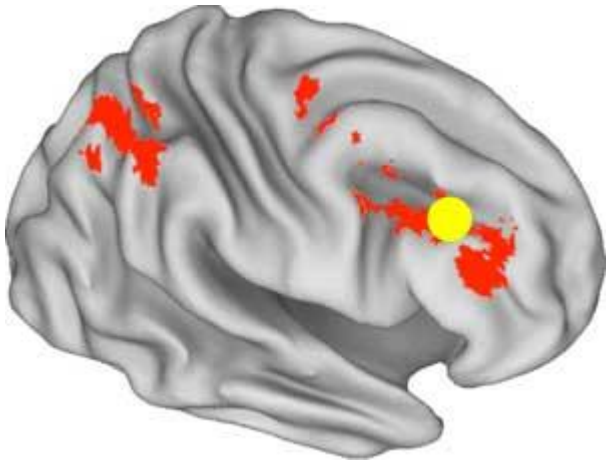
Ultimately, he hopes the drugs will be able to treat different types of chronic pain, including that associated with cancer and inflammatory diseases such as arthritis and fibromyalgia.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8644788.stm

Published: 2010/04/27 02:59:58 GMT

Reward-Driven People Win More, Even When No Reward at Stake

The brain's lateral prefrontal cortex (in yellow) shows heightened and long-lasting activity in people more driven by rewards, even when a reward is not offered. (Credit: Koji Jimura)



ScienceDaily (Apr. 26, 2010) — Whether it's for money, marbles or chalk, the brains of reward-driven people keep their game faces on, helping them win at every step of the way. Surprisingly, they win most often when there is no reward.

That's the finding of neuroscientists at Washington University in St. Louis, who tested 31 randomly selected subjects with word games, some of which had monetary rewards of either 25 or 75 cents per correct answer, others of which had no money attached.

Subjects were given a short list of five words to memorize in a matter of seconds, then a 3.5-second interval or pause, then a few seconds to respond to a solitary word that either had been on the list or had not. Test performance had no consequence in some trials, but in others, a computer graded the responses, providing an opportunity to win either 25 cent or 75 cents for quick and accurate answers. Even during these periods, subjects were sometimes alerted that their performance would not be rewarded on that trial.

Prior to testing, subjects were submitted to a battery of personality tests that rated their degree of competitiveness and their sensitivity to monetary rewards.

Designed to test the hypothesis that excitement in the brains of the most monetary-reward-sensitive subjects would slacken during trials that did not pay, the study is co-authored by Koji Jimura, PhD, a post-doctoral researcher, and Todd Braver, PhD, a professor, both based in psychology in Arts & Sciences. Braver is also a member of the neuroscience program and radiology department in the university's School of Medicine.

But the researchers found a paradoxical result: the performance of the most reward-driven individuals was actually most improved -- relative to the less reward-driven -- in the trials that paid nothing, not the ones in which there was money at stake.

Even more striking was that the brain scans taken using functional Magnetic Resonance Imaging (fMRI) showed a change in the pattern of activity during the non-rewarded trials within the lateral prefrontal cortex (PFC), located right behind the outer corner of the eyebrow, an area that is strongly linked to intelligence, goal-driven behavior and cognitive strategies. The change in lateral PFC activity was statistically linked to the extra behavioral benefits observed in the reward-driven individuals.

The researchers suggest that this change in lateral PFC activity patterns represents a flexible shift in response to the motivational importance of the task, translating this into a superior task strategy that the researchers term "proactive cognitive control." In other words, once the rewarding motivational context is established in the brain indicating there is a goal-driven contest at hand, the brain actually rallies its neuronal troops and readies itself for the next trial, whether it's for money or not.

"It sounds reasonable now, but when I happened upon this result, I couldn't believe it because we expected the opposite results," says Jimura, first author of the paper. "I had to analyze the data thoroughly

to persuade myself. The important finding of our study is that the brains of these reward- sensitive individuals do not respond to the reward information on individual trials. Instead, it shows that they have persistent motivation, even in the absence of a reward. You'd think you'd have to reward them on every trial to do well. But it seems that their brains recognized the rewarding motivational context that carried over across all the trials."

The finding sheds more light on the workings of the lateral PFC and provides potential behavioral clues about personality, motivation, goals and cognitive strategies. The research has important implications for understanding the nature of persistent motivation, how the brain creates such states, and why some people seem to be able to use motivation more effectively than others. By understanding the brain circuitry involved, it might be possible to create motivational situations that are more effective for all individuals, not just the most reward-driven ones, or to develop drug therapies for individuals that suffer from chronic motivational problems.

Their results are published April 26 in the early online edition of the *Proceedings of the National Academy of Sciences.*

Everyone knows of competitive people who have to win, whether in a game of HORSE, golf or the office NCAA basketball tournament pool. The findings might tell researchers something about the competitive drive.

The researchers are interested in the signaling chain that ignites the prefrontal cortex when it acts on reward-driven impulses, and they speculate that the brain chemical dopamine could be involved. That could be a potential direction of future studies. Dopamine neurons, once thought to be involved in a host of pleasurable situations, but now considered more of learning or predictive signal, might respond to cues that let the lateral PFC know that it's in for something good. This signal might help to keep information about the goals, rules or best strategies for the task active in mind to increase the chances of obtaining the desired outcome.

In the context of this study, when a 75-cent reward is available for a trial, the dopamine-releasing neurons could be sending signals to the lateral PFC that "jump start" it to do the right procedures to get a reward.

"It would be like the dopamine neurons recognize a cup of Ben and Jerry's ice cream, and tell the lateral PFC the right action strategy to get the reward -- to grab a spoon and bring the ice cream to your mouth," says Braver. "We think that the dopamine neurons fires to the cue rather than the reward itself, especially after the brain learns the relationship between the two. We'd like to explore that some more."

They also are interested in the "reward carryover state," or the proactive cognitive strategy that keeps the brain excited even in gaps, such as pauses between trials or trials without rewards. They might consider a study in which rewards are far fewer.

"It's possible we'd see more slackers with less rewards," Braver says. "That might have an effect on the reward carryover state. There are a host of interesting further questions that this work brings up which we plan to pursue."

Adapted from materials provided by Washington University in St. Louis.

Journal Reference:

1. Koji Jimura, Hannah S. Locke, Todd S. Braver. **Prefrontal cortex mediation of cognitive enhancement in rewarding motivational contexts**. *Proceedings of the National Academy of Sciences*, 2010; DOI: 10.1073/pnas.1002007107

http://www.sciencedaily.com/releases/2010/04/100426182006.htm

Brown Rice and Cardiovascular Protection

Brown rice might have an advantage over white rice by offering protection from high blood pressure and atherosclerosis. (Credit: iStockphoto/Wojtek Kryczka)

ScienceDaily (Apr. 27, 2010) — Rice is generally thought to be a healthy addition to the diet because it is a source of fiber. However, not all rice is equally nutritious, and brown rice might have an advantage over white rice by offering protection from high blood pressure and atherosclerosis ("hardening of the arteries"), say researchers at the Cardiovascular Research Center and Department of Physiology at Temple University School of Medicine in Philadelphia.

New research by Satoru Eguchi, Associate Professor of Physiology, suggests that a component in a layer of tissue surrounding grains of brown rice may work against angiotensin II. Angiotensin II is an endocrine protein and a known culprit in the development of high blood pressure and atherosclerosis.

The findings are contained in a study conducted by Dr. Eguchi and his colleague at the Temple lab, Akira Takaguri. The research team is also composed of Hirotoshi Utsunomiya and Ryohei Kono of the Department of Pathology, School of Medicine, Wakayana Medical University, Wakayama, Japan; and Shin-ichi Akazawa, Department of Materials Engineering, Nagaoka National College of Technology, Nagaoka, Japan. Dr. Takaguri will present the team's findings at the annual 2010 Experimental Biology conference in Anaheim, CA on April 24-28. This presentation is sponsored by The American Physiological Society.

Brown Rice and Angiotensin II

The subaleurone layer of Japanese rice, which is located between the white center of the grain and the brown fibrous outer layer, is rich in oligosaccharides and dietary fibers, making it particularly nutritious. However, when brown rice is polished to make white rice, the subaleurone layer is stripped away and the rice loses some of its nutrients. The subaleurone layer can be preserved in half-milled (Haigamai) rice or incompletely-milled (Kinmemai) rice. These types of rice are popular in Japan because many people there believe they are healthier than white rice.

The Temple team and their colleagues at the Wakayama Medical University Department of Pathology and the Nagaoka National College of Technology Department of Materials Engineering in Japan sought

to delve into the mysteries of the subaleurone layer and perhaps make a case for leaving it intact when rice is processed. Because angiotensin II is a perpetrator in such lethal cardiovascular diseases, the team chose to focus on learning whether the subaleurone layer could somehow inhibit the wayward protein before it wreaks havoc.

First, the team removed the subaleurone tissue from Kinmemai rice. Then they separated the tissue's components by exposing the tissue to extractions of various chemicals such as ethanol, methanol and ethyl acetate. The team then observed how the tissue affected cultures of vascular smooth muscle cells. Vascular smooth muscle cells are an integral part of blood vessel walls and are direct victims of high blood pressure and atherosclerosis.

During their analysis, the team found that subaleurone components that were selected by an ethyl acetate extraction inhibited angiotensin II activity in the cultured vascular smooth muscle cells. This suggests that the subaleurone layer of rice offers protection against high blood pressure and atherosclerosis. It could also help explain why fewer people die of cardiovascular disease in Japan, where most people eat at least one rice-based dish per day, than in the U.S., where rice is not a primary component of daily nutrition.

"Our research suggests that there is a potential ingredient in rice that may be a good starting point for looking into preventive medicine for cardiovascular diseases," said Dr. Eguchi. "We hope to present an additional health benefit of consuming half-milled or brown rice [as opposed to white rice] as part of a regular diet."

Story Source:

Adapted from materials provided by Federation of American Societies for Experimental Biology, via EurekAlert!, a service of AAAS.
http://www.sciencedaily.com/releases/2010/04/100426151625.htm

Body's Response to Repetitive Laughter Is Similar to the Effect of Repetitive Exercise, Study Finds

A new study looks at the effect that mirthful laughter and distress have on modulating the key hormones that control appetite. (Credit: iStockphoto/Wouter Van Caspel)

ScienceDaily (Apr. 26, 2010) — Laughter is a highly complex process. Joyous or mirthful laughter is considered a positive stress (eustress) that involves complicated brain activities leading to a positive effect on health. Norman Cousins first suggested the idea that humor and the associated laughter can benefit a person's health in the 1970s. His ground-breaking work, as a layperson diagnosed with an autoimmune disease, documented his use of laughter in treating himself -- with medical approval and oversight -- into remission. He published his personal research results in the New England Journal of Medicine and is considered one of the original architects of mind-body medicine.

Dr. Lee S. Berk, a preventive care specialist and psychoneuroimmunology researcher at Loma Linda University's Schools of Allied Health (SAHP) and Medicine, and director of the molecular research lab at SAHP, Loma Linda, CA, and Dr. Stanley Tan have picked up where Cousins left off. Since the 1980s, they have been studying the human body's response to mirthful laughter and have found that laughter helps optimize many of the functions of various body systems. Berk and his colleagues were the first to establish that laughter helps optimize the hormones in the endocrine system, including decreasing the levels of cortisol and epinephrine, which lead to stress reduction. They have also shown that laughter has a positive effect on modulating components of the immune system, including increased production of antibodies and activation of the body's protective cells, including T-cells and especially Natural Killer cells' killing activity of tumor cells.

Their studies have shown that repetitious "mirthful laughter," which they call Laughercise©, causes the body to respond in a way similar to moderate physical exercise. Laughercise© enhances your mood, decreases stress hormones, enhances immune activity, lowers bad cholesterol and systolic blood pressure, and raises good cholesterol (HDL).

As Berk explains, "We are finally starting to realize that our everyday behaviors and emotions are modulating our bodies in many ways." His latest research expands the role of laughter even further.

A New Study: Humor versus Distress, Effect on and Appetite Hormones

Berk, along with his colleague Dr. Jerry Petrofsky at Loma Linda University, and their team have recently completed a new study, which is being presented at the 2010 Experimental Biology conference in Anaheim, CA between April 24-28, 2010.

In the current study, 14 healthy volunteers were recruited to a three-week study to examine the effects that eustress (mirthful laughter) and distress have on modulating the key hormones that control appetite. During the study, each subject was required to watch one 20-minute video at random that was either upsetting (distress) or humorous (eustress) in nature. The study was a cross-over design, meaning that the volunteers waited one week after watching the first video to eliminate its effect, then watched the opposite genre of video.

For a distressing video clip, the researchers had the volunteer subjects watch the tense first 20 minutes of the movie Saving Private Ryan. This highly emotional video clip is known to distress viewers substantially and equally.

For the eustress video, the researchers had each volunteer choose a 20-minute video clip from a variety of humorous options including stand-up comedians and movie comedies. Allowing the volunteers to "self-select" the eustress that most appealed to them guaranteed their maximum humor response.

During the study, the researchers measured each subject's blood pressure and took blood samples immediately before and after watching the respective videos. Each blood sample was separated out into its components and the liquid serum was examined for the levels of two hormones involved in appetite, leptin and ghrelin, for each time point used in the study.

When the researchers compared the hormone levels pre- and post-viewing, they found that the volunteers who watched the distressing video showed no statistically significant change in their appetite hormone levels during the 20-minutes they spent watching the video.

In contrast, the subjects who watched the humorous video had changes in blood pressure and also changes in the leptin and ghrelin levels. Specifically, the level of leptin decreased as the level of ghrelin increased, much like the acute effect of moderate physical exercise that is often associated with increased appetite.

Berk explains that this research does not conclude that humor increases appetite. He explains, "The ultimate reality of this research is that laughter causes a wide variety of modulation and that the body's response to repetitive laughter is similar to the effect of repetitive exercise. The value of the research is that it may provide for those who are health care providers with new insights and understandings, and thus further potential options for patients who cannot use physical activity to normalize or enhance their appetite."

Appetite Loss may have a new Treatment Option

For example, many elderly patients often suffer from what is known as "wasting disease." They become depressed and, combined with a lack of physical activity, lose their appetite and jeopardize their health and well-being. Based on Berk's current research, these patients may be able to use Laughercise© as an alternative, initially less strenuous, activity to regain their appetite.A similar loss of appetite is often seen in widowers, who typically suffer depression after the loss of a spouse. This often results in decreased immune-system function and subsequent illness in the surviving spouse. Chronic pain patients also suffer from appetite loss due to the chemical changes in their body that cause intolerable discomfort.

While laughter may seem unimaginable in the face of deep depression or intense chronic pain, it may be an accessible alternative starting point for these patients to regain appetite and consequently, improve and enhance their recovery to health.Berk's current research expands the role of laughter on the human body and whole-person care, but also complicates an already complicated emotion. He acknowledges, "I am more amazed by the interrelatedness of laughter and body responses with the more evidence and knowledge we collect. It's fascinating that positive emotions resulting from behaviors such as music playing or singing, and now mirthful laughter, translate into so many types of [biological] mechanism optimizations. As the old biblical wisdom states, it may indeed be true that laughter is a good medicine."

Story Source:

Adapted from materials provided by Federation of American Societies for Experimental Biology, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2010/04/100426113058.htm

Research in Antarctica Reveals Non-Organic Mechanism for Production of Important Greenhouse Gas

UGA research scientist Vladimir Samarkin and his colleagues measured the production of nitrous oxide, an important greenhouse gas, at Don Juan Pond in Antarctica and discovered at the site a previously unreported chemical mechanism for the production of this important greenhouse gas. The discovery could help space scientists understand the meaning of similar brine pools on Mars. (Credit: The University of Georgia)

ScienceDaily (Apr. 26, 2010) — In so many ways, Don Juan Pond in the Dry Valleys of Antarctica is one of the most unearthly places on the planet. An ankle-deep mirror between mountain peaks and rubbled moraine, the pond is an astonishing 18 times saltier than the Earth's oceans and virtually never freezes, even in temperatures of more than 40 degrees below zero Fahrenheit.

Now, a research team led by biogeochemists from the University of Georgia has discovered at the site a previously unreported chemical mechanism for the production of nitrous oxide, an important greenhouse gas. Possibly even more important, the discovery could help space scientists understand the meaning of similar brine pools in a place whose ecosystem most closely resembles that of Don Juan Pond: Mars.

The research, published April 25 in the journal *Nature Geoscience*, adds an intriguing new variable to growing evidence that there has been -- and may still be -- liquid water on Mars, a usual prerequisite for the formation of life. In fact, the new findings could help space scientists develop sensors for detecting such brines on Mars -- thus narrowing the search for places where life may exist.

"The pond's soils and brines and the surrounding rock types are similar to those found on Mars," said Samantha Joye, a faculty member in the department of marine sciences in the Franklin College of Arts and Sciences and lead author on the paper. "So it provides an ideal location to assess microbial activity in extreme environments. While we did not detect any 'bio-gases' such as hydrogen sulfide and methane, we

did, surprisingly, measure high concentrations of nitrous oxide, which is normally an indicator of microbial activity. We needed to find out whether a non-organic process could account for this nitrous oxide production."

Other authors on the paper include Vladimir Samarkin, a research scientist, and Marshall Bowles, a graduate student, also of the department of marine sciences at UGA; Michael Madigan of Southern Illinois University; Karen Casciotti of the Woods Hole Oceanographic Institution; John Priscu of Montana State University; and Christopher McKay of the Ames Research Center of NASA.

The research was supported by grants from the National Science Foundation's Antarctic Organisms and Ecosystems Program and the McMurdo Microbial Observatory Program.

Scientists have been fascinated with Don Juan Pond since its discovery in 1961. (While the site is lovely, there's nothing romantic about the name, which comes from the helicopter pilots who first found it, Don Roe and John Hickey.) From the time of its discovery, researchers realized they had found a place like nowhere else on Earth.

The pond, which is a roughly 1,000- by 400-meter basin, is the saltiest body of water on Earth by far, some eight times saltier than the Dead Sea. While researchers more than 30 years ago reported finding abundant and varied microflora of fungi, bacteria, blue-green algae and yeasts, since then and during the Joye team's work, such life has been non-existent. Since the depth level and area covered by the pond (which is fed by hypersaline groundwater) have demonstrably varied over the years, this wasn't unexpected. What did surprise the team was that even with no life-forms present, they were able to measure nitrous oxide, perhaps best known to most people as the "laughing gas" used in dental procedures. (The amounts measured in the air were beneath a level that could make a person light-headed or giddy, as "laughing gas" can.)

"What we found was a suite of brine-rock reactions that generates a variety of products, including nitrous oxide and hydrogen," said Joye. "In addition to Don Juan Pond, this novel mechanism may occur in other environments on Earth as well and could serve as both an important component of the Martian nitrogen cycle and a source of fuel [hydrogen] to support microbial chemosynthesis."

Even more interesting, perhaps, is that the results suggest that an additional mechanism -- the reaction of brine-derived nitrates with basaltic rock -- could be a "previously unrecognized means for mobilizing nitrate from the surface soils . . . and returning it to the Martian atmosphere as nitrous oxide," Joye said.

The discovery of water has been the holy grail of numerous Mars missions over the years, and in 2009 the Mars Phoenix mission's cameras photographed on the legs of the lander what appeared to be liquid water. If ultimately confirmed -- and growing evidence appears to be solidifying in favor of such an analysis -- it would be the first time liquid water was detected and photographed outside the Earth.

Working in such a beautiful but unearthly area presents stern challenges to researchers, Joye said.

"It's a 40-minute helicopter ride over the McMurdo Sound just to get there," she said. "Once in the Wright Valley, we enter a tight enclosure with steep, rocky cliffs on both sides, and between them is Don Juan Pond. I believe it must be one of the most beautiful places in Antarctica."

Samarkin agreed. "It has the kind of beauty that rock parks in Japan have," he said, "except this is made by nature."

Beauty aside, though, the team had to dress in sterile suits and masks and use sterile instruments for sampling to avoid possible contamination. They also collected the minimal amount of material necessary to achieve their research goals.

The discovery of the new mechanism opens numerous questions that must be studied, including the possibility that the process is taking place in other extreme Antarctic habitats or that it might contribute to nitrous oxide in temperate soils -- a possible new clue to understanding greenhouse gases involved in global warming.

The most crucial result, however, may be in understanding how similar brine pools on Mars might work and whether they could support life.

Story Source:

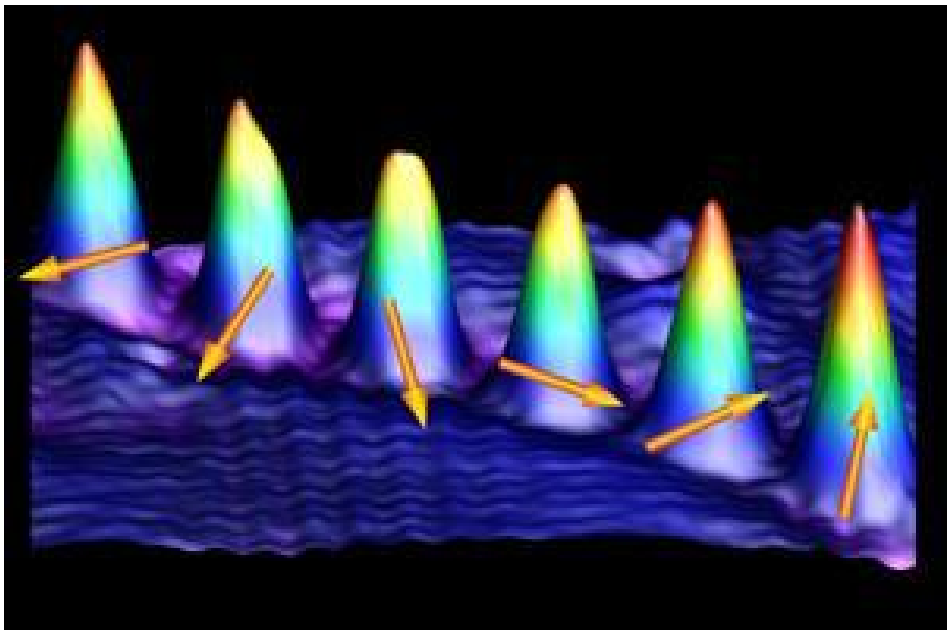
Adapted from materials provided by University of Georgia, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Vladimir A. Samarkin, Michael T. Madigan, Marshall W. Bowles, Karen L. Casciotti, John C. Priscu, Christopher P. McKay & Samantha B. Joye. **Abiotic nitrous oxide emission from the hypersaline Don Juan Pond in Antarctica**. *Nature Geoscience*, 25 April 2010 DOI: 10.1038/ngeo847

http://www.sciencedaily.com/releases/2010/04/100425151148.htm

Physicists Capture First Images of Atomic Spin



The different shape and appearance of these individual cobalt atoms is caused by the different spin directions. (Credit: Image courtesy Saw-Wai Hla, Ohio University)

ScienceDaily (Apr. 26, 2010) — Though scientists argue that the emerging technology of spintronics may trump conventional electronics for building the next generation of faster, smaller, more efficient computers and high-tech devices, no one has actually seen the spin -- a quantum mechanical property of electrons -- in individual atoms until now.

In a study published as an Advance Online Publication in the journal *Nature Nanotechnology*, physicists at Ohio University and the University of Hamburg in Germany present the first images of spin in action.

The researchers used a custom-built microscope with an iron-coated tip to manipulate cobalt atoms on a plate of manganese. Through scanning tunneling microscopy, the team repositioned individual cobalt atoms on a surface that changed the direction of the electrons' spin. Images captured by the scientists showed that the atoms appeared as a single protrusion if the spin direction was upward, and as double protrusions with equal heights when the spin direction was downward.

The study suggests that scientists can observe and manipulate spin, a finding that may impact future development of nanoscale magnetic storage, quantum computers and spintronic devices.

"Different directions in spin can mean different states for data storage," said Saw-Wai Hla, an associate professor of physics and astronomy in Ohio University's Nanoscale and Quantum Phenomena Institute and one of the primary investigators on the study. "The memory devices of current computers involve tens of thousands of atoms. In the future, we may be able to use one atom and change the power of the computer by the thousands."

Unlike electronic devices, which give off heat, spintronic-based devices are expected to experience less power dissipation.

The experiments were conducted in an ultra-high vacuum at the low temperature of 10 Kelvin, with the use of liquid helium. Researchers will need to observe the phenomenon at room temperature before it can be used in computer hard drives.

But the new study suggests a path to that application, said study lead author Andre Kubetzka of the University of Hamburg. To image spin direction, the team not only used a new technique but also a manganese surface with a spin that, in turn, allowed the scientists to manipulate the spin of the cobalt atoms under study.

"The combination of atom manipulation and spin sensitivity gives a new perspective of constructing atomic-scale structures and investigating their magnetic properties," Kubetzka said.

The research, which was carried out at the University of Hamburg, was supported by the German Research Foundation and a Partnership for International Collaboration and Education (PIRE) grant from National Science Foundation.

The research is the result of a collaboration among three research teams: a spin-polarized scanning tunneling microscopy group of Professor Roland Wiesendanger led by Kubetzka at the University of Hamburg, Germany; Hla, an expert in atom manipulation at Ohio University; and two theorists, Professor Stefan Heinze and Paolo Ferriani, now at the Christian-Albrechts-Universität Kiel, in Germany.

Story Source:

Adapted from materials provided by Ohio University.

Journal Reference:

1. David Serrate, Paolo Ferriani, Yasuo Yoshida, Saw-Wai Hla, Matthias Menzel, Kirsten von Bergmann, Stefan Heinze, Andre Kubetzka, Roland Wiesendanger. **Imaging and manipulating the spin direction of individual atoms**. *Nature Nanotechnology*, 2010; DOI: 10.1038/nnano.2010.64

http://www.sciencedaily.com/releases/2010/04/100426151638.htm

Ancient Artifacts Revealed as Northern Ice Patches Melt

Top: a birch arrow (in four pieces) and the stone projectile point. The arrow is 270 years old. Bottom: A 340-year-old bow reconstructed from several fragments found near the ice. (Credit: Image courtesy of Arctic Institute of North America)

ScienceDaily (Apr. 26, 2010) — High in the Mackenzie Mountains, scientists are finding a treasure trove of ancient hunting tools being revealed as warming temperatures melt patches of ice that have been in place for thousands of years.

Tom Andrews, an archaeologist with the Prince of Wales Northern Heritage Centre in Yellowknife and lead researcher on the International Polar Year Ice Patch Study, is amazed at the implements being discovered by researchers.

"We're just like children opening Christmas presents. I kind of pinch myself," says Andrews.

Ice patches are accumulations of annual snow that, until recently, remained frozen all year. For millennia, caribou seeking relief from summer heat and insects have made their way to ice patches where they bed down until cooler temperatures prevail. Hunters noticed caribou were, in effect, marooned on these ice islands and took advantage.

"I'm never surprised at the brilliance of ancient hunters anymore. I feel stupid that we didn't find this sooner," says Andrews.

Ice patch archeology is a recent phenomenon that began in Yukon. In 1997, sheep hunters discovered a 4,300-year-old dart shaft in caribou dung that had become exposed as the ice receded. Scientists who investigated the site found layers of caribou dung buried between annual deposits of ice. They also discovered a repository of well-preserved artifacts.

Andrews first became aware of the importance of ice patches when word about the Yukon find started leaking out. "We began wondering if we had the same phenomenon here."

In 2000, he cobbled together funds to buy satellite imagery of specific areas in the Mackenzie Mountains and began to examine ice patches in the region. Five years later, he had raised enough to support a four-hour helicopter ride to investigate two ice patches. The trip proved fruitful.

"Low and behold, we found a willow bow." That discovery led to a successful application for federal International Polar Year funds which have allowed an interdisciplinary team of researchers to explore eight ice patches for four years.

The results have been extraordinary. Andrews and his team have found 2400-year-old spear throwing tools, a 1000-year-old ground squirrel snare, and bows and arrows dating back 850 years. Biologists involved in the project are examining dung for plant remains, insect parts, pollen and caribou parasites. Others are studying DNA evidence to track the lineage and migration patterns of caribou. Andrews also works closely with the Shutaot'ine or Mountain Dene, drawing on their guiding experience and traditional knowledge.

"The implements are truly amazing. There are wooden arrows and dart shafts so fine you can't believe someone sat down with a stone and made them."

Andrews is currently in a race against time. His IPY funds have run out and he is keenly aware that each summer, the patches continue to melt. In fact, two of the eight original patches have already disappeared.

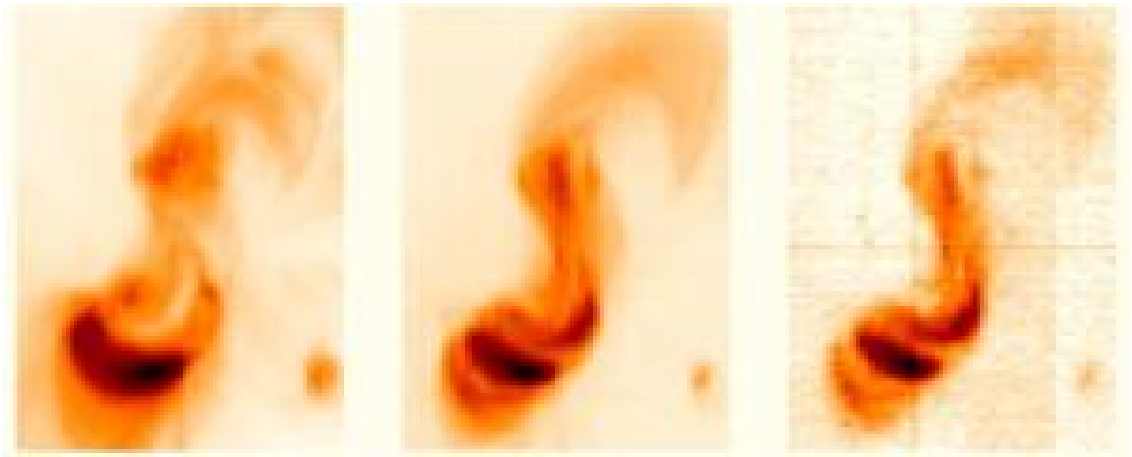
"We realize that the ice patches are continuing to melt and we have an ethical obligation to collect these artifacts as they are exposed," says Andrews. If left on the ground, exposed artifacts would be trampled by caribou or dissolved by the acidic soils. "In a year or two the artifacts would be gone."

Story Source:

Adapted from materials provided by Arctic Institute of North America, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2010/04/100426131603.htm

Magnetic 'Ropes' Tie Down Solar Eruptions



The three images reveal gases trapped in the flux rope at different temperatures, from 1.5 million degrees Celsius in the image on the left through to 2.5 million degrees Celsius in the right hand image. These were made with data taken by the EIS telescope, an instrument built by a team led by UCL-MSSL and deployed on the Hinode spacecraft (a joint JAXA/UK/NASA mission). (Credit: JAXA/ISAS/NASA/STFC)

ScienceDaily (Apr. 26, 2010) — Over the last century, astronomers have become very aware of how just dynamic the Sun really is. One of the most dramatic manifestations of this is a coronal mass ejection (CME) where billions of tons of matter is thrown into space. If a CME reaches the Earth it creates inclement 'space weather' that can disrupt communications, power grids and the delicate systems on orbiting satellites. This potential damage means there is a keen interest in understanding exactly what triggers a CME outburst.

Now a team of researchers from University College London (UCL) has used data from the Hinode spacecraft, revealing new details of the formation of an immense magnetic structure that erupted to produce a CME on the 7th December 2007. Lead researcher Dr Lucie Green will present their results April 12 at the RAS National Astronomy Meeting in Glasgow.

The Sun's behaviour is shaped by the presence of magnetic fields that thread through the solar atmosphere. The magnetic fields may take on different shapes from uniform arches to coherent bundles of field lines known as 'flux ropes'. Understanding the exact structure of magnetic fields is a crucial part of the effort to determine how the fields evolve and the role they play in solar eruptions. In particular, flux ropes are thought to play a vital role in the CME process, having been frequently detected in interplanetary space as CMEs reach the vicinity of the Earth.

Dr. Green says, "Magnetic flux ropes have been observed in interplanetary space for many years now and they are widely invoked in theoretical descriptions of how CMEs are produced. We now need observations to confirm or reject the existence of flux ropes in the solar atmosphere before an eruption takes place to see whether our theories are correct."

The formation of the flux rope requires that significant energy is stored in the solar atmosphere. The rope is expected to remain stable whilst the solar magnetic field in the vicinity holds it down.

But at some point the structure becomes unstable and it erupts to produce a CME. Using data from the Hinode spacecraft Dr. Green has shown that a flux rope formed in the solar atmosphere over the 2.5 days that preceded the December 2007 event. Evidence for the flux rope takes the form of S shaped structures which are clearly seen by one of the Hinode instruments, the UK-led Extreme-Ultraviolet Imaging Telescope.

The key point to understanding and predicting the formation of CMEs is to know when the flux rope becomes unstable. Combining the observations of the S shaped structure with information on how the magnetic field in the region evolves has enabled Dr.Green to work out when this happened. The work shows that over 30% of the magnetic field of the region had been transformed into the flux rope before it became unstable, three times what has been suggested in theory.

Dr Green sees a better understanding of magnetic flux ropes and their role in emissions from the Sun and other stars as one of the most pressing questions not just for solar physics but astronomy as a whole.

She comments, "Flux ropes are thought to play a vital role in the evolution of the magnetic field of the Sun. However, the physics of flux ropes is applied across the Universe. For example, a solar physics model of flux rope ejection was recently used to explain the jets driven by the accretion disks around the supermassive black holes found in the centre of galaxies."

Story Source:

Adapted from materials provided by Royal Astronomical Society (RAS), via AlphaGalileo.

http://www.sciencedaily.com/releases/2010/04/100412084549.htm

Solid-State Illuminator Reduces Nitrates in Leafy Green Vegetables

Green onions subjected to red LED treatment during the experiment showed a decrease in nitrates. (Credit: Photo by Akvile Urbonaviciute)

ScienceDaily (Apr. 26, 2010) — Searching for ways to improve the nutritional quality of leafy green vegetables, Lithuanian researchers have found success with new technology that features high-density photosynthetic photon flux generated by a solid-state illuminator. The technology, which can be applied in greenhouses for preharvest treatment of leafy vegetables, was found to decrease concentrations of harmful nitrates while allowing some beneficial nutrient levels to increase.

The research results were published in a recent issue of *HortScience*.

The researchers experimented with a solid-state illuminator to provide short-term preharvest light treatment of lettuce, marjoram, and green onions. The vegetable plants were grown to harvest time in a greenhouse under daylight with supplementary lighting provided by standard high-pressure sodium lamps. A subsequent 3-day treatment within a phytotron under light-emitting diodes resulted in the reduction of nitrate concentration by 44% to 65%.

According to Giedre Samuoliene, lead author of the report, the technology is different from the usual practice of using high-pressure sodium lamps; solid-state illuminators limit the amount of radiant heat, allowing a high intensity of photosynthesis. Additionally, the technique allows for short-term treatment of plants rather than for full-cycle growth.

In vegetable leaves exposed to light generated by the solid-state illuminator, nitrate concentration was reduced by two to three times in comparison with those kept under high-pressure sodium lamps. The highest nitrate reduction rate was observed in hydroponically grown lettuce; after a 3-day treatment under

red LEDs, tests showed a 65% relative decrease of nitrate concentration. The relative decrease of nitrates was similar in all species tested. "The results of our study indicate that nitrate content in lettuce, marjoram, and green onions can be considerably reduced by several times using short-term preharvest treatment under purely red light with high PPFD," stated Samuoliene.

A significant outcome of the research is the finding that leafy vegetables can be produced under normal lighting conditions, while the health quality can be improved with a relatively short treatment using an advanced solid-state illuminator. The new technology may be expensive, but can prove economically viable in terms of production costs and the benefits of vegetables with added nutritional value. Since the treatment is conducted only over 10% of the overall growth cycle, the capital cost limitations for the application of solid-state lighting in horticulture are mitigated.

The researchers noted that the technology may be particularly practical for leafy vegetable production in northern countries where greenhouse plants are often grown under poor lighting conditions.

Story Source:

Adapted from materials provided by American Society for Horticultural Science, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Samuoliene, Giedre, Urbonaviciute, Akvile, Duchovskis, Pavelas, Bliznikas, Zenonas, Vitta, Pranciskus, Zukauskas, Arturas. **Decrease in Nitrate Concentration in Leafy Vegetables Under a Solid-state Illuminator**. *HortScience*, 2009; 44: 1857-1860 [link]

http://www.sciencedaily.com/releases/2010/04/100415185814.htm

Keeping Kids Away from R-Rated Movies May Prevent Early Drinking

ScienceDaily (Apr. 26, 2010) — Middle-school children whose parents restrict access to R-rated movies are substantially less likely to start drinking than their peers who are allowed to see such films, a new study suggests.

In a study of nearly 3,600 New England middle school students, researchers found that among kids who said their parents never allowed them to watch R movies, few took up drinking over the next couple years.

Of that group, 3 percent said they had started drinking when questioned 13 to 26 months after the initial survey. That compared with 19 percent of their peers who'd said their parents "sometimes" let them see R-rated films, and one-quarter of students who'd said their parents allowed such movies "all the time."

The researchers say the findings, reported in the May issue of the *Journal of Studies on Alcohol and Drugs*, underscore the importance of parents paying close attention to their children's media exposure.

"We think this is a very important aspect of parenting, and one that is often overlooked," said Dr. James D. Sargent, a professor of pediatrics at Dartmouth Medical School in Hanover, New Hampshire.

The current findings build on evidence linking children's exposure to R-rated movies and onscreen "adult" content in general not only to early drinking but also to early smoking and kids' likelihood of having sex or behaving violently.

"The research to date suggests that keeping kids from R-rated movies can help keep them from drinking, smoking and doing a lot of other things that parents don't want them to do," Sargent said.

He pointed out that it could be argued that parents who restrict access to R movies are simply more careful in general -- keeping tabs on their children's friends or making sure their kids have no access to alcohol at home, for instance. However, Sargent and his colleagues accounted for this in the current study by asking students questions that gauge "authoritative parenting" -- which gauges the adolescent's perception of parental responsiveness (ability to respond to the adolescent's point of view) and demandingness (ability to set and enforce limits).

The researchers found that, even with such factors considered, exposure to R-rated movies was still linked to the likelihood of early drinking.Ninety percent of R-rated films have depictions of drinking, and that may be one reason that middle-schoolers who see the films are more vulnerable to early drinking. But Sargent said that the R-rated movie effect goes beyond that. Other research suggests that children who see R-rated movies become more prone to "sensation seeking" and risk taking. "We think seeing the adult content actually changes their personality," Sargent said.

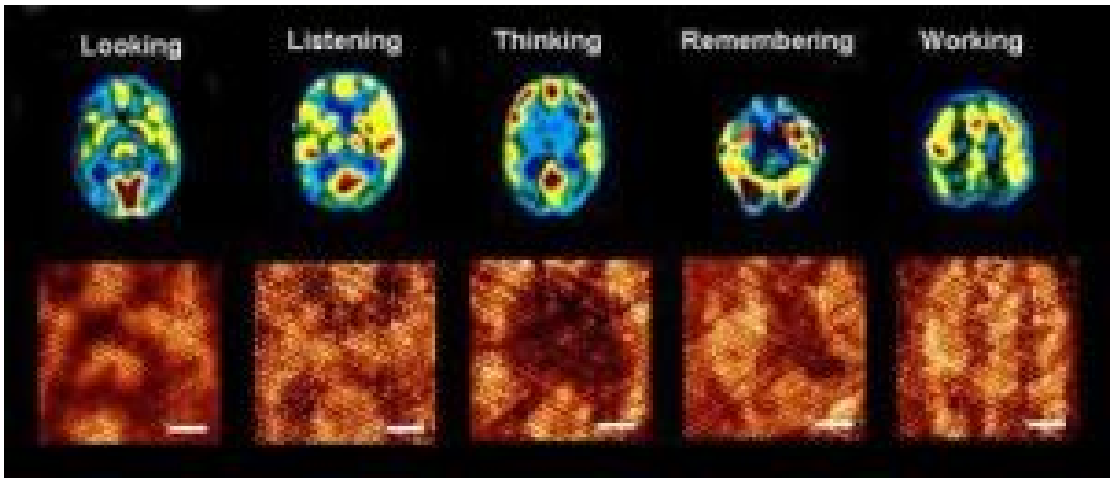
The bottom line, according to the researcher, is that parents should restrict their kids from seeing R-rated films. But he also pointed out that PG-13 movies, as well as many TV shows, often portray drinking and other adult situations -- and that supports limiting children's media time in general.The American Academy of Pediatrics currently recommends that children watch no more than one to two hours of "quality" media, including movies, TV and videos, each day.

Story Source:

Adapted from materials provided by Journal of Studies on Alcohol and Drugs, via EurekAlert!, a service of AAAS.

http://www.sciencedaily.com/releases/2010/04/100426072115.htm

Brain-Like Computing on an Organic Molecular Layer



Magnetic resonance images of human brain during different functions appear on top. Similar evolving patterns have been generated on the molecular monolayer one after another (bottom). A snapshot of the evolving pattern for a particular brain function is captured using Scanning Tunneling Microscope at 0.68 V tip bias (scale bar is 6 nm). The input pattern to mimic particular brain function is distinct, and the dynamics of pattern evolution is also typical for a particular brain operation. (Credit: Anirban Bandyopadhyay)

ScienceDaily (Apr. 26, 2010) — Information processing circuits in digital computers are static. In our brains, information processing circuits -- neurons -- evolve continuously to solve complex problems. Now, an international research team from Japan and Michigan Technological University has created a similar process of circuit evolution in an organic molecular layer that can solve complex problems. This is the first time a brain-like "evolutionary circuit" has been realized.This computer is massively parallel: The world's fastest supercomputers can only process bits one at a time in each of their channels. Their circuit allows instantaneous changes of ~300 bits.Their processor can produce solutions to problems for which algorithms on computers are unknown, like predictions of natural calamities and outbreaks of disease. To prove this unique feature, they have mimicked two natural phenomena in the molecular layer: heat diffusion and the evolution of cancer cells.

The monolayer has intelligence; it can solve many problems on the same grid.Their molecular processor heals itself if there is a defect. This remarkable self-healing property comes from the self-organizing ability of the molecular monolayer. No existing man-made computer has this property, but our brain does: if a neuron dies, another neuron takes over its function.The work is described in *Nature Physics*. It is coauthored by Ranjit Pati, of the Michigan Technological University Department of Physics. Lead author is Anirban Bandyopadhyay, National Institute for Materials Science, National Institute of Information and Communication Technology, Japan.

Adapted from materials provided by Michigan Technological University, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Anirban Bandyopadhyay, Ranjit Pati, Satyajit Sahu, Ferdinand Peper & Daisuke Fujita. **Massively parallel computing on an organic molecular layer**. *Nature Physics*, 25 April 2010 DOI: 10.1038/nphys1636

http://www.sciencedaily.com/releases/2010/04/100425151146.htm

Australian Researchers Develop Highest-Yielding Salt-Tolerant Wheat

A field of salt tolerant durum wheat grown in northern New South Wales as part of a CSIRO field trial. (Credit: Dr Richard James, CSIRO)

ScienceDaily (Apr. 26, 2010) — In a major breakthrough for wheat farmers in salt-affected areas, CSIRO researchers have developed a salt tolerant durum wheat that yields 25 per cent more grain than the parent variety in saline soils.

Recent field trials in northern New South Wales proved that durum wheat varieties containing new salt tolerant genes outperformed the other varieties in saline soils.

The breakthrough will enable wheat farmers to achieve higher yields of durum wheat in saline soils. Although durum wheat is less salt tolerant than bread wheat it attracts a premium price because of its superior pasta making qualities.

"By planting the new salt tolerant durum wheats in different levels of salinity and comparing their yield with other durum wheats, we've demonstrated an impressive 25 per cent yield advantage under saline soil conditions," says CSIRO scientist, Dr Richard James.

The CSIRO Plant Industry research team responsible for the breakthrough recently isolated two salt tolerance genes (Nax1 and Nax2) derived from the old wheat relative *Triticum monococcum*.

"Both genes work by excluding sodium, which is potentially toxic, from the leaves by limiting its passage from the roots to the shoots," says the leader of the project, Dr Rana Munns.

Through traditional, non-GM breeding methods aided by molecular markers the team was able to introduce the salt exclusion genes into durum wheat lines.

Salinity, a major environmental issue affecting much of Australia's prime wheat-growing areas, often prevents farmers from growing durum wheat.

This research is a collaborative project between the CSIRO, the NSW Department of Primary Industries, the University of Adelaide and the Australian Centre for Plant Functional Genomics. It is supported by the Grains Research and Development Corporation (GRDC).

Story Source:

Adapted from materials provided by CSIRO Australia.

http://www.sciencedaily.com/releases/2010/04/100423094622.htm

Exercise Therapy for Low Back Pain

ScienceDaily (Apr. 26, 2010) — Low back pain (or lumbago) is a common ailment often triggered by something as simple as lifting a suitcase. What is the best way to remedy the situation? An exercise machine designed specifically for back muscles could be the solution, according to a new study published in the *Journal of the American College of Sports Medicine*.

"If you want to bring about physiological change to help the development and endurance of back muscles, you must focus your training on those specific muscles and not other muscular groups such as hip extensors," says Christian Larivière, a professor at the Institut de recherche Robert-Sauvé en santé et en sécurité du travail (IRSST), who conducted the study with Université de Montréal researchers Bertrand Arsenault, Rubens A. Da Silva, Sylvie Nadeau, André Plamondon et Roger Vadeboncoeur.

The investigation requested that subjects aged 18 to 65 -- some healthy and others with low back pain -- complete various exercises. Electromyography (EMG) sensors were used to measure the level of activity and fatigue in various muscles during the routine. "Thanks to this technique, we can target tired muscles which aren't yet showing a decrease in strength," says Larivière.

Test subjects also used a machine designed for back exercises in a semi-sitting position. Results clearly showed that using this machine was beneficial. Using a cushion to stabilize the pelvis brought about a better response from the back muscles. In addition, extending the legs strengthened muscles. "Therefore, we can decrease the use of hip muscles and in turn increase the use of the back muscles," says Larivière.

Such exercises can only help reduce pain and disabilities caused by back pain, says Larivière. He recommends those who suffer severe hurt begin with stretches on the ground with low to medium effort. "Progressively, the individual will gain confidence and can use machines that require superior strength," he says.

Larivière highlights the fact that six out of 10 Quebecers will suffer from back pain in their lifetime. "Musculoskeletal disorders are a serious public health issue," says Larivière. "They're also an economic problem. In 2007, back pain cost Quebec's Commission de la santé et de la sécurité du travail $516 million in worker compensations."

Story Source:

Adapted from materials provided by University of Montreal.

Journal Reference:

1. Christian Larivière, Rubens A. Da Silva, A. Bertrand Arsenault, Sylvie Nadeau, André Plamondon, Roger Vadeboncoeur. **Specificity of a Back Muscle Exercise Machine in Healthy and Low Back Pain Subjects**. *Medicine & Science in Sports & Exercise*, 2010; 42 (3): 592 DOI: 10.1249/MSS.0b013e3181b96029

http://www.sciencedaily.com/releases/2010/04/100419162306.htm

Ancient Asphalt Domes Discovered Off California Coast

Chris Reddy (left) of WHOI and Chief Scientist Dave Valentine of UCSB hold a large chunk of undersea asphalt collected with one of the robotic arms of the DSV Alvin. The sample was surprising light in weight compared to rock. (Credit: Photo by Molly Redmond, UC Santa Barbara)

ScienceDaily (Apr. 26, 2010) — They paved paradise and, it turns out, actually did put up a parking lot. A big one. Some 700 feet deep in the waters off California's jewel of a coastal resort, Santa Barbara, sits a group of football-field-sized asphalt domes unlike any other underwater features known to exist.

About 35,000 years ago, a series of apparent undersea volcanoes deposited massive flows of petroleum 10 miles offshore. The deposits hardened into domes that were discovered recently by scientists from the Woods Hole Oceanographic Institution (WHOI) and UC Santa Barbara (UCSB).

Their report -- co-authored with researchers from UC Davis, the University of Sydney and the University of Rhode Island -- appears online April 25 in the Journal *Nature Geoscience*. The work was funded by the National Science Foundation, U.S. Department of Energy and the Seaver Institute.

"It was an amazing experience, driving along…and all of a sudden, this mountain is staring you in the face," said Christopher M. Reddy, director of WHOI's Coastal Ocean Institute and one of the study's senior authors, as he described the discovery of the domes using the deep submersible vehicle Alvin. Moreover, the dome was teeming with undersea life. "It was essentially an oasis," he said, "almost like an artificial reef."

What really piqued the interest of Reddy -- a marine geochemist who studies oil spills -- was the chemical composition of the dome: "very unusual asphalt material," he said. "There aren't that many opportunities to study oil that's been sitting around on the bottom of the ocean for 35,000 years."

Reddy's unique chance came courtesy of UCSB earth scientist and lead author David L. Valentine, who first came upon the largest of the structures -- named Il Duomo -- and brought back a chunk of the brittle, black material in 2007 from an initial dive in Alvin, which WHOI operates for the US Navy. Valentine and Reddy were on a cruise aboard the WHOI-operated research vessel Atlantis, following up on undersea mapping survey by the Monterey Bay Aquarium Research Institute (MBARI) and the work of UCSB earth scientist Ed Keller.

"The largest [dome] is about the size of two football fields, side by side and as tall as a six-story building," Valentine said. Alvin's robotic arm snapped off a piece of the unusual formation, secured it in a basket and delivered it to Reddy aboard Atlantis.

"I was sleeping," Reddy chuckled. "Somebody woke me up and wanted me to look at the rocks and test them."

It turned out to be quite an awakening. "I was amazed at how easy it was to break," Reddy recalls, "which confirmed it wasn't solid rock" and lent credence to Keller's theory that these structures might be made of asphalt.

Without access to the sophisticated equipment in his Woods Hole lab, Reddy employed a "25-cent glass tube, the back of a Bic pen and a little nail polish remover" to analyze the crusty substance. He used the crude tools like a mortar and pestle to grind the rock, "and literally within several minutes, it became a thick oil."

"This immediately said to me that this was asphalt," Reddy said. "And I remember turning to Dave [Valentine] and saying, 'We've got to back. Please take me back there'" to the dome.

After making some schedule changes, Valentine cleared the way for him and Reddy to take Alvin back to several sites in 2007. This work also set the stage for a follow-up study in September 2009, when the investigators returned to the domes with Alvin and the Autonomous Undersea Vehicle (AUV) Sentry to study the unique structures. They were joined by, among others, WHOI collaborators Dana Yoerger, Richard Camilli and Robert K. Nelson and Oscar Pizarro, now at the University of Sydney.

"With that combination, we were able to go in and do very detailed mapping of the site and very detailed sampling at the seafloor," Valentine said. Using mass spectrometers and radiocarbon dating in their respective laboratories, the scientists were able to confirm the nature and age of the domes.

"To me, as an oil-spill chemist, this was very exciting," said Reddy. "I got to find out what oil looks like after… 35,000 years."

What it looked like was "incredibly weathered," said Reddy. "That means nature had taken away a lot of compounds. These mounds of black material were the last remnants of oil that exploded up from below. To see nature doing this on its own was an unbelievable finding."

A few asphalt-like undersea structures have been reported, says Valentine, "but not anything exactly like these…no large structures like we see here." He estimates that the dome structures contain about 100,000 tons of residual asphalt and compares them to an underwater version of the La Brea Tar Pits in Los Angeles, complete with the fossils of ancient animals.

The researchers are not sure exactly why sea life has taken up residence around the asphalt domes, but one possibility is that because the oil has become benign over the years that some creatures are able to actually feed off it and get energy from it. They may also be "thriving" on tiny holes in the dome areas that release minute amounts of methane gas, Reddy says.

The scientists plan to continue studying the domed structures. "We have some very fundamental questions that remain," Valentine says. "It would be nice to know what is going on deep down under these things.

"One future direction is to try and actually drill into them," he says. "We also need to turn it over to some geologists to figure out where this oil is really coming from. More fundamentally, we're going to look at the actual degradation of the oil by microorganisms and maybe even see what organisms are trapped in this…very much like the La Brea Tar Pits."

From a chemical point of view, Reddy says he will continue to probe the question of exactly which of the chemicals that make up the domes "stayed around" all these years.

"Instead of this taking place at a refinery, nature used a variety of its own tools," he said, to manufacture the asphalt substance. With some heating and a few chemical tweaks, he added, this is essentially the same material that paves highways and parking lots. After all, it is California.

The Woods Hole Oceanographic Institution is a private, independent organization in Falmouth, Mass., dedicated to marine research, engineering, and higher education. Established in 1930 on a recommendation from the National Academy of Sciences, its primary mission is to understand the oceans and their interaction with the Earth as a whole, and to communicate a basic understanding of the oceans' role in the changing global environment.

Story Source:

Adapted from materials provided by Woods Hole Oceanographic Institution.

Journal Reference:

1. David L. Valentine, Christopher M. Reddy, Christopher Farwell, Tessa M. Hill, Oscar Pizarro, Dana R. Yoerger, Richard Camilli, Robert K. Nelson, Emily E. Peacock, Sarah C. Bagby, Brian A. Clarke, Christopher N. Roman & Morgan Soloway. **Asphalt volcanoes as a potential source of methane to late Pleistocene coastal waters**. *Nature Geoscience*, 25 April 2010 DOI: 10.1038/ngeo848

http://www.sciencedaily.com/releases/2010/04/100425151143.htm

Tapping Away Desire for Those Favorite Foods and Snacks

ScienceDaily (Apr. 26, 2010) — Psychological acupuncture has been shown to be successful in reducing food cravings for up to six months in people who are overweight or obese.

The technique combines gentle tapping on pressure points while focussing on particular emotions and thoughts.

Psychologist Dr Peta Stapleton, an academic title holder in Griffith University's School of Medicine, said the technique was painless and easy to learn.

Her research also showed the impact on food cravings was almost immediate and long lasting. Food cravings significantly reduced after just four, two-hour sessions and were maintained at a six-month follow-up.

"Participants in the trial were surprised by how quickly the technique works -- that it doesn't take a lot of time to eliminate food cravings they may have had for many years," Dr Stapleton said.

She said common cravings were for sweet carbohydrates such as cakes and chocolate or salty foods such as chips and savoury biscuits.

"Food cravings play a big role in people's food consumption and ultimately their body weight. If we can beat the cravings without the need for willpower or conscious control of behaviour, then weight loss is also possible."

While the study did not show any significant impact on body weight or body mass index (BMI) after six months, the results of a 12-month follow-up are still being analysed.

Dr Stapleton, who specialises in the management of eating disorders, said some participants had actually forgotten they had a previous problem with food cravings until they were reminded at the six-month follow-up.

She said because the technique helps over-ride emotional eating at a sub-conscious level, it was more likely to be effective in the long-term.

Psychological acupuncture, also known as the emotional freedom technique (EFT), has also been used to manage clinical issues such as post traumatic stress disorder, phobias and addictions.

The results of the study will be presented at the International Congress of Applied Psychology in Melbourne in July.

Story Source:

Adapted from materials provided by Griffith University. Original article written by Mardi Chapman.

http://www.sciencedaily.com/releases/2010/04/100423094627.htm

Electoral dysfunction: Why democracy is always unfair

- 28 April 2010 by **Ian Stewart**
- Magazine issue 2758.

Vote for fairness (Image: Peter Muhly/AFP/Getty Images)

IN AN ideal world, elections should be two things: free and fair. Every adult, with a few sensible exceptions, should be able to vote for a candidate of their choice, and each single vote should be worth the same.

Ensuring a free vote is a matter for the law. Making elections fair is more a matter for mathematicians. They have been studying voting systems for hundreds of years, looking for sources of bias that distort the value of individual votes, and ways to avoid them. Along the way, they have turned up many paradoxes and surprises. What they have not done is come up with the answer. With good reason: it probably doesn't exist.

The many democratic electoral systems in use around the world attempt to strike a balance between mathematical fairness and political considerations such as accountability and the need for strong, stable government. Take first-past-the-post or "plurality" voting, which used for national elections in the US, Canada, India - and the UK, which goes to the polls next week. Its principle is simple: each electoral division elects one representative, the candidate who gained the most votes.

This system scores well on stability and accountability, but in terms of mathematical fairness it is a dud. Votes for anyone other than the winning candidate are disregarded. If more than two parties with substantial support contest a constituency, as is typical in Canada, India and the UK, a candidate does not have to get anything like 50 per cent of the votes to win, so a majority of votes are "lost".

Dividing a nation or city into bite-sized chunks for an election is itself a fraught business (see "Borderline case") that invites other distortions, too. A party can win outright by being only marginally ahead of its competitors in most electoral divisions. In the UK general election in 2005, the ruling Labour party won 55 per cent of the seats on just 35 per cent of the total votes. If a candidate or party is slightly ahead in a bare majority of electoral divisions but a long way behind in others, they can win even if a competitor gets more votes overall - as happened most notoriously in recent history in the US presidential election of 2000, when George W. Bush narrowly defeated Al Gore.

The anomalies of a plurality voting system can be more subtle, though, as mathematician Donald Saari at the University of California, Irvine, showed. Suppose 15 people are asked to rank their liking for milk (M), beer (B), or wine (W). Six rank them M-W-B, five B-W-M, and four W-B-M. In a plurality system where only first preferences count, the outcome is simple: milk wins with 40 per cent of the vote, followed by beer, with wine trailing in last.

So do voters actually prefer milk? Not a bit of it. Nine voters prefer beer to milk, and nine prefer wine to milk - clear majorities in both cases. Meanwhile, 10 people prefer wine to beer. By pairing off all these preferences, we see the truly preferred order to be W-B-M - the exact reverse of what the voting system produced. In fact Saari showed that given a set of voter preferences you can design a system that produces any result you desire.

In the example above, simple plurality voting produced an anomalous outcome because the alcohol drinkers stuck together: wine and beer drinkers both nominated the other as their second preference and gave milk a big thumbs-down. Similar things happen in politics when two parties appeal to the same kind of voters, splitting their votes between them and allowing a third party unpopular with the majority to win the election.

Can we avoid that kind of unfairness while keeping the advantages of a first-past-the-post system? Only to an extent. One possibility is a second "run-off" election between the two top-ranked candidates, as happens in France and in many presidential elections elsewhere. But there is no guarantee that the two candidates with the widest potential support even make the run-off. In the 2002 French presidential election, for example, so many left-wing candidates stood in the first round that all of them were eliminated, leaving two right-wing candidates, Jacques Chirac and Jean-Marie Le Pen, to contest the run-off.

Order, order

Another strategy allows voters to place candidates in order of preference, with a 1, 2, 3 and so on. After the first-preference votes have been counted, the candidate with the lowest score is eliminated and the votes reapportioned to the next-choice candidates on those ballot papers. This process goes on until one candidate has the support of over 50 per cent of the voters. This system, called the instant run-off or alternative or preferential vote, is used in elections to the Australian House of Representatives, as well as in several US cities. It has also been suggested for the UK.

Preferential voting comes closer to being fair than plurality voting, but it does not eliminate ordering paradoxes. The Marquis de Condorcet, a French mathematician, noted this as early as 1785. Suppose we have three candidates, A, B and C, and three voters who rank them A-B-C, B-C-A and C-A-B. Voters prefer A to B by 2 to 1. But B is preferred to C and C preferred to A by the same margin of 2 to 1. To quote the Dodo in *Alice in Wonderland*: "Everybody has won and all must have prizes."

One type of voting system avoids such circular paradoxes entirely: proportional representation. Here a party is awarded a number of parliamentary seats in direct proportion to the number of people who voted for it. Such a system is undoubtedly fairer in a mathematical sense than either plurality or preferential voting, but it has political drawbacks. It implies large, multi-representative constituencies; the best shot at truly proportional representation comes with just one constituency, the system used in Israel. But large constituencies weaken the link between voters and their representatives. Candidates are often chosen from a centrally determined list, so voters have little or no control over who represents them. What's more, proportional systems tend to produce coalitions of two or more parties, potentially leading to unstable and ineffectual government - although plurality systems are not immune to such problems, either (see "Power in the balance").

Proportional representation has its own mathematical wrinkles. There is no way, for example, to allocate a whole number of seats in exact proportion to a larger population. This can lead to an odd situation in

which increasing the total number of seats available reduces the representation of an individual constituency, even if its population stays the same (see "Proportional paradox").

Such imperfections led the American economist Kenneth Arrow to list in 1963 the general attributes of an idealised fair voting system. He suggested that voters should be able to express a complete set of their preferences; no single voter should be allowed to dictate the outcome of the election; if every voter prefers one candidate to another, the final ranking should reflect that; and if a voter prefers one candidate to a second, introducing a third candidate should not reverse that preference.

All very sensible. There's just one problem: Arrow and others went on to prove that no conceivable voting system could satisfy all four conditions. In particular, there will always be the possibility that one voter, simply by changing their vote, can change the overall preference of the whole electorate.

So we are left to make the best of a bad job. Some less fair systems produce governments with enough power to actually do things, though most voters may disapprove; some fairer systems spread power so thinly that any attempt at government descends into partisan infighting. Crunching the numbers can help, but deciding which is the lesser of the two evils is ultimately a matter not for mathematics, but for human judgement.

Editorial: *Giving democracy a shot in the arm*

Borderline case

In first-past-the-post or "plurality" systems, borders matter. To ensure that each vote has roughly the same weight, each constituency should have roughly the same number of voters. Threading boundaries between and through centres of population on the pretext of ensuring fairness is also a great way to cheat for your own benefit - a practice known as gerrymandering, after a 19th-century governor of Massachusetts, Elbridge Gerry, who created an electoral division whose shape reminded a local newspaper editor of a salamander.

Suppose a city controlled by the Liberal Republican (LR) party has a voting population of 900,000 divided into three constituencies. Polls show that at the next election LR is heading for defeat - 400,000 people intend to vote for it but the 500,000 others will opt for the Democratic Conservative (DC) party. If the boundaries were to keep the proportions the same, each constituency would contain roughly 130,000 LR voters and 170,000 DC voters, and DC would take all three seats - the usual inequity of a plurality voting system.

In reality, voters inclined to vote for one party or the other will probably clump together in the same neighbourhoods of the city, so LR might well retain one seat. However, it could be all too easy for LR to redraw the boundaries to reverse the result and secure itself a majority - as the following two dividing strategies show.

Proportional paradox

Although elections to the US House of Representatives use a first-past-the-post voting system, the constitution requires that seats be "apportioned among the several states according to their respective numbers" - that is, divvied up proportionally. In 1880, the chief clerk of the US Census Bureau, Charles Seaton, discovered that Alabama would get eight seats in a 299-seat House, but only seven in a 300-seat House.

This "Alabama paradox" was caused by an algorithm known as the largest remainder method, which was used to round the number of seats a state would receive under strict proportionality to a whole number.

Suppose for simplicity's sake that a nation of 39 million voters has a parliament with four seats - giving a quota of 9.75 million voters per seat. The seats must, however, be shared among three states, Alabaska, Bolorado and Carofornia, with voting populations of 21, 13 and 5 million, respectively. Dividing these numbers by the quota gives each state's fair proportion of seats. Rounded down to an integer, this number of seats is given to the states. Any seats left over go to the state or states with the highest remainders.

The rounded-down integers allocate three seats. The fourth goes to Carofornia, the state with the largest remainder.

Suppose now the number of seats increases from four to five. The quota is 39 million divided by 5, or 7.8 million, and so our table becomes:

The rounded-down integers account for three seats as before. The two spare go to Alabaska and Bolorado, which have the two largest remainders, and Carofornia loses its only seat. (The US Constitution stipulates that each state must have at least one representative, which would protect Carofornia in this case - the size of the House would have to be increased by one seat.)

The precise conditions that lead to the Alabama paradox are mathematically complex. For three states they can be portrayed graphically, as above. The left-hand diagram shows the populations (as a fraction of the country's total) and fair proportions of three states in the case of four seats; the right-hand side superimposes the diagram for five seats. The Alabama paradox occurs for the shaded population combinations: our example lies in the leftmost orange-shaded region.

Such quirks mean that seats in proportional systems are now generally apportioned using algorithms known as divisor methods. These work by dividing voting populations by a common factor so that when the fair proportions are rounded to a whole number they add up to the number of available seats. But this method is not foolproof: it sometimes gives a constituency more seats than the whole number closest to its fair proportion.

Power in the balance

One criticism of proportional voting systems is that they make it less likely that one party wins a majority of the seats available, thus increasing the power of smaller parties as "king-makers" who can swing the balance between rival parties as they see fit. The same can happen in a plurality system if the electoral arithmetic delivers a hung parliament, in which no party has an overall majority - as might happen in the UK after its election next week.

Where does the power reside in such situations? One way to quantify that question is the Banzhaf power index. First, list all combinations of parties that could form a majority coalition, and in all of those coalitions count how many times a party is a "swing" partner that could destroy the majority if it dropped out. Dividing this number by the total number of swing partners in all possible majority coalitions gives a party's power index.

For example, imagine a parliament of six seats in which party A has three seats, party B has two and party C has one. There are three ways to make a coalition with a majority of at least four votes: AB, AC and ABC. In the first two instances, both partners are swing partners. In the third instance, only A is - if either B or C dropped out, the remaining coalition would still have a majority. Among the total of five swing partners in the three coalitions, A crops up three times and B and C once each. So A has a power index of 3 ÷ 5, or 0.6, or 60 per cent - more than the 50 per cent of the seats it holds - and B and C are each "worth" just 20 per cent.

In a realistic situation, the calculations are more involved. The diagram on the right shows how the power shifts dramatically when there is no majority in a hypothetical parliament of 650 seats in which five voting blocs are represented.

The UK's next prime minister

Psychologists Rob Jenkins and Tony McCarthy from the University of Glasgow, and Richard Wiseman of the University of Hertfordshire, have run a subliminal online experiment with *New Scientist* to predict the outcome of the UK general election next week. And the result is:

Conservatives 290

Labour 247

Liberal Democrats 70

Were they right? They explain their method - and its success or failure - in the 15 May issue of *New Scientist*.

Ian Stewart is based at the University of Warwick in the UK. His latest book is Professor Stewart's Hoard of Mathematical Treasures (Profile)

http://www.newscientist.com/article/mg20627581.400-electoral-dysfunction-why-democracy-is-always-unfair.html?DCMP=NLC-nletter&nsref=mg20627581.400

There's no doubt about the health dangers of salt

- 18:00 28 April 2010 by **Franco Cappuccio** and **Simon Capewell**

Magazine issue 2758.

Even a pinch packs a punch to our health (Image: Photographer's Choice/Getty Images)

SALT hidden in food kills millions of people worldwide. Reducing dietary salt is therefore important for public health; it is also one of the cheapest and easiest ways to save lives. So why are efforts to cut dietary salt being met with fierce resistance?

First the facts. Decreasing salt intake substantially reduces blood pressure, thus lowering the risk of heart attacks and strokes. An analysis of all the available evidence, published in 2007, suggested that reducing salt intake around the world by 15 per cent could prevent almost 9 million deaths by 2015. That is on par with the public health benefits of reducing cholesterol and stopping smoking (*The Lancet*, vol 370, p 2044).

Other analyses have concluded that cutting daily salt intake by 5 grams could reduce strokes by 23 per cent and cardiovascular disease by 14 per cent (*BMJ*, vol 339, p b4567; *Journal of Human Hypertension*, vol 23, p 363).

The benefits of salt reduction may also extend further. Links have repeatedly been reported between high salt intake and chronic kidney damage, stomach cancer and osteoporosis.

There is no doubt that our salt intake is excessive. A typical British adult consumes roughly 8.6 grams of salt per day. Americans consume even more, about 10 g, which is almost twice the recommended limit in the US. It is also over six times what the body actually needs.

According to US national dietary guidelines, adults should eat no more than 6 g of salt a day. The World Health Organization recommends 5 g. Even this is in excess of bodily needs. The physiological "adequate intake" for an adult is only about 1.5 g.

US guidelines are being updated and the 2010 version is widely expected to recommend a lower salt intake. New UK recommendations, from the National Institute for Health and Clinical Excellence, are also awaited with interest.

This excess intake is not a matter of personal choice. Only about 15 per cent of the salt in our diets comes from our own salt shakers; the rest is added to foods before they are sold. Salt is added to make food more palatable, to increase the water content of meat products and to increase thirst. All generate profit for the food and drink industry.

This hidden salt means it is important to read labels and buy foods that are low in salt. That, however, is not enough. It is fine for people with the education, income and time to read and understand labels and the energy to modify their behaviour. But real life is rather different for many of us. Hence the need for public health interventions.

Excess intake of salt is not a personal choice. Most of the salt in our diets is added to food before it is sold

Most people agree that even in free-market economies, governments have a duty of care. This is especially true for children, who are particularly vulnerable to high salt intake.

This is the ethical justification for public health interventions in salt consumption. Governments legislate to make public spaces smoke-free, and they mandate cholera-free drinking water. They should also aim to progressively reduce the salt hidden in food.

In the US, the New York City Health Department is doing exactly that. It is coordinating the National Salt Reduction Initiative, a coalition of cities, states and health organisations working to help food manufacturers and restaurants voluntarily reduce salt. Fifteen state health departments are already signed up. The goal is to reduce Americans' salt intake by 20 per cent over five years. An authoritative analysis suggests that this may save tens of thousands of lives each year and avoid billions of dollars in healthcare costs (*The New England Journal of Medicine*, vol 362, p 650).

It can be done. Since 2004, the UK Food Standards Agency has been working with the food industry to reduce salt through clearer labelling and progressive reduction of salt so that consumers neither notice nor mind. As a direct result, average UK salt intake has fallen from 9.5 g to 8.6 g per day.

Other countries, notably Japan, Portugal and Finland, have done much better, reducing average salt intake by 5 g or more per day via a combination of regulation, labelling, public education and collaboration with industry.

Earlier this month the US Institute of Medicine recommended government intervention to reduce salt intake. However, the food industry is fighting a bitter rearguard action against any such move. The salt industry's annual turnover is several billion dollars and it has no plans to downsize. Thus, in advance of the new US guidelines, articles have appeared in *The New York Times* and elsewhere claiming that the evidence for reducing salt is not clear-cut.

This controversy is fake. The evidence for salt reduction is clear and consistent. Most of the "contradictory research" comes from a very small number of scientists, most of whom are linked to the salt industry. However, it takes skill to spot misinformation and subterfuge. And so the confusion is successfully promulgated.

It is a familiar story. The tobacco industry spent decades denying that smoking caused fatal diseases. Their very successful strategies included accusations of scientific conspiracies, selective use of scientific evidence, and paying scientists to produce evidence to contradict the public health experts and confuse the public. In general, the food industry is more ethical, but it is far from squeaky clean.

Lives can be saved by cutting salt. How many depends on whether politicians choose to accept the evidence, or cave in to industry pressure instead.

Franco Cappuccio is director of the European Centre of Excellence in Hypertension and Cardio-Metabolic Research and head of the World Health Organization Collaborating Centre for Nutrition, both based at the University of Warwick, UK

Simon Capewell is professor of clinical epidemiology at the University of Liverpool, UK

http://www.newscientist.com/article/dn18835-theres-no-doubt-about-the-health-dangers-of-salt.html

Native American settlement highlights DNA dilemma

- 18:30 27 April 2010 by **Ewen Callaway**
- Magazine issue 2757.

Havasupai people visited Tempe to say prayers over disputed blood (Image: Jim Wilson/The New York Times/Redux/Eyevine)

A university has agreed to pay 41 members of a Native American tribe $700,000 after using DNA for purposes it was not donated for. As well as ending a dispute between the Havasupai people and geneticists at Arizona State University in Tempe, the settlement highlights a dilemma facing much modern genetics research.

Scientists who work with human subjects must obtain informed consent, making sure the participants understand and agree to the purposes of the research and the risks it might entail. This process does not always sit well with the demands of genetics research.

Direct physical harm is unlikely but the potential for privacy violation is great. DNA can also turn out to reveal so much about disease risk, ancestry and other aspects of biology that researchers often find themselves itching to use people's DNA to answer questions that could not have been predicted at the outset.

Such curiosity is what got Arizona State University into trouble with the Havasupai. The disputed DNA was collected in the early 1990s to shed light on the high rates of diabetes among the Havasupai, but researchers went on to use it to probe their ancestry, which angered tribe members.

Tough to track

Since then, "things have really progressed", says Bartha Maria Knoppers, director of the Centre of Genomics and Policy at McGill University in Montreal, Canada.

Nowadays, if researchers want to use samples to study a condition not initially specified, they must get permission from the participants – something that did not happen with the Havasupai's DNA. Another option is to obtain a waiver that usually requires all the data to be anonymised.

This approach is not ideal for either researchers or volunteers. Participants can be difficult to track down, and once the link between DNA data and the donor has been broken it becomes impossible to collect extra information, such as a disease's progression.

Matthias Wjst at the Institute for Genetic Medicine in Bolzano, Italy, says that researchers could also do much more to keep study participants abreast of how their DNA is being used, perhaps by making better use of social networking tools.

Open consent

The Personal Genome Project (PGP), an effort to sequence the complete genomes of 100,000 volunteers, takes a radically different approach: it requires participants to consent to their DNA being used for just about anything – and posted online along with their medical history, allowing anyone to use it.

PGP's bioethicist, Jeantine Lunshof, says this "open consent" approach is the only honest way to collect DNA. "We need to tell people that there is an uncertain future."

Others are more cautious. "It's an intriguing model, but I think it's totally un-generalisable," says Ellen Clayton at Vanderbilt University in Nashville, Tennessee. Researchers ought to focus on improving ways of protecting genetic data, not removing them, she says. "Without the trust of the public this isn't going to work."

Dan Vorhaus, a biotechnology lawyer who advises PGP, agrees its approach isn't for everyone. He suggests that some researchers asking for open consent could limit who can access participants' DNA, decreasing the chances of misuse. "I don't think it's the case that we need to abandon all attempts at privacy," he says.

http://www.newscientist.com/article/dn18832-native-american-settlement-highlights-dna-dilemma.html?full=true&print=true

Schrödinger's cash: Minting quantum money

- 20 April 2010 by **Justin Mullins**

Magazine issue 2756.

Would you welcome spooky banknotes? (Image: Mark Wilson/Getty)

In God we trust; all others must pay cash
Sign on a market stall

THERE is something special about cold, hard cash. Perhaps it is that its value is guaranteed by the government of the day, or that you can stash it under the bed when a banking collapse threatens. Maybe it is the freedom that cash allows: the ability to live without banks or credit cards or taxes.

Quantum physicists think a lot about cash. Not just any old money, you understand. They think about quantum cash. Quantum banknotes aren't like credit cards or dollar bills. They are simply information: a mixture of bits - the 0s and 1s that we use to send electronic transactions - and quantum bits, or qubits, that are governed by the laws of quantum mechanics and can be both a 0 and 1 at the same time.

Since quantum money is just information, it can be stored and transmitted just like a digital picture or a text file. But because it has quantum properties too, it cannot be copied. It is this combination that makes quantum cash so attractive: whoever is in possession of it has exclusive and unequivocal ownership of it, just as with hard, physical cash and unlike a credit card. That is not the only use for quantum cash, though. To physicists, quantum cash is a toy problem, a sort of test case with which to study the strange properties of quantum mechanics.

Now the theoretical foundations are almost in place that could one day allow quantum cash to become a reality. These techniques could potentially be useful for other applications, too, such as making software impossible to pirate.

The idea of quantum money was first suggested in 1968 by Stephen Wiesner, a physicist then at Columbia University in New York. He envisaged creating a banknote containing light traps that could somehow store a few dozen photons. Being quantum objects, photons can never be counterfeited thanks to something called the no-cloning theorem. This states that quantum objects can never be perfectly copied since any measurement of the original also destroys its ability to be a 0 and a 1 at the same time and forces it to be one or the other.

Quantum objects can never be perfectly copied since any measurement simply destroys them

In Wiesner's scheme, the polarisation of these photons would act as a unique identifier for the banknote. These polarisations would be known only to the bank, so anybody wanting to check the authenticity of the banknote need only take it to their local branch, which would use its prior knowledge of the polarisations to check it. And since the photon states cannot be copied, neither can the banknote.

Wiesner's original idea has a serious flaw. One important feature of a practical currency is that anybody should be able to authenticate it. That is why the banknotes in your wallet have watermarks, holograms and ink that fluoresces in ultraviolet light - features that allow anybody to be pretty sure that the banknote is real. But with Wiesner's quantum money, you would have to take your quantum cash to the bank every time you want to check it. "That just wouldn't work," says Scott Aaronson, a computer scientist at the Massachusetts Institute of Technology.

Wiesner's quantum money remained little more than a theoretical oddity for 40 years and was pretty much forgotten, though his work on exploiting quantum mechanics for sending secret messages became hugely influential. Then last year, Aaronson proposed a new approach that does away with the banknote and concentrates instead on the stream of information that represents quantum cash.

Talk to cryptographers about protecting information and they will tell you that there are two different kinds of security. The gold standard is "informational security", where mathematicians can prove beyond doubt that a piece of information is secure. An example of informational security is quantum key distribution, a technique that exploits the laws of quantum mechanics to send messages in a way that cannot be surreptitiously overheard. The security is guaranteed by the laws of physics.

This kind of security is hard to come by, so we usually have to resort to the second type, called "computational security". Here information is protected by a code that, while not impossible to break, is so difficult to crack that nobody could feasibly do it, even with the world's most powerful computers. An example is the RSA algorithm, which is widely used to encrypt e-commerce transactions and other forms of communication.

RSA is an example of public key cryptography, in which the method for encrypting messages is simple and made available to anyone. However, the process for decrypting messages is kept secret, so only those in the know can read encrypted messages. The security of public key cryptography relies on a certain kind of mathematical relation, called a trapdoor function, that is asymmetric - easy to calculate in one direction but hard to do in reverse. The most famous example is multiplication. It is easy to multiply two numbers together to get a third, but much harder to start with the third number and work out the two factors used to generate it.

This is exactly what RSA encryption relies on, and the fact that it is always possible to make the starting numbers so big that no computer could factor their product in any reasonable time. Computer scientists call this kind of problem "computationally hard". RSA encryption may not be impossible to crack but it is so hard to tackle that it is practically impossible.

Wiesner's quantum banknotes are informationally secure, but making quantum money that anybody can authenticate changes the nature of the problem significantly. So Aaronson decided to devise a quantum money scheme that was merely computationally secure, and he based it on the kind of asymmetric mathematics behind public key cryptography.

In Aaronson's scheme, so-called "public key quantum money" is always issued in two parts. The first is the quantum state. This might belong to a group of photons with a particular set of polarisations, which the issuing bank keeps secret. The second part is a circuit (or the plans for such a circuit) that verifies whether the secret set of polarisations is present in something purporting to be quantum cash. Such a circuit would be to quantum transactions what an ultraviolet light is to today's banknotes. A shopkeeper might keep a device containing the circuit behind the till to check any quantum money used in a transaction, rather than having to take the money to a bank as in Wiesner's scheme.

This circuit performs the same role as the trapdoor functions in public key cryptography. The process of verifying the secret using the circuit is easy but the process of working out the secret polarisations of the photons is hard. The security of the scheme relies entirely on the difficulty of this task.

Aaronson gives the example of a thief who has broken into a shop and stolen the quantum verifier. The thief then proceeds to feed randomly generated quantum states into the verifier, hoping to find one that it accepts. "I proved that a counterfeiter would have to use this box an unfeasible number of times," he says. "This rules out a large class of 'brute-force' attacks against quantum money."

The devil is in the detail, however. In trying to flesh out exactly how to construct a quantum verification circuit, he and others have run up against one problem after another.

The trouble with computational security is its reliance on the idea that a mathematical process is much more difficult in one direction than the other. While this may seem obvious from all attempts to perform calculations on the chosen task, it is often merely an assumption. So the task for Aaronson and his colleagues is to find a quantum process which we have good grounds to think is asymmetric, and which could therefore form the basis for the security of quantum money. "That's an entirely new problem in cryptography," says Aaronson.

How secure is secure?

Not having an agreed way of making tasks computationally secure makes this problem much more difficult to solve. Aram Harrow, a mathematical physicist at the University of Bristol, UK, agrees. "We need to find a plausible assumption to base the security on, and unfortunately it's very difficult to show that anything is very computationally hard," he says.

That hasn't stopped Aaronson and his colleagues trying. Over the last year or so, they have teamed up to form a "quantum money club" to find new ways of making quantum money computationally secure. They then look for weak links in their own work. Together, they have developed several important classes of scheme and then gone on to break each one.

Last summer, Aaronson published one such scheme, claiming the first evidence for quantum money that anyone can verify and only banks can clone. "That one stood for five months," he says. Then a group turned up at his door with a proof it wasn't true. "I did the only thing I could in such circumstances: I joined their paper."

In December, their joint paper breaking Aaronson's own quantum money scheme was published on the physics preprint server (arxiv.org/abs/0912.3825). The team behind it has an impressive pedigree and includes theoretical physicist Peter Shor of MIT, who previously developed a quantum computer algorithm that could factor numbers faster than a conventional computer.

The loophole they found in Aaronson's scheme was that the verification algorithm does not make a perfect check on the photon polarisations. So a hacker doesn't need to know the original quantum state to fool the verifying circuit into thinking the secret polarisations are present. To counterfeit this particular form of quantum money, the hacker would only need a state close enough to the original to pass the test. This is much easier for a hacker to work out, says Andrew Lutomirski, a graduate student in theoretical physics at MIT and one of the group that broke Aaronson's scheme.

All was not lost, however. As well as breaking this scheme, Aaronson, Lutomirski and colleagues put forward a new one which takes a different approach: it produces a quantum state that is secret, even from the bank that created it. This time the bank has a different way of making the quantum states that form the secret part of the quantum money. As part of the "minting" process, the bank measures part of the secret quantum state while leaving the rest of the state unmeasured. This leaves the unmeasured part with certain

properties that work like a quantum watermark. And a verifying circuit can use this subsequently to authenticate the money.

This means the bank can publish a verification algorithm that allows anybody to check the money, but which cannot be used to counterfeit it. Aaronson and Lutomirski call this "collision-free quantum money". The beauty of this public key scheme is that it is just as difficult for the bank to create counterfeits as for anybody else - a property that even conventional money does not have.

It is just as difficult for a bank to create counterfeit quantum cash as for anyone else - unlike conventional money

There is a sting in the tail, however. While the members of the quantum money club are pretty sure that collision-free quantum money is computationally secure, they have not been able to prove it.

Despite the failure to nail quantum cash, the efforts to study it have revealed new insights into the behaviour of quantum states. Some members of the quantum money club are using these ideas to explore the limits of what can be known about a quantum state. Quantum mechanics says you cannot measure a state without destroying it, but the team's work on quantum money has shown that it is possible to verify a quantum state is physically present, even though they know nothing about that state. In effect, they are able to get some information about it without destroying it.

Now the quantum money club is exploring what other information can be extracted about a quantum state using verifying algorithms. That is potentially bad news for quantum money: it may be that a verifying circuit will always allow the user to gain enough information about the quantum state to make a counterfeit. However, Shor and colleagues suspect not.

The constant creation and cracking of quantum money schemes is forcing them to the conclusion that a radically new approach is needed. "Much as we wish it were otherwise, it seems possible that public key quantum money intrinsically requires a new mathematical leap of faith," they say in their paper. They have in mind a revolution as big as the one that made public key cryptography possible in the 1970s - though when that new breakthrough might happen and what advances will set it off is anybody's guess.

Even so, the process of studying this problem is turning out to be fruitful. "It's opening up a whole new area to study," says Harrow. The greatest legacy of the race to create quantum money may not be a new kind of currency, at least not in the short term. Instead, we are getting a better understanding of the fundamental laws of physics. It is a trade-off most would say was worthwhile.

The quantum cash machine

There are significant technological barriers to creating quantum money. One problem is finding a way to send qubits - chunks of quantum information - over the internet in the same way as email. We know how to send qubits from one place to another in the form of photons, but only through single stretches of optical fibre; they cannot be routed from one fibre to another without destroying them. Then there is the fact that, at present, we can store qubits only for microseconds at a time. While it might sometimes seem as though conventional cash can disappear from our wallets faster than this, we will need to be able to store qubits safely for years or decades to make quantum money a practical proposition.

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http://www.newscientist.com/article/mg20627562.700-schrodingers-cash-minting-quantum-money.html

Dark matter may give neutron stars black hearts

- 20 April 2010 by **Anil Ananthaswamy**
- Magazine issue 2756.

A black hole in waiting (Image: NASA/SAF/Eurelios/SPL)

DARK matter may be prompting black holes to appear spontaneously in the hearts of distant exotic stars. If so, this could hint at the nature of dark matter.

Arnaud de Lavallaz and Malcolm Fairbairn of King's College London wondered what would happen when dark matter - which makes up most of the mass of galaxies - is sucked into the heart of neutron stars. These stars, the remnants of supernova explosions, are the densest known stars in the universe. It turns out that the outcome depends on the nature of dark matter.

Most of the favoured theories of dark matter suggest each particle of the stuff is also an antiparticle, meaning that they should annihilate each other when they meet. But Fairbairn and de Lavallaz considered a dark matter particle of a different type, which is not also its antiparticle.

The pair calculated what would happen if dark matter particles like these were attracted by the intense gravity of neutron stars. Because they would not annihilate each other, the dark matter particles would end up forming a smaller, dense star at the heart of the neutron star. If the neutron star were near the centre of the galaxy, for example, and surrounded by an abundance of dark matter, then it would continue to accrete dark matter.

Eventually, the mass of the dark matter star would exceed its "Chandrasekhar limit" - beyond which a star cannot withstand gravitational pressure. The dark matter star would collapse into a black hole. "Then the neutron star won't be able to survive anymore, and it'll collapse too," says Fairbairn. "It would be pretty catastrophic."

Their calculations show that if a neutron star collapsed in this way the result would be a burst of gamma rays, which could be spotted from Earth (arxiv.org/abs/1004.0629).

Various underground experiments back on Earth have been trying to detect dark matter, using different techniques. While none of the major experiments have seen anything yet, physicists running the Dark Matter (DAMA) experiment inside the Gran Sasso mountain in Italy have been saying for some time that dark matter particles are hitting their detector. Most physicists are sceptical of the DAMA results because it doesn't sit well with favoured theories on the nature of dark matter.

Fairbairn says that the DAMA experiment could be sensitive to dark matter particles that do not self-annihilate, which might explain why it is seeing something and others are not.

Dan Hooper of Fermilab in Batavia, Illinois, agrees the pair's scenario is plausible because the existence of dark matter particles that do not self-annihilate cannot be ruled out. "We could look for evidence that neutron stars don't live very long in regions with a lot of dark matter," he says. "I find exciting the prospect of using exotic stars as dark matter detectors."

http://www.newscientist.com/article/mg20627564.900-dark-matter-may-give-neutron-stars-black-hearts.html

First twin sequences: What do they say about disease?

- 28 April 2010
- Magazine issue 2758.

DISAPPOINTING or what? The first whole genome sequencing of a pair of identical twins has uncovered little about the origins of disease - even though only one twin has multiple sclerosis (MS).

Identical twins inherit identical genomes but are exposed to different environmental influences. That means they can be enormously valuable in teasing apart genetic and environmental factors. But clearly even whole genome sequencing, the gold standard in genetics, has its limits, judging by the latest analysis from Sergio Baranzini of the University of California, San Francisco, and colleagues.

Identical twins can be enormously valuable in teasing apart genetic and environmental factors

One thing Baranzini's team looked for was "de novo" mutations - which are not inherited. If they had found these in just one of the twins, such mutations would have arisen after the twins' shared egg split and could explain why one identical twin can have MS and not the other. The researchers found no such differences.

They also examined gene activity levels and epigenetic changes, which might silence a gene in one twin but not the other, leading to MS. But again, no key differences emerged (*Nature*, DOI: 10.1038/nature08990).

This leaves the causes of MS shrouded in mystery. However, the researchers point out that their analysis does at least rule out some possible culprits

http://www.newscientist.com/article/mg20627583.000-first-twin-sequences-what-do-they-say-about-disease.html

Why acupuncture aids spinal recovery

- 11:18 26 April 2010 by **Wendy Zukerman**

Aiding recovery (Image: Garo/Phanie/Rex Features)

Rats with damaged spines can walk again thanks to acupuncture. But it's not due to improvements in their energy flow or "chi". Instead, the ancient treatment seems to stop nerve cell death by reducing inflammation.

Acupuncture's scientific credentials are growing. Trials show that it improves sensory and motor functions in people with spinal cord injuries.To find out why, Doo Choi and his colleagues at Kyung Hee University in Seoul, South Korea, damaged the spines of 75 rats. One-third were given acupuncture in two locations: Shuigou – between their snout and mouth, and Yanglingquan – in the upper hind leg. Others received no treatment or "simulated acupuncture".

After 35 days, the acupuncture group were able to stand at a steeper incline than the others and walk better. Staining their paws with ink revealed that their forelimb-hindlimb coordination was fairly consistent and that there was very little toe dragging, whereas the control groups still dragged their feet.

Inflamed spines

The rats in the acupuncture group also had less nerve cell death and lower levels of proteins known to induce inflammation after spinal cord injury and make neural damage worse.One explanation is that sharp needles prompt a stress response that dampens down inflammation. In humans, the inflammation that follows spinal cord injury is known to be responsible for nerve cell death.

Zhen Zheng of the Royal Melbourne Institute of Technology in Australia says the results are "very encouraging". But she says we don't yet know if the results will apply to humans.

For example, the acupuncture treatment on the rats was given almost immediately after injury, but most patients don't seek acupuncture until at least three months after damage to their spines.

Journal reference: *Neurobiology of Disease*, DOI: 10.1016/j.nbd.2010.04.003

http://www.newscientist.com/article/dn18817-why-acupuncture-aids-spinal-recovery.html

Athletes' sweat test road to glory

- 18:03 27 April 2010 by **Duncan Graham-Rowe**

Sweat in training pays off (Image: Simon Bruty/Sports Illustrated/Getty Images)

Track athletes in Ireland preparing for the 2012 Olympics have been testing a device designed to improve performance by optimising their hydration levels during training.

Dehydration can undermine both mental and physical performance, including causing tiredness and cramping.

Analysis of sweat samples taken after training is unreliable because the key compounds oxidise when in contact with air. "It does not give a real measure of what is happening during exercise," says Fernando Benito Lopez at the Clarity Centre for Sensor Web Technologies at Dublin City University.

To tackle the problem, Benito Lopez and colleagues have developed a device that assesses hydration levels while athletes are training. It is based on an absorbent pad strapped to the athlete's body, which draws sweat through a narrow channel containing pH sensors.

Colour sensors

Benito Lopez is investigating the use of two different types of sensor. One uses a patch of pH-sensitive textile. The other uses an ionic dye which changes colour in the presence of sodium ions.

An LED is used to illuminate the sensor while a second light-sensitive LED detects the colour changes by measuring the intensity of light reflected off it.

The resulting readings, sent wirelessly to the trackside, tell the coach the sodium content of the athlete's sweat and therefore their hydration level. Based on this information, the coach can fine-tine the athlete's training programme. Initial tests show the pad can continuously monitor pH changes for up to 3 hours.

This could be potentially very useful, says Charlie Pedlar, a research physiologist at the Endurance Performance and Coaching Centre at St Mary's University College in Twickenham, UK, who worked with the British Olympic team in Beijing, China, in 2008. "We measure body weight before and after training to measure water loss through sweat and breathing," he says. But he says this does not give enough information to optimise athletes' water intake and avoid dehydration.

Benito Lopez and colleagues are investigating whether it is possible to apply the same approach to lactate, which is also present in sweat.

The device will soon be tested on a rugby team in England.

Details of the research will be presented at next month's Lab-on-a-Chip European Congress in Dublin.

http://www.newscientist.com/article/dn18831-athletes-sweat-test-road-to-glory.html

Gene silencing prevents its first human disease

- 20:01 26 April 2010 by **Bob Holmes**
- Magazine issue 2758.

The discovery over a decade ago that snippets of RNA can be used as gene silencers in worms garnered a Nobel prize in 2006. Now, for the first time, RNA interference (RNAi) has been proven effective against a human disease – a common respiratory virus.

Under RNAi, short strands of RNA are added to cells to destroy any native RNA molecules with a complementary sequence of letters. Since genes use RNA molecules to make proteins, these snippets effectively "silence" genes that carry the same sequence. In animals, RNAi has shown promise, but progress in people has been slow.

John DeVincenzo studies paediatric infectious disease at the University of Tennessee Health Science Center in Memphis. He and his colleagues tested the ability of short interfering RNA (siRNA) to inhibit viruses of the respiratory tract, where cells are exceptionally willing to take up RNA snippets.

Eighty-five healthy adults were given a nasal spray containing either a placebo or siRNA designed to silence one of the genes of respiratory syncytial virus (RSV), which is the leading cause of infant hospitalisation in the US but fairly harmless in healthy adults.

Delivery issue

They were to use the spray daily for five days. On day two, all the volunteers were infected with live RSV. By day 11, just 44 per cent of those who received the RNAi nasal spray had RSV infections, compared with 71 per cent of the placebo group.

RNAi can trigger an immune response, which might have helped keep infections at bay. But blood samples showed that the risk of RSV infection did not depend on levels of immune molecules, suggesting that RNAi's protective effect was due to the silencing of genes.

The team is now testing the therapy in lung-transplant patients, who take immunity-suppressing drugs that can make RSV infections deadly. DeVincenzo also hopes to test the therapy in infants soon.

For non-respiratory diseases, however, new ways of getting RNA into the target cells are still needed. "Delivery has always been the big issue for RNAi," says John Rossi, a molecular geneticist at City of Hope medical centre in Duarte, California, who is testing RNAi's potential to fight HIV.

Journal reference: *Proceedings of the National Academy of Sciences*, DOI: 10.1073/pnas.0912186107

http://www.newscientist.com/article/dn18819-gene-silencing-prevents-its-first-human-disease.html?full=true&print=true

The shape of life to come

- 26 April 2010 by **Michael Le Page**

Magazine issue 2757.

Rapid climate change may leave polar bears high and dry (Image: Ingrid Visser/SplashdownDirect/Rex Features)

The United Nations has made 2010 its Year of Biodiversity. While there could be as many as 30 million species on this teeming planet, so far fewer than 2 million have been identified. That includes a staggering 114,000 catalogued in the past three years alone. Our exploration of life is just beginning. No wonder the UN is keen that this year should be one of celebration.

*It is also time to take stock, though. Human activities are causing a mass extinction, but the right action now could pull life back from the brink. At last we are beginning to understand what generates biodiversity (*Why the tropics are hotbeds of evolution*) and what makes a good conservation programme (*How to save an island*). We can also predict how our activities today will shape biodiversity in the future (this article, below). It is a sobering vision – but one that is still in our power to change.*

Editorial: *Let's put an end to biosentimentality*

A 3-metre-tall kangaroo; the car-sized armadillos called glyptodons; giant lemurs and elephant birds from Madagascar. Almost as soon as humans evolved, we began killing off other species, not just by hunting but also by changing the landscape with fire.

Now we are altering the planet more rapidly and profoundly than ever, and much of the diversity produced by half a billion years of evolution could be lost in the next few centuries. We are triggering a mass extinction that could be as severe as the one that ended the reign of the dinosaurs.

Given enough time, biodiversity will recover. Extinctions create new evolutionary opportunities for the survivors: the blossoming of mammals after the dinosaurs died out ultimately led to our evolution, after all. But the aftermath of this Anthropocene extinction will not be like any other. Humans have become the main driving force in evolution - and life will never be the same again.

The list of threats we pose to biodiversity is long. We are killing many creatures directly, destroying habitats, introducing exotic predators and diseases, and pumping out pollution. Already, a tenth of birds, a fifth of mammals and a third of amphibians are regarded as threatened.

Rapid climate change will make matters even worse. Warming threatens a lot of species that might otherwise be able to cope with the changes inflicted by humans, says Chris Thomas at the University of York in the UK. To work out how many species are at risk, Thomas and colleagues looked at the climatic conditions required by 1000 representative species and used them to work out how much habitable area would remain for each if the world warmed by between 1.5 and 2.5 °C. Based on these figures, the team estimated that between 15 and 37 per cent of species will be "committed to extinction" by 2050 (*Nature*, vol 427, p 145).

"There are very large uncertainties," Thomas admits. "But it is equally likely for things to be worse than we are suggesting." Indeed, without drastic action the world will warm by far more than 2 °C. "We [will be] subjecting our biota to environmental conditions not seen for more than 10 million years," Thomas says.

The combination of so many different challenges will make it increasingly difficult for species to cope. "It's this perfect storm of extinction drivers that's the problem," says David Jablonski of the University of Chicago.

Loss of diversity is not just the result of these challenges, it is also part of the problem. Plummeting population levels have already greatly reduced the genetic diversity within many species, decreasing their chances of adapting to changing environments by depriving them of the raw material needed for evolution. As well as this, extinctions can lead to further extinctions, because so many species depend on others. And as ecosystems become less diverse, they generally become less resilient to change. "The worse it gets, the worse it gets," says Jablonski.

The collapse of ecosystems will have huge economic consequences. From flooding in Haiti to dust storms in Beijing, the effects of environmental degradation are already hitting us hard. The loss of more coral reefs, for instance, would be a disaster for many fisheries and tourist resorts, and their death and erosion will leave formerly protected coastlines vulnerable to the ocean.

Dawn of the minifauna

Some believe there is still time to stave off the worst. "The level of extinction can be considerably modified," says David Western of the African Conservation Centre in Nairobi, Kenya. For example, we must restore animals' freedom to move, as the current strategy of trying to protect areas of high biodiversity will not work if species are trapped in increasingly unsuitable climate zones. Transporting species to areas that have a more suitable climate is also an option, although this would be expensive so could only be used for a few species.

Other researchers are more pessimistic. "We can turn the ship a little," says Jablonski. The main problem he sees is a lack of political will.

No one can predict exactly what the Earth of our descendants will look like. However, there are some clues in what's happening right now. Our influence is so profound that we are altering the evolutionary pressures that shape life. There have already been very large and quick behavioural changes as landscapes become "humanscapes", says Western. Foxes and coyotes are adapting to life in cities, and elephants have

started moving out of parks at night to feed at the fringes of settlements before returning in the morning to avoid us. Human pressures are also producing genetic changes in wildlife. As a result of poaching for ivory, for instance, tuskless elephants are evolving. "There will be a new round of evolution," says Western. "We are already seeing that."

Almost all biologists believe that the age of megafauna is over. Large, slow-to-reproduce animals are the most likely to become extinct and, at least on land, those that do survive will not have the vast expanses of habitat needed for further speciation. The greater pressures on large animals will downsize entire communities, says Western. For example, small antelope are likely to become more common than larger herbivores on the African savannah, which would lead to lions becoming smaller too. Lions may also become more benign as we kill off the aggressive individuals that encroach on human settlements. "There will be a transformation of large animals to ones that are compatible with the humanscape," Western says.

The species most likely to thrive will be small ones that are easily spread around by humans and good at colonising new territory - pests, weeds and pathogens. "It's not good to be big or rare," says Jablonski. "You want to be a rat, or a weed, or a cockroach." In theory, as humans fragment habitats, evolution may throw up new species, especially small mammals and insects - but these might not be very resilient. They may limp along and easily go extinct, Jablonski says.

So the ecosystems of the future are likely to be far poorer affairs, with fewer species, fewer links between species and a dearth of large animals. Anyone who has dived on a degraded reef knows the sort of thing to expect: a dazzling array of corals swarming with fish of all shapes and sizes giving way to algae-covered rocks with barely a tiddler in sight.

After previous mass extinctions, the recovery of biodiversity took millions of years. Coral reefs, for example, did not reappear until about 10 million years after the Permian-Triassic extinction (see diagram). The recovery from the Anthropocene extinction could be different, however, as we are already laying the foundations that will allow our descendants to speed up the process.

The recovery from the Anthropocene extinction could be far faster than previous mass extinctions

For starters, we are preserving samples of endangered species so that they can be revived if necessary. There are over 1400 plant "gene banks" worldwide storing millions of seeds, mostly from food plants but also some wild species. Animals are also being stored as frozen tissue samples. The Frozen Zoo at San Diego Zoo in California contains over 8000 samples from 800 species or subspecies, and many similar projects are being set up around the world.

Even assuming that civilisation survives and that gene banks get the funding they need to store many more samples, to look after them for the next few centuries and to revive species as suitable habitat becomes available, only a tiny fraction of the world's species could be saved this way. Nevertheless, that fraction could include not only many charismatic megafauna - revived by cloning, perhaps - but also keystone species that play a vital role in maintaining ecosystems, such as corals. The Zoological Society of London is considering creating a "cryobank" of frozen corals, which can be revived simply by thawing them.

The second thing people could do to aid the recovery of biodiversity would be to manage habitats in a way that allows evolution to continue. This is now being tried in the Cape region of South Africa, home to some of the most diverse flora in the world. "Species come and species go," says Richard Cowling of the Nelson Mandela Metropolitan University, Port Elizabeth. "You've got to preserve the processes."

To that end, Cowling has helped to devise a conservation plan for the region that focuses not only on preserving distinct kinds of habitats, but also the gradients between them, such as between soil types and micro-climates (*Biological Conservation*, vol 112, p 191). The idea is that environmental gradients produce genetic gradients within species as subpopulations adapt to local conditions. The resulting

diversity can give rise to new species if, say, the populations at the extreme ends of the gradient become isolated.

In the future, ecologists might go even further and actively manage ecosystems in a way that promotes evolutionary processes that produce biodiversity. "It's a damn good idea," says Cowling.

Finally, we might generate diversity in an even more direct way. We have already created millions of new varieties of plants and animals through selective breeding, and many of these creatures, from mustangs and burros to the dingo, have established feral populations. In the vacuum left by a mass extinction, many more domesticated species may turn wild - and genetically modified domesticates could have a particularly dramatic impact.

Take the increasing interest in boosting the efficiency of photosynthesis to increase food production. Most plants capture less than 2 per cent of available energy. If this proportion can be significantly increased, the resulting "superphotosynthesisers" might outcompete many wild plants over the next few millennia, compounding biodiversity loss. On a geological timescale, however, they could lead to unprecedented levels of diversity, because more energy would be available to life than ever before.

Things might get wilder still if we create artificial life. Some researchers are trying to produce truly synthetic organisms whose chemistry is unlike anything alive today. It is unlikely that such organisms could survive outside laboratories, as they would have to compete with species honed by billions of years of evolution, but it might just happen.

This vision of a world in which biodiversity depends largely on clones of long-extinct creatures, feral animals, genetically modified organisms, human-directed evolution and perhaps even artificial life will sound like a nightmare to many people. But it is just a continuation of the process that began as soon as our ancestors started reshaping the landscape and meddling with evolution. And if we don't do more about the accelerating rate of extinctions, it is perhaps the best outcome our descendants can hope for.

Michael Le Page is a features editor at New Scientist

http://www.newscientist.com/article/mg20627571.600-living-world-the-shape-of-life-to-come.html

Cheaper home power from sunlight

- 11:12 27 April 2010 by **Helen Knight**

Windows today, power plant tomorrow (Image: Druvo/iStock)

Solar cells are becoming an increasingly familiar sight on roofs, but soon even the walls and windows of your home could generate electricity and capture heat from the sun.

That's because researchers are borrowing a trick or two from solar power plants. Some of these use large parabolic mirrors or lenses to concentrate sunlight onto a photovoltaic (PV) device, allowing them to generate electricity efficiently while minimising their use of expensive PV materials. The concentrators typically track the sun across the sky, to ensure they direct as much light as possible onto the solar cells.

The same idea is being used by Soliant Energy, based in Monrovia, California, which has developed solar concentrating "buckets" for the roofs of commercial buildings. Arranged in clusters of six, the buckets tilt and swivel to track the sun, with lenses at the front to concentrate sunlight onto small cells at the rear.

But such systems are too complex and unwieldy to be fitted to homes, says Tapas Mallick at Heriot-Watt University in Edinburgh, UK. So instead he is developing grids of low-cost concentrators that would sit on walls, roofs or between the panes of double-glazed windows. Each concentrator is shaped like a funnel, with an egg-shaped opening facing the light and a PV device at the other end. It would trap and reflect light from different directions onto the solar cell – without moving.

No escape

Mallick is experimenting with making the concentrators from various different polymers. A leading contender is perspex, also known as plexiglas. Both because of the shape of the concentrators and because perspex has a higher refractive index than air, the light inside the concentrator cannot escape and simply bounces around until it hits the PV cell – a process known as total internal reflection.

By using a cheap polymer, Mallick hopes to reduce the cost of PV-based solar cells by 40 per cent. With an electrical efficiency of 20 per cent, he calculates the cells will produce up to 200 watts per square metre. This would make the technology much more efficient than previous attempts to concentrate sunlight onto window-mounted solar cells using a light-sensitive dye, which have an efficiency of around 5 to 6 per cent, says Mallick.

When fitted onto windows, the grid would allow 25 per cent of the available light through windows to illuminate the room and use the remaining 75 per cent to generate electricity. This would make rooms a lot darker, but it would be possible to alter the ratio to allow more light through in exchange for less electricity generation, Mallick says.

Solar panels currently waste a large amount of the solar energy that hits them as heat, so Mallick also plans to try fitting a panel made of a heat-recovering material to the back of the device. This would not be suitable for windows but could be used in roof-mounted systems to heat the home or provide hot water.

http://www.newscientist.com/article/dn18822-green-machine-cheaper-home-power-from-sunlight.html

Cactus gum could make clean water cheap for millions

- 27 April 2010 by **Helen Knight**

Magazine issue 2757.

Not just for storing water (Image: Philip Condit II/Stone/Getty)

FORGET expensive machinery, the best way to purify water could be hiding in a cactus. It turns out that an extract from the prickly pear cactus is effective at removing sediment and bacteria from dirty water.

Many water purification methods introduced into the developing world are quickly abandoned as people don't know how to use and maintain them, says Norma Alcantar at the University of South Florida in Tampa. So she and her colleagues decided to investigate the prickly pear cactus, *Opuntia ficus-indica*, which 19th-century Mexican communities used as a water purifier. The cactus is found across the globe.

The team extracted the cactus's mucilage - the thick gum the plant uses to store water. They then mixed this with water to which they had added high levels of either sediment or the bacterium *Bacillus cereus*.

Alcantar found that the mucilage acted as a flocculant, causing the sediment particles to join together and settle to the bottom of the water samples. The gum also caused the bacteria to combine and settle, allowing 98 per cent of bacteria to be filtered from the water (*Environmental Science and Technology*, DOI: 10.1021/es9030744). They now intend to test it on natural water.

Householders in the developing world could boil a slice of cactus to release the mucilage and add it to water in need of purification, says Alcantar. "The cactus's prevalence, affordability and cultural acceptance make it an attractive natural material for water purification technologies."

But Colin Horwitz of GreenOx Catalysts in Pittsburgh, Pennsylvania, says many issues remain, including how much land and water is needed to grow cacti for widespread water purification, and how households will know all the bacteria have been removed.

http://www.newscientist.com/article/mg20627576.100-cactus-gum-could-make-clean-water-cheap-for-millions.html?full=true&print=true

Putting the touch into touchscreens

- 26 April 2010 by **Duncan Graham-Rowe**
- Magazine issue 2757.

Where's the feedback? (Image: Maurice Tsai/Bloomberg/Getty Images)

YOUR eyes tell you that your hand is locked in a vice-like mechanical device, but your fingertips tell you you're stroking fur. Welcome to the world of haptics, where nothing is quite how it feels.

As neuroscientists decode how we process signals from nerves that sense touch, engineers are beginning to use their discoveries to dupe us into feeling something that isn't there. Given the right kind of manipulation, a smooth surface can be made to mimic the feel of a range of materials, and a solid slab can be made to feel like shifting sand.

As well as producing weird tactile illusions, haptics have practical uses. For example, tactile feedback can make touchscreen devices more intuitive to use, says Vincent Hayward, head of haptics at the Institute of Intelligent Systems and Robotics at Pierre and Marie Curie University in Paris, France. Such systems are already in use on some smartphones in which actuators within the touchscreen produce a basic "clicking" sensation when the screen is pressed.

Immersion, a company in San Jose, California, is attempting to push haptics further. In a system planned for later this year, users will be given the tactile illusion that touchscreen buttons protrude from the surface. This will be achieved by using a piezoelectric motor to vibrate the screen laterally, though beyond that Immersion is not revealing how its system will work.

Hayward's team has been working on similar systems, using surface vibrations to generate sensations of texture. By altering the frequencies of the vibration, they are able to make the surface feel rougher or smoother at will.

Others, like Gabriel Robles De La Torre, a neuroscientist and computer engineer based in Mexico City, have used vibrating surfaces to simulate sensations of sharpness, again by using motors to impart lateral movement to a smooth, flat surface. This produces a sharp change in the resistance a user's finger feels as they move it across a particular portion of the screen, and this change is perceived as a sharp edge.

Meanwhile Ed Colgate, a mechanical engineer at Northwestern University in Evanston, Illinois, has used vibrations to achieve a very different effect - making objects feel more slippery. His system vibrates their

surface at high frequency with an amplitude of a mere 2 micrometres. "It's not much but it's enough to act like a pump, pumping a little bit of air underneath a finger when touched."

Under normal circumstances, our sense of touch combines input from different kinds of sensory nerves to build up a model of what we are touching. Some of the nerves in our skin sense pressure, while others detect stretching of the skin.

Our brain combines input from different kinds of nerves to build up a model of what we are touching

Systems like Robles De La Torre's show that it is not necessary for both kinds of nerves to be stimulated. Though his device only mimics the way an edge stretches the skin, the brain is fooled into feeling pressure.

A force-feedback system devised by Ian Summers at the University of Exeter, UK, expoits pressure-sensitive nerves, rather than stretch-sensitive ones. It is able to simulate the feel of a range of flexible materials, including silk, hessian and fur. Subjects place their hand in a constraining device inside which are 24 computer-controlled actuators that make contact with the skin. "The computer imagines you are moving each bit of your finger over the material, and works out what mechanical input would be applied to your finger," says Summers. "With something like fur it doesn't have to press very hard."

Our sense of touch can also use temperature changes to helps us identify materials. Haptics researcher Lynette Jones at the Massachusetts Institute of Technology has devised a mouse-like contraption that exploits this, in which the temperature changes are produced by the Peltier effect - the heating or cooling that occurs when current flows between two dissimilar metals. Running current through strips of metal laid one on top of another on the surface of the mouse allows rapid changes to be made to the temperature sensed by the subject's fingers when they graspit. "You can get them to respond very quickly, on the order of milliseconds," says Jones. This can be used to induce rapid changes of skin temperature, simulating the different rates at which heat is transferred to and from the skin by different materials. Jones says her team has identified how different materials conduct heat, and how to adjust current in their device to convince subjects that they are touching metal or plastic, for example.

Jones is exploring how this could help people with impairment to their sensory systems, such as the nerve damage caused by diabetes. Haptic devices could be used to retrain their senses, by tricking them to grasp objects more tightly than their damaged nerves suggest is needed.

It is not just the sense of touch in our fingers that is attracting the attention of haptics researchers. Instead, Yon Visell at the Centre for Intelligent Machines at McGill University in Montreal, Canada, is focusing on the feet, and has developed a novel surface designed to simulate walking on different types of ground. It uses a series of 30-centimetre tiles, each with sensors at its corners and an actuator similar to a loudspeaker coil mounted beneath it. By modelling the properties of various surfaces and calculating what vibrating forces the coil should apply as different parts of the foot make contact with it, Visell has been able to mimic the sensation of walking on solid ground, gravel or sand.

Visell's tiles could be used to help rehabilitate people who have difficulty walking. By making them feel as if they are walking on a soft, compliant surface like sand, for example, their muscles could be retrained to lift the foot higher to ensure that it clears the ground between steps.

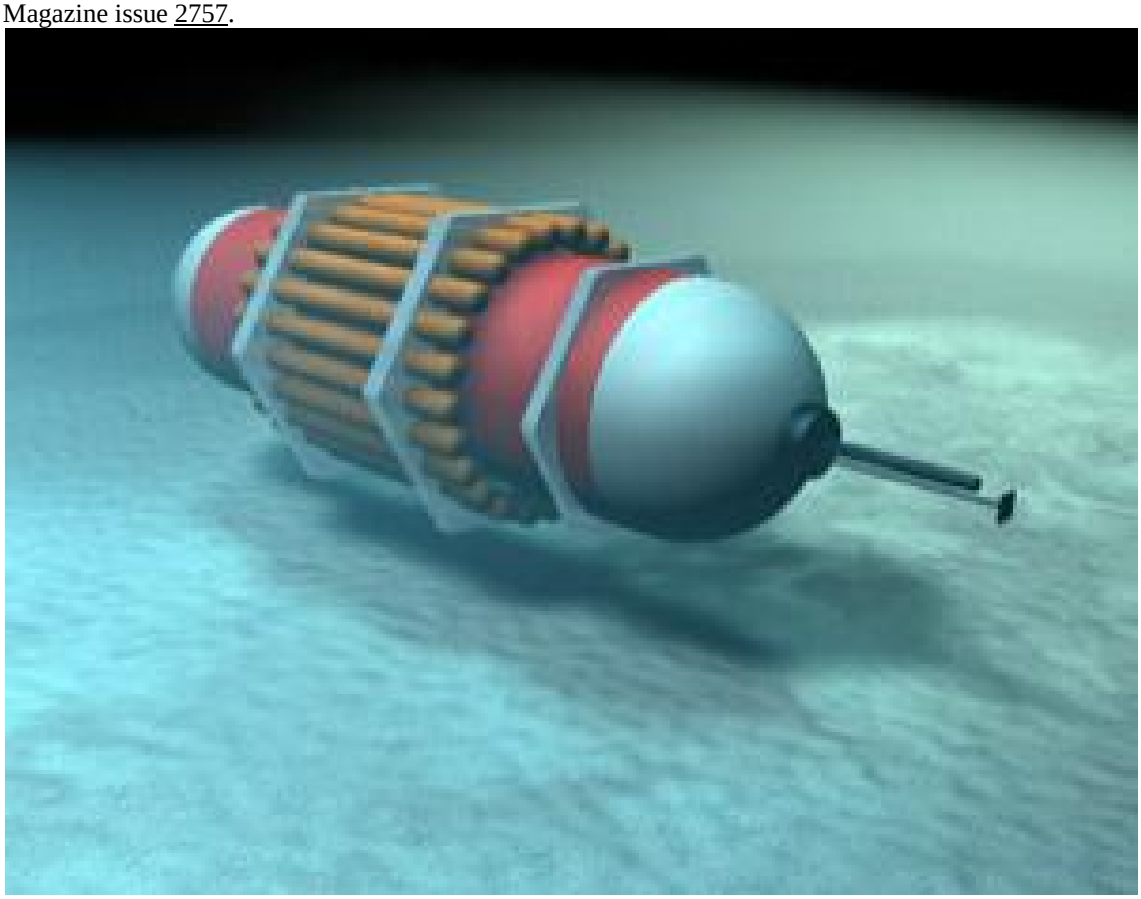
So far, haptics researchers have concentrated on individual facets of our sense of touch, but Hayward looks forward to future applications which will combine them. For example, by vibrating a Peltier device it should be possible to convey temperature and texture information in a single surface.

http://www.newscientist.com/article/mg20627575.900-putting-the-touch-into-touchscreens.html

Tireless diving robot feeds on the ocean's heat

- 23 April 2010 by **Rachel Courtland**

Magazine issue 2757.



No stopping us now (Image: *New Scientist*)

EAT your heart out, Duracell bunny: NASA has unveiled an ocean-going robot that really can go on forever. It is the first of its kind to be fuelled entirely by renewable energy.

This month the agency revealed that SOLO-TREC, a wax-filled buoy powered only by the temperature differences in the water around it, has been tirelessly diving to depths of 500 metres off the Hawaiian coast three times a day since November 2009. The float gathers data on temperature and salinity to improve studies of ocean currents.

SOLO-TREC extracts thermal energy from the ocean each time it travels from the cold depths to the warmer surface. Tubes of oil on its shell are surrounded by a compartment filled with two different waxes. They flip from solid to liquid when the sea temperature exceeds 10 °C, and expand by 13 per cent (see diagram).

The expanding wax squeezes oil from the tubes into the float's interior, where it is stored at high pressure. The oil can then be released to drive a generator and charge batteries. They power the pumps that take on and expel water so the buoy can dive and surface, and also the float's GPS receiver, sensors and the transmitter that beams data to satellites when at the surface.

"Each full dive generates about 200 watts for 30 seconds," says Jack Jones, one of the project's leaders at the Jet Propulsion Laboratory in Pasadena, California.

The buoy can recharge as it travels to the warm surface. Each dive generates about 200 watts for 30 seconds

He and colleagues hope to create large numbers of the floats to boost existing monitoring of oceanic conditions, which helps in weather and climate prediction.

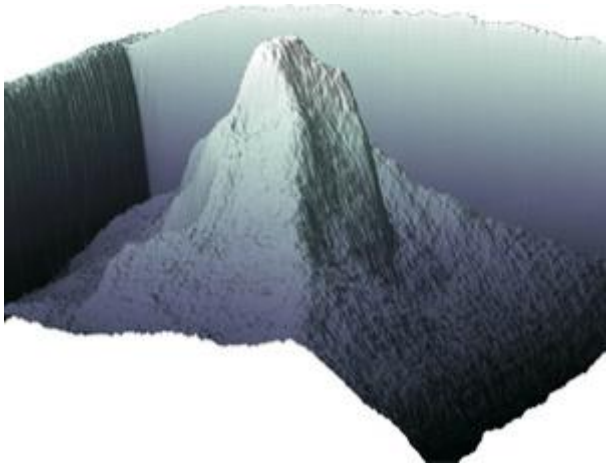
More mobile robots that use the technology are planned.Teledyne Webb Research in Falmouth, Massachusetts, makes winged robots that "glide" underwater using thermal wax to control buoyancy. But they need batteries for their electronics.

The US Office of Naval Research has asked the two teams for ideas for gliders that will never need a battery change.

http://www.newscientist.com/article/mg20627576.000-tireless-diving-robot-feeds-on-the-oceans-heat.html

Nanosculptors could help focus light on silicon chips

- 19:00 22 April 2010 by **Colin Barras**



Climb ev'ry nanomountain (Image: IBM)

It turns making a mountain out of a molehill on its head, to say the least. IBM researchers have sculpted a 1:180 billion scale model of the Matterhorn, the 4478-metre-tall Alpine peak on the Swiss-Italian border.

The team carved the minute mountain using a technique they have developed for making high-density computer storage. This wasn't art for art's sake, however: their aim was to demonstrate how their nanosculpting method can be used for other applications. One could be to shape tiny lenses on silicon chips that would carry optical rather than electronic circuits.

"No other method can produce 3D objects with such precision," says Armin Knoll at IBM Research in Zurich, Switzerland.

Hot chisel

In 2002 IBM unveiled Millipede, a kind of computer memory that promises to store hundreds of gigabytes of data per square centimetre by punching nanoscale holes in a polymer sheet.

More recently the team found they could evaporate material from a surface by heating a Millipede-like punching needle to 330 °C and using it as a kind of chisel, says Knoll. "We use heat instead of force to carve," he adds.

They carved their microscopic Matterhorn from a glassy organic material whose molecules are held together by hydrogen bonds, forces of attraction between partially positive hydrogen ions in one molecule and electron-rich oxygen ions in another.

Flashes of heat only a few microseconds long from the needle can break these hydrogen bonds but are too weak to unlock the chemical bonds within molecules, in which electrons are shared between atoms.

New tool

Knoll's team thinks the system could be put to regular work making things instead of storing data as Millipede does. Typically, electron beam lithography (EBL) is used for the precise nanoscale

manipulations required in the fabrication of circuit boards because it is faster than scanning-probe techniques that use physical probes or needles.

However, when it comes to nanoscale manufacturing, Knoll and colleagues claim they can operate their probe technology at speeds that are close to matching EBL – and potentially with greater precision.

As well as looking promising for 2D nanofabrication of things such as circuit boards, the system also offers precise control over depth of carving. The team suggests the technique could, for example, be used to create tiny lenses for optical connections on silicon chips so small that the electronic wires used to carry current no longer function efficiently.

Dae-Eun Kim at Yonsei University in Seoul, South Korea, is impressed at the claim that the technique is close to rivalling EBL for speed but is more sceptical about its 3D credentials.

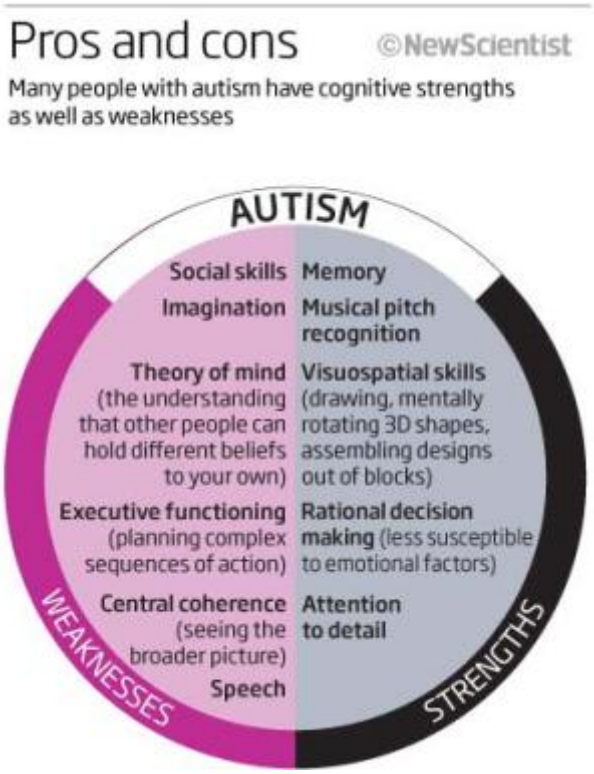
"The mountain height is 25 nanometres, but the dimensions of the base are about 5000 by 5000 nanometres," he says, making it "somewhere between 2D and 3D". The technology will have to mature before it can be used to sculpt nanolenses, he says.

Journal reference: *Science*, DOI: 10.1126/science.1187851

http://www.newscientist.com/article/dn18809-nanosculptors-could-help-focus-light-on-silicon-chips.html

The advantages of autism

- 28 April 2010 by **David Wolman**
- Magazine issue 2758.



Pros and cons

MICHELLE Dawson can't handle crowded bus journeys, and she struggles to order a cup of coffee in a restaurant because contact with strangers makes her feel panicky. Yet over the past few years, Dawson has been making a name for herself as a researcher at the Rivière-des-Prairies hospital, part of the University of Montreal in Canada.

Dawson's field of research is the cognitive abilities of people with autism - people such as herself. She is one of a cadre of scientists who say that current definitions of this condition rely on findings that are outdated, if not downright misleading, and that the nature of autism has been fundamentally misunderstood for the past 70 years.

Medical textbooks tell us that autism is a developmental disability diagnosed by a classic "triad of impairments": in communication, imagination and social interaction. While the condition varies in severity, about three-quarters of people with autism are classed, in the official language of psychiatrists, as mentally retarded.

Over the past decade or so, a growing autistic pride movement has been pushing the idea that people with autism aren't disabled, they just think differently to "neurotypicals". Now, research by Dawson and others has carried this concept a step further. They say that auties, as some people with autism call themselves, don't merely think differently: in certain ways they think better. Call it the autie advantage.

How can a group of people who are generally seen as disabled actually have cognitive advantages? For a start, research is challenging the original studies that apparently demonstrated the low IQ of people with autism. Other studies are revealing the breadth of their cognitive strengths, ranging from attention to detail and sensitivity to musical pitch to better memory.

More recently, brain imaging is elucidating what neurological differences might lie behind these strengths. Entrepreneurs have even started trying to harness autistic people's talents (see "Nice work if you can get it"). "Scientists working in autism always reported abilities as anecdotes, but they were rarely the focus of research," says Isabelle Soulières, a neuropsychologist at Harvard Medical School in Boston, who works with Dawson. "Now they're beginning to develop interest in those strengths to help us understand autism."

The fact that some people with autism have certain talents is hardly a revelation. Leo Kanner, the psychiatrist who first described autism in the early 1940s, noted that some of his patients had what he termed "islets of ability", in areas such as memory, drawing and puzzles. But Kanner's emphasis, like that of most people since, was on autism's drawbacks.

Today it is recognised that autism varies widely in terms of which traits are present and how prominently they manifest themselves. The cause remains mysterious, although evidence is pointing towards many genes playing a role, possibly in concert with factors affecting development in the womb.

A single, elegant explanation capturing all that is different about the autistic mind has so far proved elusive, but several ideas have been put forward that attempt to explain the most notable traits. Perhaps one of the best known is the idea that autistic people lack theory of mind - the understanding that other people can have different beliefs to yourself, or to reality. This account would explain why many autistic people do not tell lies and cannot comprehend those told by others, although the supporting evidence behind this theory has come under fire lately.

Verbal cues

People with autism are also said to have weak central coherence - the ability to synthesise an array of information, such as verbal and gestural cues in conversation. In other words, sometimes they can't see the wood for the trees.

The idea of the autistic savant, with prodigious, sometimes jaw-dropping, talents has taken hold in popular culture. Yet savants are the exception, not the rule. The usual figure cited is that about 1 in 10 people with autism have some kind of savant-like ability. That includes many individuals with esoteric skills that are of little use in everyday life - like being able to instantly reckon the day of the week for any past or future date.

The reality is that children with autism generally take longer to hit milestones such as talking and becoming toilet-trained, and as adults commonly struggle to fit into society. Only 15 per cent of autistic adults have a paying job in the UK, according to government figures. The mainstream medical view of autism is that it represents a form of developmental brain damage. But what if that view is missing something?

The first way in which Dawson challenged the mainstream view was to address the association between autism and low IQ. In 2007, Dawson and Laurent Mottron, head of the autism research programme at the University of Montreal, published a study showing that an autistic person's IQ score depends on which kind of test is used. With the most common test, the Weschsler Intelligence Scale, three-quarters of people with autism score 70 or lower, which classifies them as mentally retarded, as defined by the World Health Organization's *International Classification of Diseases*. But when the team administered a different, yet equally valid, IQ test known as the Raven's Progressive Matrices, which places less weight

on social knowledge, most people with autism scored at a level that lifted them out of this range (*Psychological Science*, vol 18, p 657).

Dawson believes her personal connection to this field of inquiry gives her unique insights. Recently, she began wondering if autistic strengths might already have surfaced in research settings, only to be buried in a literature dominated by the view of autistic people as damaged goods. "No one had ever thought to ask: What cognitive strengths have been reported in the literature?" she says.

After reviewing thousands of papers and re-examining the data, Dawson says she has found dozens that include empirical evidence of autistic strengths that are cloaked by a preoccupation with deficits.

Take, for example, a 2004 study where autistic and non-autistic people did sentence comprehension tests while lying in a brain scanner (*Brain*, vol 127, p 1811). The autistic volunteers showed less synchronicity between the different language areas of the brain as they performed the task. The authors speculate that this could explain some of the language problems seen in autism. Yet according to the results section, the autistic group did better at this particular comprehension task than the control group. "The researchers use the higher performance in one area to speculate about deficit elsewhere," says Dawson.

Attention to detail

Evidence for autistic advantages is also coming in from new studies. One strength derives from an aspect of autism that has long been seen as one of its chief deficits: weak central coherence. The flip side of an inability to see the wood for the trees is being very, very good at seeing trees.

The flip side of an inability to see the wood for the trees is being very, very good at seeing trees

Psychologists investigate the ability to aggregate or tease apart information by showing volunteers drawings of objects such as a house, and asking them to identify the shapes embedded within it, like triangles and rectangles. Numerous studies have shown that people with autism can do these tasks faster and more accurately. And that's not just with pictures; autistic people also do it with music, in tasks such as identifying individual notes within chords.

Maretha de Jonge, a child psychiatrist at the University Medical Centre in Utrecht, the Netherlands, who has done such studies, explains that "weak" in the context of central coherence doesn't have to mean inferior in daily life. "Weakness in integration is sometimes an asset," she says. It can be useful to filter out external stimuli if you are writing an email in a noisy coffee shop, for example, or are searching for a camouflaged insect in a rainforest. Recasting weak central coherence as attention to detail and resistance to distraction suggests a mode of thought that could have advantages.

Other autistic strengths are harder to paint as disabilities in any way. For example, Pamela Heaton of Goldsmiths, University of London, has shown that people with autism have better musical pitch recognition.

On the visual side, a few autistic savants who are immensely talented artists are well known, but recent studies suggest superior visuospatial skills may be more common in autism than previously supposed. Autistic people are better at three-dimensional drawing, for example, and tasks such as assembling designs out of blocks printed with different patterns (*Journal of Autism and Developmental Disorders*, vol 39, p 1039).

Brain scans indicate that this may be because people with autism recruit more firepower from the brain's visual areas when doing such tasks. They may even use their visual areas for other thought processes. Mottron's team found that people with autism were completing the reasoning tasks in the Raven's IQ test by using what is usually regarded as the visual part of the brain, along with more typical intelligence networks (*Human Brain Mapping*, vol 30, p 4082).

Many researchers note that people with autism seem hypersensitive to sights and sounds. In 2007, based partly on this finding, Kamila Markram and Henry Markram and Tania Rinaldi of the Swiss Federal Institute of Technology in Lausanne set out a theory of autism dubbed the "intense world syndrome" (*Frontiers in Neuroscience*, vol 1, p 77). According to this, autism is caused by a hyperactive brain that makes everyday sensory experiences overwhelming.

One of their planks of evidence is autopsy findings of structural differences in the brain's cortex, or outer layer. People with autism have smaller minicolumns - clusters of around 100 neurons that some researchers think act as the brain's basic processing units - but they also have more of them. While some have linked this trait to superior functioning, the Lausanne team still framed their theory as explaining autism's disabilities and deficits.

Mottron's team has published an alternative theory of autism that they believe more fully and accurately incorporates autistic strengths. Their "enhanced perceptual function model" suggests autistic brains are wired differently, but not necessarily because they are damaged (*Journal of Autism and Developmental Disorders*, vol 36, p 27). "These findings open a new educational perspective on autism that can be compared to sign language for deaf people," says Mottron.

While Henry Markram maintains that autism involves a "core neuropathology", he told *New Scientist* that the intense world idea and Mottron's theory are "aligned in most aspects". "Of course the brain is different, but to say whether the brain is damaged or not depends on what you mean by damaged."

What other cognitive abilities make up the autistic advantage? More rational decision-making seems to be one - people with autism are less susceptible to subjective or emotional factors such as how a question is worded (*New Scientist*, 18 October 2008, p 16). Still, until the idea of the autie advantage gains ground, the full range of autistic strengths will remain unknown.

Yet the idea seems to be taking root. When speaking at the TED conference in Long Beach, California, in February, professor of animal science Temple Grandin, who has autism, was cheered after quipping that Silicon Valley wouldn't exist without the condition. She also claimed the tech-heavy crowd was probably stacked with "autism genetics".

Galling message

Perhaps it will prove impossible to draw all-encompassing conclusions about the advantages and disadvantages of a condition described as a spectrum. Autism includes brilliant engineers, music prodigies who can't unload a dishwasher, maths savants who can't speak, and other combinations of talent and disability.

It is important to note, however, that the concept of the autie advantage has not been universally welcomed. A number of researchers, as well as parents of autistic people, are leery of too much emphasis on autistic strengths. They fear it could lead society to underestimate some people's impairments and the difficulties they face.

That outcome could threaten funding for badly needed social services and therapy programmes. As one researcher who did not want to be identified put it: "Michelle Dawson's first-hand experience is valuable. But her experience doesn't necessarily map onto other people's."

For a parent struggling with a child who cannot feed or use the toilet themselves it must be galling to hear that the condition may be advantageous. Yet other parents may be equally fed up of hearing uniformly negative messages about their children's potential. Perhaps only by considering the advantages of autism as well as its disadvantages can those affected reap better opportunities in life.

As far as Dawson is concerned, what matters most is evidence. Last year, at an autism conference, she presented a poster on her work. "When people looked at my results, they said, 'It's so good to see something positive!' I said that I don't see it as positive or negative. I see it as accurate."

Nice work if you can get it

Thorkil Sonne, founder of the IT firm Specialisterne in Copenhagen, Denmark, has led private-sector efforts to capitalise on autistic strengths, such as memory and attention to detail. His company employs 48 people, 38 of whom have autism.

After receiving training, employees work as IT consultants to other firms. Sonne, a former IT consultant himself, founded the company in 2004, soon after his son was diagnosed with autism. "I am just a father who reacted in despair by establishing a company tailored to meet the working conditions of people with autism," he says.

Specialisterne is no charity, though. The company turns a healthy profit - £120,000 in 2008 - and branches will soon open in the UK, Iceland and Germany. In Chicago, a non-profit start-up called Aspiritech is based on Sonne's model.

Michelle Dawson, an autistic cognition researcher at the University of Montreal, Canada, who has the condition herself, is hopeful that such enterprises will improve public attitudes and career opportunities for people with autism. Yet she cautions against pigeonholing people: "Asking what kind of job is good for an autistic is like asking what kind of job is good for a woman," she says.

Sonne says it is not his intention to stereotype autistic people as data-entry drones. The IT connection is because that's where his experience lay, but he's already ramping up the operation to cater to individual preferences and talents. He recently established an education programme for adolescents with autism, and hired a music and art teacher. Sonne says: "Our ambition is to work out a model in which people who struggle with traditional expectations of social skills can excel."

David Wolman is a science writer in Portland, Oregon. His book Righting the Mother Tongue is available from HarperCollins/Smithsonian Books

http://www.newscientist.com/article/mg20627581.500-the-advantages-of-autism.html?DCMP=NLC-nletter&nsref=mg20627581.500

Southpaws: The evolution of handedness

- 28 April 2010 by **Nora Schultz**
- Magazine issue 2758.

HANDICRAFTS were never my strong point at school. For each project I attempted, I'd struggle with tools and techniques that didn't suit a left-hander like me, which often made me wonder why humans are wired to prefer using one side of the body over the other. Apart from a few wrist aches, though, my handedness hasn't been too much of a burden. Contrast this with the bad luck of a toad that fails to jump away from a snake approaching from its right, just because its right eye is much worse at spotting the danger than its left. Clearly, such asymmetry can have fatal consequences.

All the more perplexing, then, that creatures across the animal kingdom - including mammals, birds, fish and invertebrates - prefer to use one paw, eye or even antenna for certain tasks, even though they may then be let down in crucial situations by their weaker side.

The cause of this trait, called lateralisation, is fairly simple: one side of the brain, which generally controls the opposite side of the body, is more dominant than the other when processing certain tasks. Why would animal brains ever have evolved a characteristic that seems to put them in harm's way? Armed with a spate of ingenious cognitive tests, a group of animal psychologists think they've finally found the answer, in the shape of some previously overlooked benefits to a lopsided brain-body connection.

Not before time. Up until the not-too-distant past, it had been broadly assumed that handedness was a uniquely human trait that evolved as a by-product of our amazing capacity for language. "This unique skill depends predominantly on the left hemisphere, so everybody thought language and lateralisation were tied up," explains Richard Andrew of the University of Sussex, UK.

This notion rapidly fell apart as researchers starting spotting evidence of lateralisation in all sorts of animals. Back in the 1970s, Lesley Rogers, now at the University of New England in Armidale, New South Wales, Australia, was studying memory and learning in chicks. She had been injecting cycloheximide into the chicks' brains to stop them learning how to spot grains of food among distracting pebbles, but found the chemical only worked when applied to the left hemisphere. That strongly suggested that the right side of a chick's brain played little or no role in learning such behaviours - compelling evidence that the different sides of the animal's brain perform different tasks (*Pharmacology, Biochemistry and Behavior*, vol 10, p 679). "Injecting it on the right side had absolutely no effect. And that was the initial discovery of lateralisation in the chick, at a time when everybody thought it was unique in humans," she says.

Similar evidence appeared in songbirds and rats around the same time, and since then, researchers have built up an impressive catalogue of animal lateralisation. Sometimes it's as simple as a preference for a single paw or foot - primates, cats and even parrots fall into this category. In other cases, lateralisation appears in more general patterns of behaviour.

The left side of most vertebrate brains seems to process and control feeding, for example. Since the left hemisphere processes input from the right side of the body, that means animals as diverse as fish, toads and birds are more likely to attack prey or food items if they view them with their right eye. Even humpback whales prefer to use the right side of their jaws to scrape up sand eels from the ocean floor. Some more exotic recent examples of animal lateralisation include elephants with marked preferences for which direction they swing their trunk for feeding or sand spraying, and honeybees whose right antenna is more sensitive to odours.

Animals as diverse as fish, toads and birds are more likely to attack prey viewed with their right eye

There are no hard-and-fast rules, however. Many fish, for example, consistently turn in the same direction when faced with a predator, apparently so that they can use a specific eye and brain hemisphere to deal with the situation, but a study of 16 different species found that the preferred direction varied between species, no matter how closely related they were (*Laterality*, vol 5, p 269). Similarly, parrots can be left-footed, right-footed or ambidextrous. The side preference can even differ within a species according to gender: tomcats tend to fish tuna out of a jar with their left paw, while females prefer their right paw.

Despite such diversity, we can't rule out the possibility that lateralisation was passed down from a single common ancestor. Lateralisation is caused by the way the brain is organised, with certain regions predisposed to handle certain aspects of cognition. Generally, only one side of the brain will contain the region that handles a given aspect of cognition. So a preference for a particular side therefore depends on which of these regions are typically involved in the task. Since there might be multiple ways of performing a task, each using different regions of the brain, a preference for one side may just be a symptom of the chosen cognitive strategy. "Different individuals or species may be using different cognitive approaches to deal with similar problems and this affects which side of the brain has the upper hand," says Giorgio Vallortigara at the University of Trento in Italy. In that case, the brain organisation underlying lateralisation may still have arisen in early ancestors, even if specific side preferences have shifted over the years.

What, then, ultimately determines the direction and level of lateralisation in an individual? Genetics will certainly play a part, but environmental factors can have an impact too. Rogers, for example, has found that a chick's bias depends on whether its egg was exposed to light before hatching - if they are kept in the dark during incubation, neither hemisphere becomes particularly dominant.

Fortunately, this observation allowed Rogers to test the possible advantages of a brain bias in 2004, by hatching broods with either strong or weak lateralisation. She had the notion that a lateralised brain, with each hemisphere processing input from a different eye, might help chicks to do two tasks simultaneously - watching out for predators with one eye while searching for food with the other. So she studied the behaviour of the two groups of chicks presented with a smattering of grains among small pebbles under the threatening silhouette of a fake predator bird flying overhead.

As expected, the chicks incubated in the light looked for grains mainly with their right eye, while using the left eye to check out the predator. The chicks incubated in the dark, however, had trouble deciding where to look. They had no preferred eye for foraging or checking on the predator and became so distracted by the challenge of multitasking that they actually became less likely to detect the predator. And their ability to spot the grain declined over the course of the experiment (*Proceedings of the Royal Society B*, vol 271, p S420).

Parallel processors

Similar results probably hold true for many other animals. Angelo Bisazza at the University of Padua in Italy, for example, has studied goldbelly topminnows with different levels of brain lateralisation. With the threat of a predator looming over them, the strongly lateralised fish caught tasty brine shrimp twice as fast as weakly lateralised ones.

Assigning different jobs to different brain halves may be especially advantageous for animals such as birds and fish, whose eyes are placed on the side of their heads so that there is little overlap between the two visual fields. Processing input from each side separately, with different tasks in mind, would seem a natural way to distribute their resources. "So functional left-right asymmetries are much more relevant in everyday behaviour for a fish or a bird than, for example, for a primate with frontal eyes," says Bisazza.

Nevertheless, there are many other cases of lateralisation that can't be explained this way. What about animals that prefer to use a specific paw or foot for almost all tasks, for example? This led Maria Magat and Culum Brown at Macquarie University in Sydney, Australia, to wonder if there were a more general

cognitive advantage that might apply to any lateralised animal. To investigate, they turned to parrots, which, like humans, can be either strongly right or left-footed or totally ambidextrous.

The parrots were given the intellectually demanding task of raising a tempting snack dangling on a string up to their beaks, using a coordinated combination of their claws and beak to pull the string. The results, published last year, showed that the parrots with the strongest foot preferences solved the problem far more quickly than their ambidextrous peers (*Proceedings of the Royal Society B*, vol 276, p 4155).

Why lateralisation would lead to this general cognitive advantage is not clear, though multitasking is probably still involved. Lateralisation allows the brain to channel information from multiple sources and process different parts of complex tasks in different hemispheres so that each can be processed separately at a quicker rate. One side of the brain, for example, may process well-established, routine "housekeeping" tasks while the other side detects and processes unexpected stimuli and challenges.

Yet in all these cases, it is the strength of lateralisation, rather than the direction, that confers the benefits, raising another puzzling question: why do most animals within a species prefer the same side, making their behaviour extremely predictable to predators, prey and competitors alike? And why are there always a few oddballs, like me, who are wired differently from the rest of the population?

Vallortigara and his colleague Stefano Ghirlanda at Stockholm University in Sweden, have found an answer in game theory. They have constructed mathematical models which show that every animal gets the best deal in a group that's made up of many individuals with the same lateralisation, plus a small proportion of outsiders like myself.

They considered a group of individuals constantly faced with the threat of predators - fish swimming in a sea with sharks, for example. In these situations, you might think that there would be safety in numbers - your risk of being caught reduces as you surround yourself with ever more potential victims. So it would make sense for each individual fish to stay in sync with the crowd, turning together in the face of a predator.

Conversely, however, Vallortigara supposed that as long as most fish do exactly this, it might pay for a very small proportion of group members to escape the other way. They would benefit by running off in the direction that the predator is not expecting. However, this advantage only holds as long as this alternative strategy remains rare and unpredictable. The team's models showed that the most stable grouping in the face of various evolutionary pressures is one where a large majority are lateralised in one direction, accompanied by a small minority of individuals that buck the trend (*Proceedings of the Royal Society B*, vol 271, p 853).

Surprise attacks

Similar trade-offs between majority and minority preferences may exist within a population too, explaining the varied patterns of lateralisation in many species. Numerous studies have found, for example, that both cooperative behaviours such as courtship displays or parent-offspring interactions and aggression among peers tend to be lateralised across populations in creatures as diverse as lizards, wading birds, Siamese fighting fish and primates. Here, the balance between left and right preferences would depend on two competing factors - in this case, the benefit of being able to react in kind during cooperation, and conversely, the ability to go against expectations in antagonistic interactions and launch an attack from an unexpected quarter (*Philosophical Transactions of the Royal Society B*, vol 364, p 861).

Perhaps this can partly explain the existence of left-handers in human societies. Numerous studies have found that left-handers have an advantage in many sports involving a direct opponent, such as tennis or boxing, and the advantages may run to more serious encounters: many sports are forms of ritualised combat, after all. Charlotte Faurie and Michel Raymond at the University of Montpellier in France compared eight unindustrialised indigenous societies and found that those with the highest number of

homicides also had the most left-handed people, suggesting that lefties really are more likely to survive hand-to-hand fights (*Proceedings of the Royal Society B*, vol 272, p 25).

Human left-handers are more likely to survive potentially fatal hand-to-hand fights

All this is good news for me, a left-hander in a right-handed world. I survived the complex cognitive challenges of higher education thanks to my highly lateralised brain, and with a good set of left-handed appliances, I don't even get wrist ache anymore. Fair enough, my drawing and needlework still leave a lot to be desired, but I take comfort in the knowledge that should anyone tease me about it, I might just be able to pull off a surprise attack with my left hand.

Is your pet a southpaw?

Try these tests to see if your furry, feathered or scaly friends prefer to use their left or right appendages for certain tasks - and what this reveals about their behaviour.

Dogs: See if Fido wags his tail to his left or right. If he's like most dogs, furious wagging to the right means he is relaxed and ready to approach whatever he sees; if he wags to the left he might prefer to withdraw.

Cats and rodents: Give your cat, rat or hamster a jar with a tasty treat and see which paw they use to try and extract it. If your pet is a cat, expect toms to use their left paws and the females to use their right.

Parrots and other dextrous birds: This is an easy one. "Anything they are interested in they will pick up with their dominant foot," says Culum Brown at Macquarie University in Sydney, Australia. Watch out for odd combinations of lateralised behaviours too. Unlike most birds which view the objects they hold with the eye on the same side, the Australian galah manages to pull off a cross-over number, using the eye on the opposite side.

Fish: Place an unfamiliar object in the centre of your fish tank and record if your fish go around it clockwise or anticlockwise, indicating their eye preference. Be aware, though that the preferred eye might change depending on whether the object is disturbing or attractive and whether your fish are bold or shy (*Animal Behaviour*, vol 74, p 231).

Reptiles and amphibians: Move a food morsel into your pet's field of view from either the left or right side and watch which direction elicits more or quicker catches. For most species tested so far, the right side appears to be the favourite.

Horses: Chances are that your horse has already been trained to be handled from the left side. Recent research suggests that horses prefer to use their left eye for assessment and evaluation of their surroundings regardless of such training. Yet horses are also likely to react more strongly to alarming sights they see with the left eye too, which leads Lesley Rogers and Nicole Austin at the University of New England in Armidale, New South Wales, Australia, to propose that it might be worth exploring if they should actually be trained from the right instead.

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http://www.newscientist.com/article/mg20627581.600-southpaws-the-evolution-of-handedness.html?DCMP=NLC-nletter&nsref=mg20627581.600

To be the best, learn from the rest

- 28 April 2010 by **Mairi Macleod**
- Magazine issue 2758

YOUR plane crashes and you find yourself stranded in the middle of a vast jungle. How would you work out which fruits are safe to eat and where to find clean water? You could muddle along on your own for a while, but you would probably end up sick and very hungry. Far better to find some friendly locals and learn how they do things.

Learning from others is something we do all the time, not just in extremis. We are more reliant on so-called "social learning" than any other animal - it is thought to be at the core of culture and tradition and is credited with our successful colonisation of the planet. Yet no one knows exactly how social learning works. Obviously, copying others allows us to acquire useful knowledge without having to bear the costs of working everything out for ourselves. But there is a catch. If societies are to adapt to changing conditions, there must be innovation too - people cannot blindly copy everything because the information may be wrong, outdated or unavailable.

This problem has occupied http://lalandlab.st-andrews.ac.uk/Kevin Laland of the University of St Andrews, UK, for some time. "Individuals ought to be selective with respect to when they rely on social learning and from whom they learn," he says. "Natural selection ought to have fashioned specific adaptive learning strategies." But what are these strategies? If social learning is such a powerful force in our species' success, surely we need to know when, where and why it happens. Yet previous attempts to answer these questions have only scratched the surface. Laland realised that if he was going to get anywhere he would have to come up with an original approach.

Until then, only a tiny fraction of the possible learning strategies had been investigated. The most thoroughly researched was the "conformist transmission model" - the idea that a person is more likely to copy traits that are common in the population than those that are rare. An alternative is "copy an expert", which seems like a reasonable rule to follow when buying a new computer or shares on the stock market, for example. "Copy the most successful" also makes intuitive sense, although in our celebrity-oriented world there is a chance it might backfire - George Clooney may endorse a certain brand of coffee, but does he really know any more about beverages than the next person?

Let battle commence

Laland wanted to consider a much broader range of strategies and, crucially, to find out which ones work best. He realised he could not do that with a traditional experiment, so he hit on the idea of holding a tournament. His inspiration came from a series of open competitions held in the 1970s to examine why cooperation evolved. These tournaments, based around the prisoner's dilemma, which involves deciding when to cooperate and when to defect, were a shot in the arm for research into cooperation. Laland hoped a tournament could be just as successful for social learning. "We thought if we were to advertise this idea widely we could attract all kinds of people into the field," he says. So, teaming up with several other experts in social learning, Laland secured enough funding from the European Union to pay for the project, including a €10,000 prize for the tournament winner.

Their competition was going to be a game of survival, taking place in a computer-generated world. Virtual agents would have the potential to acquire 100 possible behaviours, each with a different associated pay-off that would change over the course of the game. The pay-off represents the benefit an individual gains by performing a particular behaviour, its changing value reflecting the fact that information can become outdated as the environment changes.

Entrants to the tournament would start with 100 agents each, which would accumulate a repertoire of behaviours over their lifetime through learning. At every round of the game, each agent would have three

options: innovation, in which they randomly acquired a new behaviour by individual learning; observation, in which they acquired a new behaviour by social learning; or exploitation, in which they used a previously learned behaviour and so gained its pay-off. The entrants had to devise a strategy that their agents would use to decide between these options. The challenge was to create the strategy that generated the most successful or "fittest" agents - a criterion measured by dividing an agent's accumulated pay-off value by the number of rounds it had survived. Furthermore, in each round, every agent would have a 1 in 50 chance of dying. The deceased would then be replaced by an "offspring" of another agent. Agents were chosen to "reproduce" with a probability proportional to their mean lifetime payoff. So the better a strategy's performance, the bigger the share of the population its agents were likely to have. By this simulated version of natural selection, the entrant with the most successful strategy would have the most agents at the end of the game.

There were two phases to the tournament. The first was a round robin where all strategies played each other for 10,000 rounds in pairwise contests. The strategy with the most agents at the end was the winner. Then, in the second phase, the 10 highest scoring strategies were thrown in together to see who would win overall. They battled it out in a variety of simulated environments, differing in such parameters as the number of agents a potential learner was able to observe, the likelihood that an agent using social learning would pick up the wrong information, and the way in which pay-offs associated with behaviours changed over time. The aim here was to test how robust the strategies were in different learning environments because in the real world the costs and benefits of social learning versus individual learning may vary.

And the winner is...

The competition, held last year, turned out to be an irresistible challenge to many, with over 100 entries submitted from a variety of academic disciplines, ranging from philosophy to computer science, and even some school pupils. In fact, two teenagers from Westminster School in London beat most of the academics to come tenth overall.

Last month, Laland and colleagues published their findings in *Science*, DOI: 10.1126/science.1184719. So what did they discover? It seems a successful strategy rests primarily on the amount of social learning involved, with the most successful agents spending almost all their learning time observing rather than innovating. However, avoiding spending too much time learning either socially or individually was just as important. "Between a tenth and a fifth of their life seemed to be the optimal range," says fellow organiser Luke Rendell, also from St Andrews University. "If they did more learning than that it seemed that life was just passing them by."

The most successful agents spent almost all their learning time observing rather than innovating

Successful strategies were also good at spacing out learning throughout the agents' lives. The winning strategy, Discount Machine, submitted by PhD students Daniel Cownden and Timothy Lillicrap from Queen's University in Ontario, Canada, stood out because it did just this. It seems packing all your learning into the early part of your life is not a great idea - we need to keep updating our knowledge as we go along.

Lillicrap points out that the questions their strategy addressed resemble those posed in real life. "We face similar trade-offs all the time - for example, how much education should I get before I join the workforce?" To answer such a question we need to consider various factors such as how much more do I expect to earn with this training? How long is it going to take? What's the likelihood that my training will become irrelevant? How long will I be in the workforce? "Our strategy takes those things into account," he says.

Another attribute of the most successful strategies is that they are parasitic. This is the essence of social learning - somebody has to do the hard graft to find out how to do things before other people can copy them, so it only pays to learn socially when there are some innovators around. Indeed, in contests where

Discount Machine agents were able to invade the entire population, they actually ended up with a lower average pay-off than they did in contests where the conditions allowed some agents with more innovative strategies to survive, so providing new behaviours to copy.

This also has real-world implications. Could it be that we don't all use the same optimal social learning strategy? "It's quite clear that you would expect social learning to evolve and be favoured," says Laland. But if everyone relied heavily on it then there would be a decrease in the population's fitness and subsequent advantages for individuals who are more inclined to learn for themselves.

General observation certainly suggests that people vary considerably in their propensity to copy others or find stuff out for themselves. Personality traits such as creativity and curiosity are clearly linked to the ability and willingness to carry out successful individual learning, and these traits vary widely.

There also seems to be a gender difference. Kimmo Eriksson of Malardalen University in Sweden, one of the tournament's designers, and Pontus Strimling of Stockholm University discovered this when they carried out a game called explore and collect, in which paired players tried to get the highest possible score among a number of undisclosed options by either uncovering the relative ranks of options for themselves or choosing options already favoured by the other player (*Journal of Evolutionary Psychology*, vol 7, p 309). "We found that women tend to invest more in individual learning than men, in the sense that they spend more effort on trying out a greater number of unknown options," says Eriksson.

As well as highlighting the variability in our individual approaches to social learning, the tournament has also shed light on an apparent paradox. Laland and others have found that social learning is widespread in nature, even being used by invertebrates. So what's so special about copying in humans?

Social learning is widespread in nature. So what's so special about copying in humans?

Firstly, says Laland, the competition reveals that social learning does not require much brainpower. "You don't need any clever copying rules. You can just copy anyone at random," he says. "Other individuals are doing the filtering for you. They will have tried out a number of behaviours and they will tend to perform the ones which are reaping the highest rewards." That explains why even insects can benefit from social learning. "But," he adds, "to become the winner of the tournament you really have to do something a bit more sophisticated than that." You have to weigh up the relative costs and benefits of sticking with the behaviour that you have, versus inventing a new behaviour, versus copying others. That requires assessing how quickly the environment is changing, as this gives you an idea of how quickly information will become outdated. Discount Machine was very good at doing just that - in variable environments it placed a higher value on more recently acquired information and discounted older information more readily.

It is in this ability that humans seem to have the edge over other animals. That's not to say we are alone in making these sorts of calculations, though. For example, Laland and his colleagues have found that sticklebacks can do it. First they taught individual fish to expect more food at site A than site B. Then they switched the food around, but the only clue to the deception was that there were now more fish feeding at B than A. It turns out that the longer it has been since the fish checked the sites out for itself, the more it will rely on social information to tell it which site has the most food (*Proceedings of the Royal Society B*, vol 271, p 957).

While this is impressive, humans have a unique talent that allows us to take account of passing time and changing circumstances far more effectively: language. "You can simply talk about what might happen," says Rendell. Or you can use language to imagine yourself in a different place or time. Rendell suspects this may be what has enabled us to take full advantage of social learning, leading to the huge gap between human culture and the behaviour of other animals.

The tournament has undoubtedly provided several insights into social learning. According to Rob Boyd of the University of California, Los Angeles, a pioneer of social learning research and another of the tournament's designers, its big advantage over previous approaches is the level of realism. It entails "much more environmental complexity and more cognitive complexity in the organisms", he says. Nevertheless, there is room for improvement. Rendell points out that the simulations cannot track particular individuals through time, and that it doesn't include formal teaching, a vital part of learning in the real world. "We want to explore additional complexities with some more tournaments in the future," he says.

Before they do that, however, the team has another intriguing idea to pursue. "We want to go out and try to explore this in the real world," says Rendell. "We plan to set up an experimental version of this tournament where we get people to play it themselves and see what they actually do."

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http://www.newscientist.com/article/mg20627581.700-to-be-the-best-learn-from-the-rest.html?DCMP=NLC-nletter&nsref=mg20627581.700

Energy and the Empire State

The King Kong of buildings makes efficiency pay, but how much energy renovation should come from regulators?

By Melinda Burns

As if the Empire State Building needed any more notoriety. The pre-World War II skyscraper will begin a retrofit designed to cut energy use by 38 percent and save its owner $4.4 million in yearly energy costs.

Anthony Malkin, the owner of the Empire State Building, is an environmentalist — but he's also a capitalist. If he's going to spend $20 million on an energy retrofit of his famous skyscraper, he wants a guaranteed three-year payback and long-term savings.

"There was no assurance that what we were going to do was going to be successful," Malkin recalled this month, a year after he launched the project with a green light show at the historic landmark, the 10th tallest building in the world. "We knew that if we could do this work at the Empire State Building, one of the largest tourist attractions in the world, the world was going to stand up and take notice."

So, Malkin and a team of experts from the Clinton Climate Initiative, a program of the New York-based William J. Clinton Foundation; Rocky Mountain Institute, a Boulder, Colo., "think-and-do tank"; Jones Lang LaSalle, a global real estate investment firm with headquarters in Chicago, and Johnson Controls Inc., a Milwaukee-based firm that serves the global building efficiency market, spent nine months quietly examining 67 ways to reduce energy use at the pre-World War II office tower.

When Malkin realized he could get an ironclad guarantee for a 38 percent reduction in energy use by 2013, together with an annual $4.4 million in savings, he went public with his plans.

The "deep energy retrofit" at the 102-story Empire State will refurbish 6,500 windows; install sensors, automatic dimmers and high-efficiency light bulbs; put reflective barriers behind radiators; renovate the heating and cooling systems; provide electrical meters for tenants' offices and work with tenants to make sure that they maximize the use of natural light. Far from being an outmoded liability, the skyscraper's windows are "a key to efficiency," Malkin said. With sensors, the office lights will automatically switch off when enough sunlight enters a room.

Many studies show that energy retrofits in commercial buildings deliver good bang for the buck: They reduce more greenhouse gases for less money than it would take to electrify the transportation fleet or upgrade industrial operations. And as Malkin has discovered, ambitious retrofits can have a financial payback for owners.

But progress in the efficiency field overall has been hampered by the up-front capital cost of renovations and the complexities of landlord-tenant relationships over who should pay.

Last year marked the end of the first decade of the Energy Star for building efficiency, a voluntary rating program administered by the U.S Environmental Protection Agency. To date, the EPA has qualified 9,700 commercial, or non-residential, buildings for the Energy Star label, out of 5 million commercial buildings nationwide.

Last year alone, a record 3,900 such buildings received the Energy Star label. At that rate, it would still take more than 1,000 years for the U.S. to upgrade its commercial building stock.

A 2009 report on building efficiency in the U.S., European Union, Japan, China, India and Brazil, a project of the World Business Council for Sustainable Development, a global CEO-led association of more than 200 companies, bluntly called the status quo "sleepwalking into crises."

"Building professionals, owners and users do not grasp the urgency and remain unmotivated to act," the report said. "Business-as-usual inertia is a drag on progress. … The sleepwalking path achieves occasional advances, but these are soon lost and total energy consumption is much higher by 2050. The number of low-energy buildings grows erratically and slowly. …"

"The building sector must radically cut energy consumption — starting now — if countries are to achieve energy security and manage climate change."

With Malkin, that's preaching to the choir.

"If we don't cut the energy consumption in cities, we cannot sustain life as we know it on Earth," he said.

Disclosing energy scores

Worldwide, commercial and residential buildings account for 40 percent of global energy consumption and resulting carbon footprint, according to the World Business Council. That's more greenhouse gas from buildings than from cars, trucks, trains and planes combined. In cities, where more than half the world lives, buildings account for up to 80 percent of the carbon footprint, and in that category, and office buildings emit more greenhouse gas than any other commercial structure.

"Everybody recognizes that over 70 to 80 percent of the buildings that exist today will exist in 2050," said Caroline Fluhrer, a consulting engineer who works for the Rocky Mountain Institute and conducted a "lifecycle cost analysis" for the Empire State. That's the deadline set by the Intergovernmental Panel on Climate Change for an 80 percent reduction in greenhouse gas emissions to head off the most severe impacts of global warming.

The institute recently launched pilot projects in three Ford car dealerships in the U.S. to see how the company might cut energy costs at 3,500 dealerships.

"We can't just focus on new buildings," Fluhrer said. "We need to retrofit our existing stock. It's a huge opportunity."

The market alone cannot produce an energy transformation in buildings, efficiency advocates say. Existing law provides a tax credit of $1.80 per square foot for building retrofits, but the U.S. Green Building Council, a Washington, D.C.-based nonprofit organization, and a leader in the industry, is part of a coalition lobbying Congress this month to increase the credit to $3 per square foot.

In March, Sens. Jeff Merkley (D-Ore.) and Mark Pryor (D-Ark.) introduced "Building Star" legislation with a big "carrot" for investment in energy efficiency renovations for commercial and multifamily apartment buildings. It included $6 billion in federal tax credits, grants and low-interest loans, and is supported by a coalition of manufacturers, contractors, unions, financial services companies, and building owners and managers.

Meanwhile, the cities of Austin, New York, Seattle and Washington, D.C., and the states of California and Washington are giving the market a push. On a phased-in basis, they are requiring the owners of large commercial buildings to obtain an EPA score for energy efficiency and disclose it to prospective buyers, renters or lenders. In some cases, the score must be made available to the public at large. In the European Union, energy efficiency labeling is required for all buildings, including homes.

The Institute for Market Transformation, an environmental nonprofit group, helped write the Washington, D.C., disclosure rules that went into effect Jan. 1. Andrew Burr, the group's program manager, likened them to the disclosure of miles per gallon in cars and calories per unit in food.

"This is a good starting point," he said. "It's a matter of governments helping the market work better so the government doesn't need to intervene with a heavy hand. The key is getting building owners to think about energy efficiency. If people aren't in that mindset, they say it's just another burden on them."

The disclosure rules don't require building owners to make any repairs to qualify for Energy Star status. But proponents hope the competition will nudge them in that direction. The EPA estimates that Energy Star buildings save 50 cents per square foot compared to average energy costs.

"These rules do make a difference," said Jason Hartke, a vice president of the Green Building Council. "Understanding your energy use has shown to improve energy efficiency as much as 15 percent. Getting this information out is powerful."

Opponents of disclosure rules include the Building Owners and Managers Association International, a Washington, D.C. trade group that encourages its members to obtain a rating from the EPA but wants the program to remain voluntary.

Karen Penafiel, the association's vice president of advocacy, said the group's careful position, while it may seem "a bit confusing," reflects a membership divided between the owners of new and old buildings. She said the association has worked closely with the EPA in the Energy Star program for years and aggressively promoted it with members.

"We feel like we're finally getting the message out that this makes sense, not just from the tree-hugger mentality, but also making the financial case," Penafiel said.

The association opposes provisions that would promote mandatory building energy performance labeling, such as those contained in the American Clean Energy and Security Act, which was narrowly approved by the House and is awaiting a vote by the Senate. The bill would provide federal funding to states that require energy labeling for buildings. A Senate bill containing similar provisions also is pending.

Penafiel said the association supports the creation of a national model for voluntary disclosure of energy efficiency scores to prospective buyers and tenants. A national model would be an improvement over dozens of different rules in cities and states, Penafiel said.

"We honestly believe more and more jurisdictions are going to move in that direction," she said. "It might be six today, but it could be 60 next year."

New York City recently made energy audits mandatory for large privately owned buildings. But the mayor withdrew a proposal for mandatory upgrades after property owners complained.

'First step to green'

The Energy Star goes to buildings in the top 25 percent for energy efficiency, compared to the national average, based on a review by an independent, third-party, licensed engineer. The average building has an

energy score of 50, and an Energy Star building has a score of at least 75. The Empire State retrofit is expected to produce a score of 90: New buildings or retrofits may apply for certification after they have operated for a year.

Malkin doesn't own the only energy-conscious office tower in the country. The Chrysler Building in New York, Wrigley Building in Chicago, Phoenix Tower in Houston, Prudential Tower in Boston and Transamerica Pyramid in San Francisco, to name a few, are Energy Star-certified.

On the agency's list of top 25 cities for buildings that earned the Energy Star in 2009, Los Angeles placed first with 293; Washington D.C. was in second place with 204; New York was in 10th place with 90, and Louisville was No. 25 with 35.

"The effort to be environmentally sustainable is an important movement in the commercial building arena right now," said Maura Beard, an EPA spokeswoman. "These are real buildings operating and saving energy."

In a reference to the blue Energy Star logo, she added, "The first step to green is blue."

Industry analysts predict that 10 years from now, buildings all over the county will be rated for energy efficiency. In the meantime, they say, an owner's motivation for retrofits has more to do with vacancy rates than electrical bills.

"The incentive for an individual building owner is not to save money on energy," said Levin Nock, the author of a 2009 report on energy efficiency retrofits in commercial and government buildings for Pike Research, a Boulder-based consulting firm.

"That's a small, boring incentive, not a big exciting incentive," Nock said. "The incentives are from other things – low vacancy for someone who's renting space, or higher productivity for an owner-occupier, or higher sales. I think at some point it will be mandatory. As a national policy, it will become more important. The excuses for not doing it will become fewer and fewer."

Meanwhile, Malkin is out to prove by example that energy retrofits are a "commercially intelligent investment." He hopes the Empire State model will be replicated, and he's placed his team's findings online so that others don't have to reinvent the wheel."The heck with making people 'do the right thing,'" Malkin said. "I would rather get them to do what makes economic sense. Everything here is about dollars. I'm improving my competitive position. I'm improving my ability to attract tenants and make more money.

"On the other hand, I'm also trying to change the world. We're creating jobs. And we will reduce the amount of money that is sent overseas for energy. That's a good security policy and economic policy."The Empire State retrofit, part of a much larger overall restoration, is slated for completion in 2013. Half the savings in energy cost is slated to kick in at the end of this year when the building systems work is finished. Already, Malkin said, he's attracting larger tenants with better credit, firms with their own mandates for sustainability.

"The point is, we're taking things in a whole new direction from where they have been," Malkin said. "This is not theory. This isn't a neat slide show on the basis of what could be done. It's happening right now."

http://www.miller-mccune.com/science-environment/energy-and-the-empire-state-14879/?utm_source=Newsletter107&utm_medium=email&utm_content=0504&utm_campaign=newsletters

Can Hurricanes Be Predicted Decades in Advance?

The rapidly growing field of paleotempestology lays the foundation for reliable hurricane predictions a decade or more into the future.

By Jim Morrison

Paleotempestology lays the foundation for reliable hurricane predictions. (NASA)

In 2007, a reporter for the *Post & Courier* of Charleston, S.C., was tired of doing straight stories on hurricane forecasts. So he hired a medium to predict the forthcoming storm season. "The sense we got from emergency-management people here," the reporter wrote, "is that the forecasts had been so wrong that they were hearing from the public, 'Why should we pay any attention to this stuff?'"

At the end of the hurricane season, it turned out the medium had been more accurate than the scientists who took it upon themselves to make storm predictions. But research seems likely to soon make weather mediums a thing of the past.

University of Massachusetts researcher Jon Woodruff putters his plastic boat near enough to the rest of his team so the others can hear when X marks the spot. Slowly, he relays the string of numbers: 30.01136N and 84.42989W. Sam Zipper, a research assistant from Woods Hole Oceanographic Institute, enters them into his GPS device and directs us west and then north.

Dana McDonald, another Woods Hole researcher, and I row the pond-worthy vessel — two aluminum canoes with a square of plywood lashed between them — making a few passes until we're over the right coordinates. McDonald sets three anchors to hold the ungainly catamaran against the cutting wind on this uncommonly cold 27-degree morning in St. Mark's National Wildlife Refuge, 25 miles south of Tallahassee along Florida's Gulf Coast.

The team has named this unassuming freshwater pond Lake Patricia after a favorite aunt of researcher Christine Brandon, who helped scout it yesterday. Thick brush, dry and brown with the season, surrounds the water. Lily pads ring the shallows of the shoreline. The water is surprisingly clear down to 3 or 4 feet. We're just a few miles from several small towns and million-dollar beach houses, but this is coastal wilderness, the gates to the refuge unlocked only for Woodruff and the team.

Earlier this morning, Brandon and Woodruff, who resembles a young Ron Howard, motored slowly back and forth watching the results from ground-penetrating radar on his laptop. The profile: a flat-bottomed bowl.

It's the perfect shape for a pond to be history's repository.

Woodruff and fellow principal investigator Jeff Donnelly of Woods Hole are seeking sediment samples, long tubes of sand, muck and other material that serve as a muddy analog to tree rings, giving evidence of weather and other physical phenomena going back thousands of years. The deeper into the muck they can drill, the longer the historical record. Each core is like a many-layered cake. They're looking for thin white slivers in the dark peat revealing major storms that picked up sand and deposited it far inland.

By reading the history in those sedimentary cores, these scientists hope to uncover patterns and, by knowing more about those patterns and the hurricanes they produced, to be better able to predict the future, saving lives and billions of dollars in damage.

Woodruff and Donnelly's quest for sediment cores is one example of the innovative techniques scientists are using to reconstruct hurricane history in a rapidly growing field called paleotempestology. Others are studying different proxies for prehistoric weather: the chemistry of corals, tree rings, oxygen isotopes in coastal cave stalagmites and the deposition of marine microfossils.

While researchers in the field are collecting specimens, others at select supercomputer sites across the globe are tuning massive models they say will be able to forecast the likelihood of hurricane strikes decades in advance. Most important, they may help settle the question of whether climate change will spawn a period of more frequent and destructive storms.

Greg Holland, the director of the Mesoscale and Microscale Meteorology program at the National Center for Atmospheric Research in Boulder, Colo., and one of the *éminences grises* of the hurricane forecasting community, says that 20 years ago, predicting the track of hurricanes headed toward land wasn't terribly reliable. Then a burst of research dramatically improved these real-time forecasts. He sees the same thing happening now with forecasting hurricane frequency and intensity, years and even decades in advance. "It's a rapidly evolving field," he says. "There's this intensive effort. You can see the curve bending down towards better and more precise predictions. It's an exciting time."

Last summer, Congress held hearings and called for a national hurricane research initiative similar to one that exists for earthquakes, which have caused only a fraction of the economic losses that hurricanes have in the U.S. in recent years. Nearly 30 million Americans live in coastal areas, from North Carolina to Texas, that are threatened by hurricanes. More than 3,000 people have died since 2003 in hurricanes. The National Science Board estimates that from 2002 to 2007, economic losses due to hurricanes totaled $180 billion. According to the Reinsurance Association of America, insured property exposure is $9 trillion. AIR Worldwide, a catastrophe modeling company, estimates that disaster losses will double every decade because of growing residential and commercial density along the coasts.

But predicting the number and intensity of hurricanes before they spawn in the Atlantic has been a hit-or-miss proposition, even just a few months before the season begins.

Every spring, researchers from Colorado State University, the National Oceanic and Atmospheric Administration, and the Center for Ocean-Atmospheric Prediction Studies at Florida State University issue forecasts for the coming hurricane season. They rely mostly on statistical models guided by recent history.

None projects hurricanes beyond the next season. Risk Management Solutions, a company that helps insurers manage their exposure from natural disasters, took a stab in 2006, issuing a five-year forecast

predicting that insured hurricane losses in the United States would be 40 percent higher than the historical average. The projection has been a colossal bust, greatly overestimating losses.

Holland and others, including Roger Pielke Jr., director of the Center for Science and Technology Policy Research at the University of Colorado and a senior fellow at the Breakthrough Institute, a progressive think tank, say the current seasonal forecasts exhibit no more skill than Punxsutawney Phil predicting the end of winter. “These efforts to predict are scientifically worthwhile exploring and add to the understanding of hurricane dynamics,” Pielke says. “But from the standpoint of being practical, skillful and useful, they are not there yet, and, who knows, they may never be.”

In early 2005, hurricane predictions ranged from 11 to 14 tropical storms. Instead, there were 27 named tropical storms and more hurricanes — 15 — than any year in the past half century. Katrina, Rita, Dennis and the other storms did more than $100 billion damage. In the next two years, forecasters predicted more storms than materialized. In the last two years, they’ve been roughly on the mark.

It’s easy to see why understanding hurricane risk is important driving with Woodruff along Route 98, the Coastal Highway, through the tiny town of Panacea, Fla. It seems as if every third building is for sale. As the road veers along the beach and past expensive homes down private roads, the for-sale signs only multiply.

We pass Angelo & Sons, a restaurant perched on stilts at the base of the bridge across the Ocklockonee Bay. The longtime eatery has been rebuilt since Dennis battered it into submission on July 10, 2005, the earliest major hurricane on record. The storm surge through here, expected to be only a few feet, reached 10 to 12 feet. As Dennis spun up the Gulf of Mexico, it pushed a rising wall of water. Winds skimmed the Apalachee Bay, which is only 5 to 10 feet deep even miles offshore, lifting the water and forcing it into the coast where rain had already swelled the St. Marks and Wakulla rivers. In Florida alone, Dennis killed 10 people and caused an estimated $1.5 billion in damages.

Part of the record-breaking 2005 season, Dennis was the second punch to Florida’s northwest coast. Nine months earlier, Hurricane Ivan, nicknamed Ivan the Terrible, landed a left hook with 130 mph winds and extensive flooding, although the major damage was further west in Santa Rosa County and Pensacola, where the storm surge reached 15 feet. The storm destroyed a quarter mile of the bridge across Escambia Bay. At sea, Ivan sunk seven oil rigs and set five others adrift. Even more costly was the damage to underwater pipelines. Some were moved 3,000 feet while others were lost, buried under 30 feet of mud, according to a study by the United States Naval Research Laboratory. A monitoring buoy 100 miles south of Mobile, Ala., recorded a wave of more than 53 feet as Ivan approached. The hurricane killed 14 people in Florida and caused $13 billion in damages across the southern United States. (Three other hurricanes — Charley, Frances and Jeanne — struck other parts of Florida in 2004).

From 2000-2009, 53 tropical storms or hurricanes struck Florida, causing an estimated $64 billion in damages. Homeowners in high-risk areas like the Gulf Coast continue to pay the cost through soaring insurance rates. Some say they have been unable to sell their homes because the buyers can’t obtain insurance, so getting a mortgage is all but impossible.

One afternoon, as Woodruff prepares to survey a nearby lake, a resident comes by and says the value of his beachfront home has dropped to $500,000 from $1 million. A friend, he adds, is paying $2,000 a month for insurance. Claiming it was losing $20 million a month, State Farm Florida threatened to withdraw from the state last year before agreeing to stay, but at a cost. The insurer said it would drop 125,000 policyholders in high-risk areas and raise rates on the remaining 685,000 by about 41 percent. Florida insurers say it took them 11 years to recover from the catastrophic losses of 1992’s Hurricane Andrew, a rare Category 5 storm.

Franklin W. Nutter, president of the Reinsurance Association of America, says the industry has been encouraging and funding research on three main fronts: longer-term regional forecasts looking to

understand the effects of climate change, a better understanding of storm surges in coastal areas and better forecasts of storm intensity. “There are so many unresolved questions,” he says.

The most relevant for insurers is the outlook 10, 20 or 30 years in the future. “The big concern is whether the past is prologue, or whether, because of climate change, we’re in for a period of not just natural variability, but a change in the dynamics of the oceans and ocean currents and winds — El Niño, La Niña — that might make the past less relevant going forward,” Nutter adds. “The problem for insurance companies is you’re pricing a product today, but you’re paying losses based on future developments.”

Better forecasting would give insurers, homeowners and policymakers an opportunity to adapt by changing land-use policies, strengthening building codes and preserving or restoring natural mitigation by wetlands, floodplains, and beach and dune systems. Several studies have shown investing in better forecasting and mitigation has significant returns. One study by the Multihazard Mitigation Council of the National Institute of Building Sciences concluded that each dollar spent on mitigation saves an average of $4 in damage costs.

“If you know what’s happening, you can at least get ready for it or have the capacity to get ready for it,” Holland says. “It’s your choice.”

Anecdotal information about hurricanes goes back a few hundred years but is considered unreliable until the last century or so. In 1943, the “Surprise Hurricane” (the current naming system wasn’t in place) struck Texas. British pilots were being trained for World War II at Bryan Field in College Station. When they saw Americans evacuating their AT-6 Texan trainers, they chided them about the plane’s durability. The lead instructor, Col. Joseph Duckworth, hopped into a trainer and flew into the storm. After Duckworth returned safely, the base’s weather officer, Lt. William Jones-Burdick, demanded he be taken into the storm. Soon, there were regular flights through hurricanes to gather meteorological data.

Today, NOAA planes disperse dropsondes, foot-long probes that parachute through storms transmitting data every half-second. The first weather satellite was launched in 1960, but it wasn’t until about a decade later that satellites began collecting hurricane data.

In 1984, William Gray, a meteorologist and professor at Colorado State University, issued the first seasonal hurricane forecast, predicting that 10 tropical storms and five hurricanes — existing for a total of 30 “hurricane days” — would strike the Atlantic and Caribbean basins.

He was close. That year produced 12 storms, five hurricanes and 18 hurricane days. Since then, Gray, an imposing 6 feet 5 inches tall with piercing eyes and white hair, has become the most quoted hurricane forecasting expert in the world. He’s 80 now and has turned over the primary responsibility for the forecasts to his assistant, Philip Klotzbach, but is still revered for his work uncovering the effect conditions in the Pacific Ocean and in West Africa have on hurricanes spawning in the Atlantic.

He and Klotzbach use 60 years of data on sea surface temperature, atmospheric pressure and winds to make annual predictions. “We assume that the future is going to behave similarly to how the past has behaved,” says Klotzbach, who has worked with Gray since 2000.

In 1998, the NOAA began offering an outlook that gives a range of named storms, hurricanes and major hurricanes. At NOAA, statistical analysis of climate factors and history, aided during the last two years by predictions from computer models, form the basis of the hurricane forecast. While Gray’s team issues a forecast based on numbers, NOAA issues an “outlook” that reports the likelihood of a range of storms.

Three main factors, NOAA meteorologist Gerry Bell says, influence the number of hurricanes. They are the El Niño/La Niña cycle in the Pacific Ocean; what are known as multidecadal cycles, 25-to-40-year periods of higher or lower hurricane activity (we’ve been in a higher activity phase since 1995); and Atlantic Ocean temperatures. “Based on the climate patterns and their combined strength, we have a

variety of statistical tools that say given this set of climate conditions, what historically have we seen?" Bell says. "You would say this combination has produced anywhere from 13 to 16 named storms or three to five hurricanes, things like that. Based on historical record, you can go back and link these climate conditions to level of activity."

Bell, who furthered Gray's work by creating an index to measure a hurricane season's strength, has heard the critics, and he acknowledges the outlook's limitations and the barriers to better forecasts. "There's a lot of skill in these forecasts," he says. "But we don't have the knowledge to make every outlook correct."

It's often not clear until April or May, for instance, whether it will be an El Niño or La Niña year. In an El Niño, waters in the Pacific Ocean are warmer than usual; the warm waters affect wind patterns in the atmosphere, increasing wind shear in the Atlantic, which depresses hurricane formation. La Niña, with cooler Pacific water temperatures, has the opposite effect, increasing the number of Atlantic hurricanes and their frequency. Because of uncertainties about the arrival and strength of El Niños and La Niñas, forecasters issue an early season prediction in April or May and a second forecast in August, just before the height of the season.

There is also no understanding when an active hurricane era, like the one we're in, will end. Cycles of low and high activity can last for decades, then suddenly shift. "We really don't have an ability to say here's our active era, and we expect it to end in year X," Bell adds.

Where Holland and Bell agree is that the future of forecasting lies in computer modeling. "The models get the entire complex chain of events that lead into the season in detail," Holland adds.

At the National Center for Atmospheric Research in Boulder, researchers have married a global climate model with a weather model, coupling the long view of changes over decades in oceans and wind shear that control hurricane activity with the finer regional resolution of shorter-term weather modeling. The project is looking at experimental predictions for three decades in detail: the current decade, 2020-2030 and 2045-2055.

Holland says NCAR researchers are still learning how to use the model properly, and it will take another five to eight years before it becomes fully operational. "I'm not going to forecast a squall line through New York in 2050," he adds. "But what we want to do is be able to say: 'What are the statistics of squall lines going through New York in 2050?'"

Running 20 or more forecasts with slightly different conditions gives forecasters a measure of confidence. "That's where the insurance industry and the emergency managers are starting to go," Holland says. "If they can get an indication next year will be 15 tropical storms and the uncertainty is plus or minus 1, or 15 and the uncertainty is plus or minus five, [rather] than just saying 15 [storms], tells them a lot more. They have an idea on what the bounds will be."

Holland and Bell think predicting landfalls — what matters most to residents, insurers and emergency planners — will one day be possible. NOAA is researching East Coast landfalls, working out the climate patterns controlling them and looking at the kind of statistical models needed to produce a meaningful forecast, Bell says.

Holland thinks it's just a matter of time. "I genuinely think as the models get better able to predict the general characteristics [of storms] in places like the Atlantic, you'll be able to get skillful at which ones are going to make landfall," he says.

The raging question is what effect climate change will have. Gray denies climate change is occurring. Bell says the effect is unclear. Holland says look out. "The consensus looks like there will be more tropical storms and hurricanes combined — a small amount," he says, "but the research starting to emerge is there will be a substantial increase in the really intense ones, half as many again."

The most severe hurricanes are so rare that it's almost impossible to detect a pattern in their occurrence. Only three Category 5 storms have pounded American shores in the last century: Hurricane Andrew, which killed 23 when it struck Florida and Louisiana in 1992, Hurricane Camille, which plowed through Mississippi in 1969, and an unnamed storm that smashed through the Florida Keys in 1935.

Finding patterns that link such storms is one of the aims of the Woodruff and Donnelly team. That's why they've come to Florida's Forgotten Coast, a sparsely populated area of longleaf pine flatlands, searching for the right spot to transport them back through time.

Together and separately, Woodruff and Donnelly have extracted cores in Belize, Yucatan, St. Kitts, St. Croix, Grenada, Brazil, Puerto Rico, New York, Massachusetts and Japan. "Given the limited scope of climate change experienced over the instrumental record, the paleorecord is a critical archive that allows us to explore a fuller range of climate conditions in order to tease apart what the important climatic controls are," says Donnelly, who has been extracting and analyzing cores from across the globe for 14 years.

In 2007, a Woodruff-Donnelly paper in *Nature* reported that a Playa Grande, Puerto Rico, sediment core revealed a 5,000-year storm record that identified weak El Niños and strong monsoons in West Africa as key factors that heightened Atlantic hurricane activity and that should be incorporated into computer models.

Last year, in another *Nature* paper, the researchers reported that the frequency of intense hurricanes in the Atlantic over the past 1,500 years has been closely linked to changes in El Niño and sea surface temperatures. The work suggested that a warming world may face more intense hurricanes, something that has become a consensus among scientists starting to analyze the data from computer models. The past decade, they noted, had the highest number of North Atlantic hurricanes since a similar period 1,000 years ago when El Niños were also weak and sea surface temperatures were high.

"Hurricane activity has responded noticeably to past climate shifts," Woodruff said in the careful words of a researcher. "When considering future climate change over the next century, our results indicate that measurable changes in hurricane activity could occur."

Holland, the National Center for Atmospheric Research official, sums up their efforts another way: "Some of the work those guys are doing is just brilliant stuff. The detective work would make Sherlock Holmes proud."

When he went to Japan for the first time to meet his future in-laws, Woodruff dragged them and his parents to a small island 12 miles southwest of the main island to dig in the muck. On a return trip in 2006, he drafted his wife and mother-in-law for long days of pulling sediment cores from jellyfish-infested waters onto a craft named The Unsinkable, fashioned from two Wal-Mart rafts. (It wasn't, by the way.) His Japan work formed the basis for his doctoral thesis, the first long-term coring record for North Pacific typhoons.

Woodruff found his research passion in the mud while earning a master's degree and doctorate in a joint Massachusetts Institute of Technology and Woods Hole program. He has a reputation as being the team's MacGyver, someone who can fashion tools from this and that in the field. He's made boats out of children's toy rafts and a beer cooler.

He and Donnelly returned this year to Florida's Apalachee Bay area to survey ponds farther from the coast to get a record of intense hurricanes that washed deep inland. The idea is to add pieces to the puzzles that portray both regional hurricane inundation and global conditions and activity.

The area is ideal for such research because hurricane strikes are common, storm surges are high and the sinkhole ponds offer the possibility of deep sedimentary records. Using Google Earth, Woods Hole

researcher Phil Lane identified more than 100 potential ponds to scout. One night, after dinner in the cinderblock beachfront dormitory of Florida State University's Coastal and Marine Laboratory on St. James Island, the team sits at tables arranged in a T, poring over map printouts and the computerized results of ground-penetrating radar and sonar scouting expeditions.

They've spent the last two days pulling cores from some small ponds, but they're relatively short cores, not the kind promising a long sedimentary record. The next morning, the first site they look at is Lake Patricia. While Woodruff and Brandon slowly criss-cross the pond, using ground-penetrating radar to look for an area of deep sedimentation, the others lash the plywood to the canoes to create a platform for coring. Then they mount a homemade pipe assembly spanning the plywood. From it hangs a small winch used to raise the core.

By the time we're on the water, Woodruff has found a better coring location than the one scouted by Donnelly the day before. After he relays the coordinates, he swings back around as we're preparing the equipment.

"There's a boatload of sediment right under you," he shouts.

"How much?" McDonald asks.

"Twenty meters."

It's the best news of a research expedition, now in its second week, that has had more than its share of misses.

To get deep, the team is vibracoring, a technique using a vibrating drill head, designed to rid concrete forms of voids and air pockets, to sink the coring tube deep into the muck. A piston assembly in the tube creates a vacuum, holding the sediment when the tube is raised, like pressing your finger to the top of a straw in a drink. By the time we assemble the equipment, Woodruff has joined us. The gas motor to drive the head starts on the first pull, and, with some effort, we raise the 30-foot coring tube over the spot.We steady it, then — with a "one-two" count — push down. It plows through the sediment like a spoon through yogurt, slowing only after the top end of the tube dips below the surface. Zipper, the Woods Hole research assistant, reaches into the frigid water to cap the tube. Woodruff attaches a winch to the homemade crossbar mounted on the plywood, and the tube is winched from the bottom until the four of us can muscle it onto the boat.

As it breaks the surface, Woodruff reaches into the bottom of the tin cylinder. "That's sand, my friend," he says holding out a smear with white grains highlighted against the dark organic matter. Sand is hard to move. Only a high-energy event like a hurricane, a big one, would blow it here."Paleo hurricane," McDonald says, offering the quickie caption.

Back in Massachusetts two weeks later, Woodruff notes that a previous core 6 meters long contained a historical record covering 4,000 years. How far back the layers in the Lake Patricia core will transport researchers depends upon the rate of sedimentation. More rapid deposition means a shorter record, but more detail. It will take months to begin radiocarbon dating the core and perhaps a couple of years to analyze it. "Each of these lakes is recording hurricanes in slightly different fashion. You sort of have to get a feel for how to read the book," Woodruff says. "It's a slow process, and there are few eureka moments."

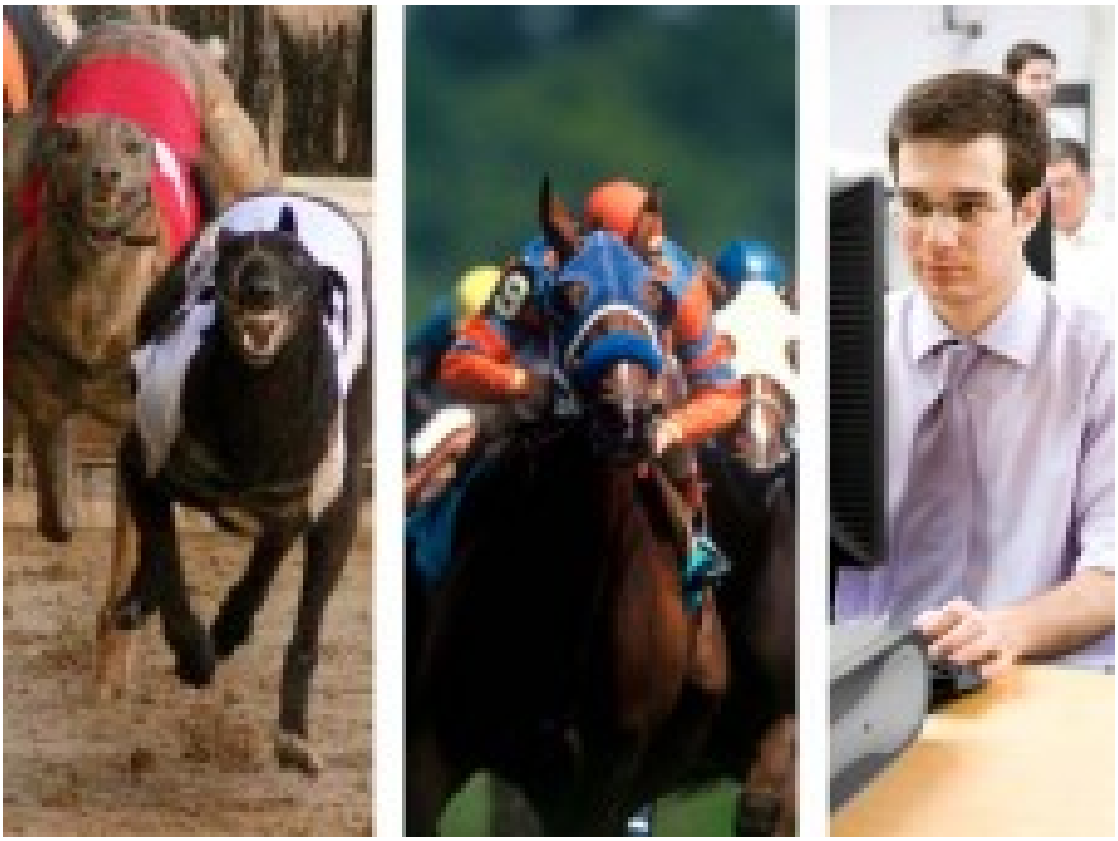
For quicker answers, there's always the local medium.

http://www.miller-mccune.com/science-environment/can-hurricanes-be-predicted-decades-in-advance-11424/

Off to the Pay Races

Although it may be hard to discern at the CEO level, higher pay equals higher performance. Two academics went to the track to suss out why.

By Richard Korman



Horse racing and dog racing were studied to determine how or if incentives really do produce better work.

I thought I had landed accidentally on an article from the British journal *Animal Behaviour*, a publication where you find studies called "'The Bone is Mine': Affective and Referential Aspects of Dog Growls," next to "Leadership and Social Information Use in Human Crowds."

Actually, I was reading the January issue of the *Journal of Labor Economics* and an article invitingly titled, "The Thrill of Victory: Measuring the Incentive to Win." The authors, Bentley Coffey, adjunct assistant professor, and Michael T. Maloney, professor emeritus at Clemson University, compared data on racing thoroughbred horses and greyhounds as a way to gain insight into whether financial incentives play a role in getting employees to work hard.

The authors discovered that jockeys pushed the horses harder when the purse was bigger but the dogs ran hard and couldn't have cared less about the money. That confirmed to Coffey and Maloney that, elsewhere in the working world, humans are more likely to toil through the weekend and skip the concert if they think it will get them a promotion and raise or bonus.

Had the horses and dogs run the same without regard to the payoff, then employer "performance pay schemes are a waste," Coffey and Maloney write. And that has important policy implications, they say, because employers across the land then would need only to match an unfilled job with a talented, ambitious individual knowing he or she is likely to work hard anyway, even if there is no cash in it.

In other words, the typical wage hierarchy where everybody earns more as you go up the organizational chart, as well as bonus pools and other types of incentive compensation, could be unnecessary. And that could have blown to bits the logic governing the way most of us are paid.

To this world of cross-species comparisons Coffey and Maloney have brought a sophisticated mathematical analysis. Their approach has roots in the neoclassical economic vision, which has reshaped the field as a science about the behavior of rational agents, responding rationally to incentives, signals and constraints, in a complete universe or system. As a subject of study, sports provide relatively clean examples and rich data that are rarely ever available from the business world.

In one well-known study of this type, other authors showed that race walkers gear their effort to the expected payoff, walking harder when there are fewer contestants and the chances of winning are higher.

Coffey and Maloney extended a similar style of academic resourcefulness to four-legged competitors. They sought to refine a well-established but controversial economic explanation for why companies pay substantially more to higher-ranked employees even when what the higher-ranked employees produce is hard to measure.

Known as Tournament Theory, the explanation has been a foundation stone in the subdiscipline referred to as personnel economics, a field that was developed partly by one of the labor economics journal's founding editors, Edward Lazear.

"Everyone agrees that as pay goes up so does performance," Coffey and Maloney write, but so far no one has untangled three competing effects possible in incentive-based performance.

Is the extra effort a monetary cost-benefit effect, where participants measure the marginal cost of winning, or the effort needed to produce victory, against the payoff?

Or is it the ability effect, where higher rewards draw the interest of better-qualified participants?

Or is it still another effect, the thrill of victory, where participants work to get to the top just because of a tendency toward "outperforming the next fellow?" as Coffey and Maloney write.

Since it's hard to get data on cubicle dwellers and factory foremen, the authors built a complex model to represent differing race conditions and fed it information from races at the Orange Park Kennel Club in Jacksonville, Fla., for 2006 gathered from www. Greyhound-data.com. The data covered 1,037 races run on 77 days with an average length of 550 yards.

They also gathered data on 712 thoroughbred horse races at Churchill Downs in Louisville in 1994 covering 566 races where the normal distance is 6.5 furlongs.

By scrutinizing the speeds, and in the case of the horses, the distances between the competitors, Coffey and Maloney found that the jockeys pushed the horses harder when looking forward to bigger prize winnings. That said something, especially when you are risking injury to a costly investment-a thoroughbred horse.

Still, the track is a long way from the office or factory.

Personnel economics recognizes that in the modern economy, most job mobility occurs within an organization according to its rules and that the factors that determine who makes what differ from those that face job seekers in an arms-distance impersonal labor market that runs according conventional pricing, allocation and training decisions.

Tournament theory added a new dimension when Lazear and his co-author, Sherwin Rosen, in 1981 published an article in the *Journal of Political Economy* called "Rank Order Tournaments as Optimum Labor Contracts." It deals with the relation between compensation and incentives.

By paying workers based on rank order, rather than spending time and money determining what they actually produce, employers avoid the troublesome task of actually measuring the value of what higher-paid employees do, Lazear and Rosen showed. In showing the advantages of pay schemes based on hierarchy rather than output, the theory also provided a way of understanding, and a possible justification for, outlandishly large executive salaries.

Critics such as Alfie Kohn, backed by other studies, argued that incentive pay schemes are based on behaviorist nonsense that confuses intrinsic motivation, such as enjoyment in doing the work itself, with extrinsic motivation, where the job is a means to an end, a claim on a prize or meant to avoid reprimand or firing.

Another critic, economist Albert Rees, noted that few employees ever get or hope to get one of the top jobs, tournaments take place in very limited time frames and losers in companies can't just sign up for the next tournament.

Yet blaming tournament theory for huge executive compensation strikes me as an exaggeration.

While the tournament literature may seem at face value a justification of high executive pay and unequal distribution of income, it's also subversive of basic neoclassical economic theory, which says workers are paid their "marginal product," the amount of labor needed for one additional unit of production, with no room for negotiations, motivation or consideration of morale. In that sense, it opens the door to a sociological analysis of the workplace.

"Whatever its implications for executive pay, I welcome it as a movement away from the unrealistic wage theories presented in some college economic textbooks," one economist told me.

Maloney says there's a trade-off when companies choose to give executives what he describes as "super-levered bonuses" based on incentives. "They're either going to make whatever goal is set for them or they're not going to get much at all," he says. "And when you make an incentive contract, the average amount the employee earns has to be a lot or they won't take the job."

The tournament theory "shouldn't get knocked on this," he adds. Highly paid executives are "getting an enormous amount of money because they are taking a risk of not making much."

Scholars respond to incentives, too, such as layering an extra level of meaning on a study for the possible reward of getting a paper published. Perhaps in this case there was a little anthropomorphizing of Lassie by portraying the dogs' behavior as pure, uncorrupted competitive spirit, the "thrill of victory."

Animal rights advocates have claimed that greyhounds bred specifically for the track must run well in their first few races or they may be euthanized or given away. So the greyhound may be responding to a genetic memory that tells it to run to avoid slaughter. A hard-running dog may also anticipate receiving praise from owners or handlers, extra helpings of food or even eventually congratulatory mating in the form of stud service after retirement.

Thoroughbreds provide other problems if you are going to consider the horse-jockey team a rational actor in an economic universe. A jockey can whip and exhort his or her mount to run faster, but horses, despite their remarkable affiliation with humans as domesticated animals, can't always muster the leg-power or emotional states that bring out top performance.

Maloney had already thought this through when I asked him about it.

"We thought that horses and dogs were pretty much the same in pre-race conditioning and incentives that they can imagine in the states of consciousness they have, including the incentive for the dog to do well because they would be treated better and had seen their friends leave the kennel and never come back," he says.

Those same types of factors exist for humans, too, Maloney adds. Only with people, they're called working conditions.

I'm still stuck on the idea that it's too expensive to figure out if the boss deserves the big salary, and overpaying the boss keeps everybody else running hard.

Just seems like another trick to make us work our tails off.

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Balancing the Power of Offshore Wind

Fears that wind only provides power when it's blowing outside could be neutralized by drawing from a wide area — like the U.S. Atlantic coast.

By David Richardson

A wind farm in Middelgrunden off Copenhagen's shoreline. In the wake of the U.S. interior secretary approving the Cape Wind project off Cape Cod, fears that wind only provides power when it's blowing outside may be quelled. (Offshore Windenergy Europe)

Despite the buzz this week from Interior Secretary Ken Salazar approving the controversial Cape Wind project off Cape Cod, the United States has yet to construct any offshore wind farms despite a slew of ideas blowing around and 11 specific proposals on the table.

Europe, meanwhile, has taken a lead in offshore wind, and is looking at more.

While those U.S. projects inch forward, researchers see a wealth of wind being wasted.

Willett Kempton, a marine policy professor and offshore wind expert at the University of Delaware, calls the wind off the Mid-Atlantic coast "a huge resource. It's enough to run the whole East Coast."

He points to a 2007 study (he was the lead author), which showed that two-thirds of the power available from wind off the East Coast could provide enough energy to completely satisfy the demand for electricity, light vehicle fuel, and heating fuel for the region from Massachusetts to North Carolina.

But Kempton noted that study left an important question unanswered: What happens when the wind lets up?

In a paper published this month in the *Proceedings of the National Academy of Sciences*, Kempton suggested that if you look at it the right way, the wind never lets up. When it dies down in one spot off the Atlantic coast, it's invariably kicking up in another.

The research demonstrates, he said, that a fleet of offshore wind farms strung together along a 1,500-mile high-voltage cable could, from their combined output, provide more than enough electricity for the East Coast without interruption. And, he told Miller-McCune.com, this could happen using everyday technology and a few institutional changes.

"If you assume new technology, we could run the whole United States," he added.

It's all in the balance

Even though the power supply and customer demand vary constantly, the power grid must maintain consistent voltage at all times. To avoid power failures when circumstances change, utilities generally "load balance" — firing up highly responsive gas-fired turbines to adjust to fluctuating demand for power. In effect, these generators are what keep the lights across town from flickering whenever the stadium powers up for a big game.

Because variability is inherent in wind, Kempton says utilities use the same equipment to accommodate fluctuations in power levels introduced by the small volume of wind generation currently feeding into the grid.

"If you have 20 percent wind, that's fine, no problem. We'll just ramp the generators up and down as the wind fluctuates." So it works — up to a point.

"It keeps the managers busy; it's not that they let the fluctuations go out and let your lights bulbs flicker, but it adds maybe 5 percent to the cost of wind power to do that management."

However, "If you want to run 50 percent or 80 percent of your electricity from wind, then that fluctuation becomes more problematic." This calls for either massive power storage systems to warehouse energy for a rainy (or not so rainy) day, or major investments for more gas-fired generators.

Kempton believes that wind farms up and down the coast, under the power of local weather conditions, could perform the same load balancing function for one another that gas turbines provide onshore.

He and his co-authors Dana Veron and Felipe Pimenta from University of Delaware and Stony Brook University associate professor Brian Colle tracked coastal winds over five years using hour-by-hour data from 11 offshore weather buoys and meteorological stations.

Then they put together a computer simulation that substituted wind farms for weather stations and included the proposed interlinking cable. They generated data simulating five years' worth of power feeds from the hypothetical wind farms.

While the researchers found that output from individual wind farms varied widely over time, the power output of the network as a whole held steady. Fluctuations, when they did occur, were gradual, but at no time during the study period did power output on the simulated grid drop to zero.

Other wind energy researchers see potential in other U.S. coastal areas. For example, Stanford's Mike Dvorak and Mark Jacobsen looked at the California coast and determined that despite deep water close to shore creating headaches for placing turbines, offshore wind conceivably could meet up to 83 percent of the state's electricity demand.

Kempton says the reliability of the North America's coastal wind resource is a happy accident of geography. A similar exercise using data from Great Britain's coastal areas suggested considerably less promising results.

Researchers on the British study observed "large power swings in a 12-hour period" during the height of winter, when the region faces its highest demand for power. From that experience, lead researcher James Oswald of Coventry University suggested that "distributed generation would not help much" in the case of the British Isles, "since most of the region experienced the same wind conditions."

By contrast, according to Kempton, from the Bermuda High to the Nor'easter, "there is almost always a pressure gradient somewhere and cyclonic events move along the [Atlantic] coast. There are a few times of low power throughout, but they are not due to any one particular weather pattern."

An energy superhighway
Kempton calls his proposed cable interconnect the Atlantic Transmission Grid, although he imagines it as an "energy superhighway." It would shuttle power between wind farms spanning 1,500 miles (2,500 kilometers) of coastline, eventually sending that power to shore wherever it is needed.

"We have a uniform grid, in a sense, already. Everything in the Eastern Interconnection is all connected together. But this would make one line that would enable us to move a lot of power north and south."

Kempton estimates the transmission system would add less than 15 percent to the capital cost of offshore wind generation and says the figure is "in line with the market cost of leveling wind via existing generation."

There are also other start-up issues that will raise the price, including a provision in the federal Merchant Marine Act of 1920 that requires the ships used to build the offshore portions to be U.S.-built and U.S.-citizen owned, ruling out use of vessels and experienced crews from Europe.

Building the entire offshore wind generation and transmission system remains a significant undertaking, something the Stanford researchers also noted in the California study. "We haven't calculated the amount of steel that would be required," Kempton said, "but we have calculated in terms of production capability, and it's on the order of 10 or 15 full-size automobile production facilities."

That industrial capacity doesn't require an equivalent intellectual ramp-up, since the transmission technology is readily accessible. "There are undersea cables exactly like the one's we're describing that connect New Jersey to New York," Kempton said, in addition, "[t]here is a long run in Europe connecting Norway to Belgium" with a 580 km cable. "It's not that we're requiring some kind of new technology."

Boss wanted
However, Kempton concedes an offshore interconnection would be costly and that "there is no agreed upon mechanism for the company that builds it to recover their costs."

An interstate offshore interconnect might prove a bit of a conceptual stretch for electric utilities and their regulators, who have been traditionally confined to arranging their affairs state by state. But Kempton believes existing power distribution by "independent system operators" that operate on a regional basis (take California's ISO, for example) could implement the "early phases of this without any new organizations or new structures." That, he believes, would achieve some of the desired "smoothing."

Even so, caveats remain.

"If you want to go the long distances that we show in our article, then you would need some authority that would have the ability to regulate and recover costs and determine who's got the right to use and how much they should charge." He has even proposed a name for this entity: the Atlantic Independent System

Operator. “It’s creating a whole new institution, although it would be similar to those that operate regional power distribution systems on land.”

An ever-growing circle

While two offshore wind projects in the United States, Cape Wind and one off the Delaware coast, appear to be nearing the construction stage, both currently plan to cable their electricity directly ashore to utilities in their abutting localities.

Kempton says when completed, the two projects would tap no more than 0.01 percent of the region’s wind energy potential, and he is hopeful that in the long run his ideas will be of some help. (Cape Wind says its 130 turbines could produce up to 468 megawatts, but acknowledged the more likely figure would be 170 megawatts, which it said is 70 percent of demand for the Cape Cod/Martha’s Vineyard/Nantucket area.)

“People always think of wind as a highly fluctuating resource and therefore not very useful. Not true. Because at low levels of wind, which is all we’re going to see for years anyway, it’s very easily managed within the power system,” Kempton suggested. “This study shows that you can cheaply bring in large amounts of wind without getting the kinds of fluctuations that individual wind farms are known for.”

Kempton’s science and policy proposals make sense to David H. Matthiesen, associate professor at Case Western Reserve, who leads a group of researchers studying the potential of offshore wind power on the Great Lakes.

“As you draw a circle, as the circle gets bigger, the odds become better that the wind is blowing somewhere in that circle,” he said from the offices of the Great Lakes Energy Institute in Cleveland, Ohio, “I can see this playing out very nicely in the Great Lakes. The weather that Chicago’s getting, we’ll get in two days; if you could have a regional network like that, it would make balancing that base load from wind energy a lot better.”

http://www.miller-mccune.com/science-environment/balancing-the-power-of-offshore-wind-15289/?utm_source=Newsletter107&utm_medium=email&utm_content=0504&utm_campaign=newsletters

How Urban Planning Can Improve Public Health

A growing movement looks to change development patterns — as a matter of public health.

By Jonathan Lerner

Atlanta's Broad Street is often cited as an instance of urban planning that worked to created a sense of neighborhood. (Courtesy of Congress for the New Urbanism)

You hardly need scientific research to pinpoint objectionable aspects of suburban sprawl. The big-box commercial jumble, the lifeless cul-de-sac subdivision, the traffic, the sameness — all are plain to see. Disagreeable qualities of half-empty downtowns and deteriorated city neighborhoods are equally visible. Still, people don't usually think that the things they find aesthetically objectionable about their neighborhoods might literally be making them sick.

Yet a growing mass of scientific evidence does indicate that how places are designed and built can cause and complicate grave health problems for individuals and whole populations. Depression — the clinical kind, not the aesthetic and cultural malaise that sends people vacationing to, say, Barcelona — is one. Studies show that depression correlates with the lack of access to green space, a plight of many inner-city residents; the physical isolation of suburbanites; and the immobility enforced on those who cannot drive but have no transportation alternative.

As for cars, they don't just spew pollution and trap people alone for wasted hours. They cause accident injuries and deaths. Moreover, unwalkable distances and the culture of automobility encourage sedentary habits, contributing to obesity and diabetes and other illnesses. Plowing up farmland for new subdivisions at the metropolitan edge not only diminishes local food supplies and reinforces industrial agriculture — with negative implications for nutrition and resource conservation — it also forces those who must "drive till they qualify" for housing to need a car for almost every household member. Those automobile costs, usually overlooked, have exacerbated soaring rates of foreclosure and suburban poverty, with unhealthful knock-on effects like stress, displacement and homelessness.

Many examples beyond these lead to a conclusion: The crucial questions about how we build focus less on aesthetics — important as that is to our well-being — than on public health, in its broadest sense.

City planning originated, around the turn of the last century, out of concerns over health problems created by filthy slums and industries. Then the fields of public health and planning came uncoupled. Public health took on a mainly biomedical focus on individual genetics, biology and behavior and how clinicians could affect those, and on a narrowly biological approach to epidemiology and evidence. Meanwhile the planning of built environments was hijacked by the car.

Now the fields of city planning and public health — pushed by economic crisis, climate change and green technology, among other factors — are converging again. This month, the Congress for the New Urbanism was set to hold its national convention in Atlanta; it was organized with help from the Centers for Disease Control and Prevention under the theme "New Urbanism: Rx for Healthy Places."

The convention is hardly the first effort to address the relationships between urban form and health. The World Health Organization's Healthy Cities movement was initiated in 1988; among other things, it encourages attention to health inequalities, participatory governance and the health considerations of economic and urban development. Some 1,200 European cities and many in Canada and Australia participate.

Back in the U.S., the Local Government Commission, an organization of elected and community leaders, government staff and planners and architects, adopted the Ahwahnee Principles for Resource-Efficient Communities in 1991. (The principles were named for the Yosemite National Park lodge where they were agreed to). The principles targeted the dysfunctional qualities of sprawl-pattern development; these ideas came to underlie the New Urbanism and Smart Growth movements. Meanwhile, The Robert Wood Johnson Foundation's Active Living Research program supports extensive research into the urban form/public health nexus. The CDC's Healthy Community Design initiative does the same.

Dr. Howard Frumkin, special assistant to the CDC director for climate change and health and co-author of *Urban Sprawl and Public Health: Designing, Planning, and Building for Healthy Communities*, actually calls the Congress for the New Urbanism "a public health group. By promoting walkability, mixed use, connectivity and civic space within communities, we know more and more, based on emerging evidence, that CNU is promoting public health."

To anyone who thinks the New Urbanism makes sense, research conclusions on how built environments affect health can seem self-evident. For example, studies have demonstrated that neighborhoods with shops, schools, libraries, workplaces and homes within easy walking distance tend to support higher levels of physical activity and have lower rates of obesity. Public transit use has a similar effect on activity and fatness. Research has indicated that exposure to nature may improve attention deficit hyperactivity disorder in children, and that people with access to parks exercise more.

Like, duh. "So much research is proving the obvious," says Ellen Dunham-Jones, associate professor of architecture and urban design at Georgia Tech and co-author of *Retrofitting Suburbia: Urban Design Solutions for Redesigning Suburbs*. "But once you get the numbers, you can hopefully get policy changes."

Research into the connection between urban life and public health is, however, also creating surprises. As an example, Dunham-Jones points to studies showing that compact communities reduce overall vehicular emissions — but that people who live next to highways and heavily trafficked arterial roads breathe in more emissions. "It may be healthy for the community at large but not for you," she says.

Pinning down the implications of such research subtleties remains a challenge. Frumkin identifies two still-poorly understood correlatives of built environment: "We have reason to believe that community design and building design have impacts both on mental health and on social capital. Social capital in turn is a very important determinant of overall health."

The plans for New Urbanism towns sometimes depict circles centered on retail areas, with radii labeled as the distance of a five- or 10-minute walk. But landscape architect Dee Merriam, a CDC community planner, says that even walkability, a seemingly unambiguous value, needs scrutiny. "The basic metric we've been using for urban design has been the automobile scale, and the walking scale is a totally different metric," she says. "What is the distance of a five-minute walk? It's probably very different for a young athlete than for an elderly woman or someone with toddlers."

Merriam says more investigation is also needed into green space, despite its known health connections; Dunham-Jones agrees, saying that research has raised complex questions about trade-offs. “Cities would prefer to have one big central park to maintain, than to have a whole lot of little parks. To really get people jogging, you need a big park. But to get little kids to go play, it’s much better to have a lot of little parks,” she says. “We can improve health by doing all sorts of things, but we’re not at the point where we’re maximizing dollar investment.”

Some new efforts to find design solutions for health challenges involve food. Ideas range from turning abandoned space in declining neighborhoods into urban farms — projects like this are already under way in Detroit and elsewhere — and allotting space for community gardens in new developments. There is even a vision of “agriburbia,” where entire neighborhoods are landscaped with orchards and cropland that could feed people in and beyond the development while providing local employment opportunities.

A recent design workshop addressed another piece of the healthy living puzzle: multigenerational or “lifelong” communities, where people can continue to live actively as they grow old. Specialists on aging, developers, planners and architects tried to envision the transformation of parts of metro Atlanta, reiterating the “must-haves” of New Urbanism — transit and walkability, mixed uses, multiple housing types — but describing how such elements could better accommodate the aging with, for example, shorter walking distances and shuttles to transit stops and shopping areas.

So the Congress for the New Urbanism, the CDC and others are taking important steps to address the cause-and-effect relationships of built environment and public health. But for towns and cities to be less damaging to health, those connections must become more universally acknowledged by health professionals, designers, planners and the decision-makers and developers for whom they work. Moreover, for the environment to support better health, public consciousness has to change. Individual choices will have to sustain healthier patterns of development, and political support will be needed, too, because some of the proposed changes in development demand big cultural shifts, particularly around auto use.

Many advocates say what’s needed is a holistic view that considers health, the environment, social relations, political processes and the economy as part of the development process. Jason Corburn, associate professor of city and regional planning at University of California, Berkeley, and author of *Toward the Healthy City: People, Places, and the Politics of Urban Planning*, insists that architects and planners “need to recognize that they’re part of governance,” since a healthy city should invite open participation in its political processes, planning included. “This is not to say that design is not important,” he says, but that it should be just one piece of thinking relationally about multiple influences upon health.One tool that helps government officials identify such influences is the health impact assessment, an evaluation process similar to the environmental impact statement. Such health assessments are a relatively new phenomenon in the U.S., but several dozen have already been conducted, and the CDC is actively promoting their use. While there is a legal basis under environmental protection laws for evaluating health impacts of proposed projects, the officials responsible are often unfamiliar with the HIA concept, or can feel that it deals in types of evidence not traditionally considered valid in making development decisions.

But traditional thinking has produced the sickening built environments most Americans now inhabit. Even “progressive” ideas won’t necessarily change them. For example, if everybody owned a car that drove 100 miles on a gallon of gas, the country would burn less oil — but sprawl would still be encouraged, and the population would continue to grow fatter, sicker and more isolated. It may be possible to influence the public to choose transit over cars; entrenched attitudes toward tobacco were changed after all. But to change transport habits, America needs to provide transit systems and walkable destinations as practical options, and that’s where the architects and planners come in.

http://www.miller-mccune.com/health/how-urban-planning-can-improve-public-health-11408/?utm_source=Newsletter107&utm_medium=email&utm_content=0504&utm_campaign=newsletters

Buildings Compete to Work Off the Waste

National contestants chosen by the EPA vow to slim down their energy "waste lines."

By Melinda Burns

This Glenborough LLC office building in Arlington, Va., is one of 14 finalists in the first-ever National Building Competition for energy efficiency, the EPA announced today. (Alan Schindler Photography)

With a nod to a popular TV reality show, the U.S. has launched its first-ever National Building Competition, choosing 14 energy-conscious contestants made of concrete, brick and steel to vie for the title of "biggest loser" of kilowatt-hours.

The finalists were selected from a pool of more than 200 energy efficiency crusaders by the U.S. Environmental Protection Agency and announced Tuesday as part of the Energy Star program. They include a 12-story Glenborough LLC office building in Arlington, Va.; a Marriott hotel in San Diego's historic Gaslamp District; an elementary school in Carbondale, Colo.; a JCPenney store in Orange, Calif.; a mall in St. Paul, Minn.; a Sears store in Glen Burnie, Md.; and a dorm at North Carolina State University in Raleigh, N.C.

"It's time for buildings to tighten their belts and we're happy to help them go on an energy diet," said Gina McCarthy, EPA's assistant administrator for air and radiation. "Cutting energy use will reduce their monthly expenses and their carbon footprint, showing that environmental protection and economic growth can go hand in hand."

The winning building will be chosen based on its energy performance from Sept. 1, 2009, to Aug. 31 of this year. There will be a mid-point "weigh-in" on July 21, and the winner will be announced on Oct. 26. Bob Harper, the celebrity personal trainer who advises dieters on TV's "The Biggest Loser," is offering "energy fitness" tips to the building contestants in videos on the EPA Web site.

Today, over at Glenborough, a San Mateo, Calif.-based real estate investment and management firm with 45 office buildings nationwide, they're scrambling to set up a Twitter account and Facebook page to spread the word about their entry, a 1987 office building at 1525 Wilson Blvd. in Arlington, Va., across the Potomac River from the Lincoln Memorial.

Carlos Santamaria, Glenborough's director of engineering and co-chair of sustainability, says the company has already cut energy use in the building by 30 percent since last Sept. 1 by replacing the key components of an outdated cooling and heating system. Now, among other things, Glenborough has set up "Energy Champion" teams to work with tenants, urging them to power down their computers and turn

out the lights when they are not in the office. Despite the hot summer ahead, Santamaria believes the building can achieve up to 37 percent energy savings by Aug. 31.

“We’re very, very proud and honored to be one of the elite chosen,” he said, noting that only two office buildings made the list. “Glenborough is really a forward thinker. This is part of our normal routine. We identify the big energy wasters and then attack them.”

According to the EPA, commercial buildings account for 18 percent of the nation’s energy use and nearly 18 percent of its emissions of greenhouse gas. Office buildings emit more greenhouse gas than any other kind of structure. On average, the EPA says, about 30 percent of the energy used in commercial buildings is wasted.

The finalists in the National Building Competition are old hands at saving energy.

JCPenney, for example, won an Energy Star Award for Sustained Excellence this year, and so did Hines, the Houston-based real estate firm that owns the other office building in the competition. Sears was named a 2010 Energy Star Partner of the Year.

Glenborough has been named a 2010 Energy Star Leader: 80 percent of its buildings have won the Energy Star. The label goes to buildings in the top 25 percent for energy efficiency, compared to the national average.

In one high-profile project, Glenborough spent $750,000 over five years retrofitting an 11-story office building that is part of The Aventine in San Diego, achieving a 40 percent reduction in energy use, Santamaria said. The tar and lava roof was replaced with a new, cool roof of white plastic; carbon dioxide sensors were installed throughout the building to better control the fans for outside air, light sensors were placed in the hallways and stairwells; and the chiller, or cooling unit, now runs on an automatic software program.

As a result, Santamaria said, the company is saving between $150,000 and $200,000* per year in energy costs on The Aventine alone.

“Buildings don’t get more efficient that that,” he said.

Santamaria says he’s primarily in charge of “things that hum and go ’round and ’round,” but that hasn’t stopped him from pushing through a different idea for saving energy – daylight cleaning, or hiring janitors during the day. In addition to reducing heating and lighting costs by up to 10 percent yearly, this change can improve quality of life for the cleaning staff, Santamaria said.“These are real people who need two jobs to feed their families,” he said. “They’re going to be seen as real persons throughout the building and are going to be part of Glenborough’s team.”

On Monday, Glenborough launched daylight cleaning at its 14-story building in San Mateo. Now, the janitorial staff no longer has to work nights.

“What I’ve come to learn after 30 years in this industry is that these buildings are an ecosystem,” Santamaria said. “They’re a living, breathing structure. For those of us who spend a great part of our life in them, and are given the responsibility to maintain and upgrade them, it’s our responsibility and obligation to do what we can to ensure they can live another 50 years and operate as optimally as they can.“If you start from that place, then the ideas will come to you.”

http://www.miller-mccune.com/science-environment/buildings-compete-to-work-off-the-waste-15203/?utm_source=Newsletter107&utm_medium=email&utm_content=0504&utm_campaign=newsletters

It Started More Than One Revolution

By GARDINER HARRIS

The birth control pill has been called the most important scientific advance of the 20th century, and no wonder. Fifty years after its approval by the Food and Drug Administration, it is still one of the leading methods of contraception, in the United States and around the world.

Much has been written about how it revolutionized sexual and social relationships, allowing women to defer pregnancy, enter the work force and make life choices their mothers could not — or, if you prefer, spawning promiscuity and undermining the foundations of marriage.

But the pill also led to profound changes in the F.D.A. itself — a revolution in what Dr. Margaret Hamburg, the current food and drug commissioner, calls regulatory science. Many of the steps that underlie modern drug approvals — extensive clinical trials, routine referrals to panels of outside experts, continuing assessments of a medicine's safety, and direct communications between the F.D.A. and patients — were pioneered to deal with evolving concerns about the pill's safety.

In regulatory terms, the pill brought about a kind of reformation: just as Martin Luther insisted that individual Christians could communicate directly with God without the mediation of priests, the pill eventually led the F.D.A. to communicate directly with patients without going through doctors.

That change, fiercely resisted by some physician groups, is now firmly entrenched; the F.D.A. now routinely requires that many medicines carry significant and sometimes complex warnings that patients are expected to read and understand.

But the pill was the first.

"The F.D.A. had been battling with the American Medical Association for years about who would talk to patients," said Daniel P. Carpenter, a professor of government at Harvard. "And with the pill, the F.D.A. clearly established the upper hand."

The pill's role in the maturing of the F.D.A. has often been overlooked because shortly after the agency's approval of the contraceptive, news of the horrific effects of thalidomide swept the world. That drug had been introduced in Europe as a sedative but was withdrawn in 1961 after it was linked with profound birth defects.

Although thalidomide was never approved in the United States, the horror surrounding its effects led Congress to toughen the drug approval process by requiring manufacturers to prove their medicines were both safe and effective.

It was a standard the F.D.A. had already been putting into effect, quietly if fitfully, in part because of the growing view that the safety of a medicine was inextricably linked with its efficacy.

Enovid, a pill combining the hormones estrogen and progestin, was already being prescribed for menstrual problems. But in approving it as a contraceptive, the agency's reviewers required Searle to prove that it was effective in preventing pregnancy. (If it worked, the pill would spare women the risks of pregnancy and childbirth, which dwarfed any known risks from the drug.)

So the company undertook one of the most extensive clinical trial programs to date, said Suzanne Junod, an F.D.A. historian. The pill was formally tested in 897 women, mostly in Puerto Rico and Haiti.

The trials were relatively brief and did not answer fundamental questions about risks of cancer, heart disease and other chronic diseases. Uncertain about the long-term effects of hormonal contraceptives, the F.D.A. mandated that doctors limit prescriptions to two years.

The pill's overwhelming popularity, however, soon rendered this limitation unenforceable. New versions were introduced, so women could simply switch brands — or find another doctor to prescribe the old one. And many doctors ignored the limit anyway.

Then in November 1961, a British physician reported in The Lancet that a young woman had developed a blood clot and died while taking the pill. Within months, two similar fatalities were reported in the United States, and by August 1962, the F.D.A. had received 26 reports of users' suffering blood clots.

By the end of 1964, more than four million women had used Searle's pill, and a blizzard of competitors had begun to blanket the market. With something so popular, the agency had no way of knowing if the problems experienced by users were related to the pill or would have happened anyway — the kind of mystery that has plagued drug regulators ever since.

So agency officials did two things for the first time that would eventually become routine. They asked a panel of outside experts to review the evidence on a continuing basis, and they and British regulators pressed for a large epidemiological investigation that would become a model for the future.

Even before the pill, the federal government had a long history of using advisory committees to assess specific subjects and issue reports. But in 1965, the F.D.A. established its first permanent advisory panel, the Obstetrics and Gynecology Advisory Committee, largely to track the safety of the pill. The agency now has 32 permanent advisory committees, one of them with 18 different panels. These committees provide crucial advice not only about whether to approve certain medicines and devices but also how to address safety concerns that arise after approval.

"What the pill does," said Dr. Carpenter, of Harvard, "is show the F.D.A. that postmarketing surveillance is a tough problem."

The challenge of communicating these risks to patients while still supporting the product's continued use bedeviled top agency officials. Protests by women's groups and hearings on Capitol Hill made clear that despite the agency's attempts, many women said they took the pill without being fully informed of its risks.

Frustrated that some doctors were not communicating adequately with their patients, the F.D.A. created a handout in 1975 that doctors could use in counseling patients. Many doctors, incensed at what they saw as

the agency's intrusion into the doctor-patient relationship, either ignored the material or refused to give it out.

In 1978, faced with mounting complaints that women did not have the information they needed, the F.D.A. mandated that patients be given the handouts when they picked up their prescriptions at the drugstore.

"It was the first time that the agency had provided information directly to patients at the point of sale instead of relying on physicians," said Dr. Junod, the historian.

More recently, the Ortho Evra birth control patch has become a telling example of the continuing challenges that the F.D.A. faces in regulating a global, multibillion-dollar industry on which the agency depends for crucial information about drug safety.

Johnson & Johnson developed the patch in hopes of exposing women to even lower doses of estrogen than they got with the pill. But the company's own studies showed that the patch actually delivered far higher doses.

The finding was buried in a mathematical formula in a 435-page report filed with the F.D.A. The company said it acted responsibly, but after four years, the F.D.A. issued a warning about high estrogen doses, and sales plunged.

One last bit of lore about the pill: no one is even sure when to celebrate its birthday. Ten years ago, the agency honored the occasion on June 23, the date that the F.D.A. gave formal approval for Searle to market the product. This year, the agency is celebrating on May 9, which coincides with the period 50 years ago when it announced its intention to approve the pill when a few technical details were ironed out. That this happens to be Mother's Day this year may have played a role in the decision.

But whatever the date, it represents the F.D.A.'s first steps into adulthood.

"The pill was a landmark in the field of drug regulation," said Peter Barton Hutt, a former top agency lawyer. "This is the drug that started it all."

http://www.nytimes.com/2010/05/04/health/04pill.html?nl=health&emc=healthupdateema1

My Left Foot: The High Costs of Fallen Arches

By GBENGA AKINNAGBE

SEATTLE — I have had pes planus, or flat feet, all my life, and the condition never stopped me from doing anything I wanted to do. Like most people, I never thought of it as a serious medical problem. That was until last year, when the pain got so bad I could barely walk or stand.

After trying to tough it out for a while, I finally sought medical advice.

I was hoping some simple solution, like exercises, would allow me to continue my normal, active life. The first doctor I went to tried everything — orthotics, taping my feet, a brace — but nothing worked. He then reluctantly referred me to an orthopedic surgeon.

That doctor said surgery was necessary, though he was hesitant because the procedure is invasive and recuperation is long and painful.

I sought a second opinion. The next surgeon wanted to schedule me for surgery in a week. I realized there was no running from the inevitable.

In most cases, pes planus does not interfere with everyday life, but it can in severe cases like mine. I had no arches at all, causing my body to compensate in ways that caused serious pain in my back and knees. I could see why the military used to defer draftees with flat feet. (Its policy now is to accept some recruits with flat feet who have less severe cases and who can deal with the extensive traveling on foot that the military demands.)

By this point, the pain was so intense that I had started going out less, which I hated. I felt as if elements of my life were being taken from me. I'm an actor, so if I don't work, I don't eat — and as it happened, I was up for the role of a lifetime: Macbeth, at the Guthrie Theater in Minneapolis.

But it was time to make a choice. My agent in New York, Tim Stone, wanted me to have the surgery. "Think long term," he said. I pulled out of the running for Macbeth and scheduled the surgery.

The first operation would be on my left foot; both feet could not be done at the same time or I would be an invalid. Before the operation, I was told I needed six procedures, whose names might as well have been in Mandarin: posterior tibial tendon repair, F.D.L. tendon transfer, calcaneal osteotomy, lateral column lengthening, iliac aspiration and gastroc release. Though I have insurance through the Screen Actors Guild, my out-of-pocket costs could be more than $4,000.

On Dec. 2, I went to the Hospital for Special Surgery in Manhattan. I was lucky. During the operation, led by Dr. Martin J. O'Malley, my foot adjusted better than he expected and I needed only two of the six procedures.

Still, they were like something out of science fiction. In the osteotomy, the doctors used a needle to extract marrow from my hipbone and soaked an inchlong bone graft from a cadaver in the marrow so that it would take to my body better. The graft was wedged in the ankle to change shape of my foot and ease pressure on it when I stand. The doctors then cut off my heel, moved it over a few millimeters and screwed it back to my foot to help create an arch. Gastroc release involved lengthening my calf muscle to correct years of tightness from my unnatural gait.

Before I left the hospital — four hours after surgery — I was given two six-week prescriptions for the painkiller oxycodone. A nurse called the next day to ask if I'd taken it.

I had never taken prescription painkillers, even when I was awakened by horrific pain after shoulder surgery two years ago. I figured that was preparation enough for when the feeling came back in my foot. "I'd really prefer not to take the drugs," I said.

She replied: "Oh, you definitely need to take them. You don't want to get behind the pain."

I thanked her for her concern and went back to a favorite pastime — criticizing talking heads as I flipped back and forth between Fox and MSNBC.

Two hours later, I was punching the air blindly and biting the cushions on my couch. I couldn't get the pills down my throat fast enough.

After five days, most of the pain had subsided, so I was able to stop taking the painkiller. Two weeks later, depleted by bed rest and leg atrophy, I borrowed a friend's car and drove myself to my first follow-up visit.

The doctor took X-rays, and I could actually see an arch, as well as two large screws driven into my heel. (He told me I'd never feel them, even when running.) I could also see the graft from the cadaver, which will become less visible on X-rays as my body heals and absorbs it.

The nurse took the stitches out and traded my soft cast for a boot. It would be four more weeks before I was allowed to put weight on my foot with the boot on. At Week 10, I could start physical therapy. After 14 to 16 weeks, I would be able to blend in with other New Yorkers.

After the surgery (I should have done this before), I searched the Internet for information about the recovery process. Among the sites I found most helpful were the journal Podiatry Today

(podiatrytoday.com); HealthBoards.com, a message-board site where people share information about their conditions; and BioPortfolio.com, a life-sciences news site.

The chat rooms warned that I might not be 100 percent for up to a year. My doctor said that because I am young (31) and athletic, I have strong and dense bones that should heal quickly. Also, I don't smoke or drink, other factors that might slow the healing process. (My longstanding vice is ice cream.) And of course there is my superhuman mutant healing X factor, though I had trouble convincing my doctor about that one.

The doctor said I would not be able to fly for a month after surgery. But after the two-week checkup, he cleared me. Three days later, I was on a plane to Mexico. When we landed, my foot was so swollen it looked like a clown's contorted balloon. There was no pain, just discomfort. Before I went to sleep, I elevated my foot, as the nurse at the hospital had told me to do. By the next morning, the swelling was down to normal.

The hyperactive optimist in me has no doubt that I'll be counted among the 90 percent success rate for calcaneal osteotomies. Dr. O'Malley said I healed like a 12-year-old — a full month ahead of schedule — and this week I'm rehearsing for a one-man show here in Seattle.

My right foot's up next.

Gbenga Akinnagbe, an actor, appears in a one-man play, "The Thin Place," at the Intiman Theater in Seattle, and the movie "Lottery Ticket," opening in August.

http://www.nytimes.com/2010/05/04/health/04case.html?ref=health

Long Lashes Without Prescription, but With Risks

By CATHERINE SAINT LOUIS

If women want to grow longer, fuller, darker eyelashes, Brooke Shields suggests on a ubiquitous television advertisement that they ask their doctors if Latisse is right for them.

But in the case of Latisse, which has sold more than a million bottles to date and gained something of a cult following, it turns out to be easy to bypass a doctor's prescription or visit.

Some salon workers dispense it to clients who go in for facials. Web sites in the United States and abroad sell it outright with few questions asked. Even doctors are getting into the act: for example, Dr. Anshul V. Gambhir, a former primary care doctor, runs www.latisse.bz, which boasts that it is the "largest Latisse retailer." All it takes to get Latisse mailed out — without ever seeing him — is filling out a medical history, which he reviews, and typing in a valid credit card number.

"We are doing a ton of business," said Dr. Gambhir, who also offers Latisse at his three offices in Pennsylvania.

Most people use Latisse, a topical solution, with few, if any, complaints. But the drug can cause redness, itchiness and irritation, which go away if use is discontinued. Less common is eyelid discoloration, which Allergan, the manufacturer, says "may be reversible." A rare side effect that has captured the most attention is the chance that one's hazel or blue eyes could turn brown — forever.

But if people use Latisse without seeing a doctor, the side effects may come as a big surprise. Cynthia O'Connor, an interior designer from Minneapolis, got Latisse from the woman who does her facials, who works out of the office of a plastic surgeon who is listed as a Latisse provider on Allergan's Web site. The woman did not ask her medical history or mention a single risk, Ms. O'Connor said, and she never met the doctor.

When "very dark purply" discoloration showed up on her eyelids, Ms. O'Connor was perplexed, but took it in stride because her new plum "eye shadow" garnered compliments. Then, the purple hue appeared under her eyes, where she had never applied Latisse.

"It looked like I hadn't slept in a month," said Ms. O'Connor, 58. "It was horrible."

Five months ago, she stopped using Latisse, but some discoloration is still visible.

Allergan has a policy against selling Latisse online and says it will cut off supplies to doctors who do so. “Allergan strongly believes consumers should seek consultation from a qualified doctor to determine if they are an appropriate candidate for treatment,” said Heather Katt, an Allergan spokeswoman.

Consumers have long been able to obtain some prescription drugs illicitly without seeing a doctor — think of the flurry of Web advertisements for generic Viagra — but with Latisse, it is striking how routinely no-prescription sales of the real product take place in plain sight. The high cost of the drug, $89 to $150 for a month’s supply (depending on the markup), seems to offer a powerful incentive to all kinds of would-be salespeople.

Since Dr. Gambhir started prescribing the lash-enhancing drug last summer, he said, he has put an estimated “10,000 bottles out there,” and “a good bit are online transactions.” (Though many states prohibit doctors from selling drugs online without seeing the customers, Pennsylvania does not.)

Asked about Allergan’s policy against online sales of Latisse, Dr. Gambhir said, “Allergan is aware that Latisse is being sold online by myself.”

Other Latisse providers said in interviews that their Allergan representatives knew about online sales. Dr. Peter J. Sacchetti of York, Me., said that his Allergan representative had provided before-and-after pictures for his Web site, but that he had not started selling Latisse online because of concerns raised by his insurance company. (His Web site does say that a consultation is required before buying Latisse.)

Ms. Katt said Allergan had shut down two health care providers who were selling Latisse online and was investigating 12 others. But she said that most online sales of Latisse were illegal ones over which Allergan had no control, either because the product was being smuggled into the country or because it was really a generic knockoff not approved by the Food and Drug Administration.

Latisse is the same formula as Lumigan, Allergan’s eyedrops for glaucoma, which reduces eye pressure but also happens to grow lashes. Both are also known as bimatoprost ophthalmic solution. In early 2009, Allergan introduced the drug as a lash enhancer. According to Ms. Katt, Allergan sold $73.7 million worth of Latisse last year, expects to sell $140 million of it this year and estimates that net sales could ultimately exceed $500 million a year.

Some doctors said it was common knowledge that Latisse was easily available without a prescription.

“They say in the patient packet insert that it is doctor-prescribed, and that’s not true,” said Dr. Seth L. Matarasso, a dermatologist in San Francisco. “Patients in my area say they found it in their health club. It is dispensed by a variety of people. Controls are not that strict.”

Dr. Matarasso injects his fair share of Botox but said his sales of Latisse were “not astronomical,” largely because it is so easy to obtain. He does not sell Latisse online and does require an in-person consultation.

The risks for consumers vary. The Latisse they buy online could be adulterated or fake. But even when the Latisse is the bona fide Allergan product, bypassing a doctor means a patient is not necessarily taught proper application or made aware of the potential problems.

“When the F.D.A. approved this product for marketing, they made a determination that the side effects or misuse or inappropriate use could cause harm, and that’s why they restricted it to a prescription drug,” said Carmen A. Catizone, the executive director of the National Association of Boards of Pharmacy, which represents state agencies that regulate pharmacies and pharmacists. “If it was completely safe to use without doctor supervision, they would have deemed it over-the-counter.”

Excluding ophthalmologists, most doctors do not do eye exams before dispensing Latisse, but they do explain how to apply it. Latisse must be dabbed on the upper lash line only, since it can grow unintended hair — on the cheek, for example. People are not supposed to place it on the lower lash line or eyebrows (though some do), and they are meant to use the one-use applicators that come with Latisse to avoid infection and to give the right dose.

Without a doctor's guidance, "it's a cumulative risk," said Dr. Andrew G. Iwach, executive director of the Glaucoma Center of San Francisco. "Let's say you use the product once inappropriately, or outside the approved guidelines, you might get away with it, but this drug is being applied repeatedly over weeks, months and potentially years. The consequences, or risk of consequences, add up over time."

Most people who use Latisse or Lumigan do well, Dr. Iwach said. Still, he said issues did arise, like ingrown lashes, when lashes get so long they scratch the cornea. Latisse can also reactivate dormant eye inflammation. "When it's something as personal, something so critical as vision, you don't want to cut corners," Dr. Iwach said.

Even so, some people's enthusiasm for Latisse is hard to overstate.

Last week, Brad Denherder, a 21-year-old hairdresser in Seattle, got Latisse from a client as a gift. He believes that his lashes lack fullness and said he could not wait to use Latisse: "I want them to be so long that they create wind tunnels."

Victoria Parker, 39, is thrilled by her "teenager lashes" and relieved that after four months of Latisse use, her blue eyes have not gone brown. "I'm in for life," said Ms. Parker, a licensed child care provider in Tacoma, Wash. "I can't go back to having no eyelashes."

Ms. Parker buys her Latisse on a Web site run by two registered nurses in Pennsylvania, who send their customers' medical histories to Dr. Lori Alfonse, a breast surgeon in East Norriton, Pa., for review before packing up Latisse.

Dr. Alfonse, whose practice is listed as a Latisse provider at Allergan's site, has no qualms. Latisse, she said in an interview, is "not a controlled substance."

http://www.nytimes.com/2010/05/02/health/02latisse.html?nl=health&emc=healthupdateema3

Promise Seen in Drug for Retardation Syndrome

By GARDINER HARRIS

An experimental drug succeeded in a small clinical trial in bringing about what the researchers called substantial improvements in the behaviors associated with retardation and autism in people with fragile X syndrome, the most common inherited cause of these mental disabilities.

The surprising results, disclosed in an interview this week by Novartis, the Swiss pharmaceutical giant that makes the drug, grew out of three decades of painstaking genetic research, leaps in the understanding of how the brain works, the advocacy of families who refused to give up, and a chance meeting between two scientists who mistakenly showed up at the same conference.

“Just three years ago, I would have said that mental retardation is a disability needing rehab, not a disorder needing medication,” said Dr. Thomas R. Insel, director of the National Institute of Mental Health, who was told of the Novartis trial results. “Any positive results from clinical trials will be amazingly hopeful.”

Dr. Mark C. Fishman, president of the Novartis Institutes for BioMedical Research, cautioned against too much optimism. The trial involved only a few dozen patients, only some of whom benefited from treatment. The drug is likely to be years away from being commercially available and could fail in further clinical trials, he said.

“We have been reluctant to make this public because we still need to do more experiments, do them correctly and in a bigger way,” Dr. Fishman said. “But our group feels pretty good about the data.”

If authenticated in further, larger trials, the results could also become a landmark in the field of autism research, since scientists speculated that the drug may help some patients with autism not caused by fragile X, perhaps becoming the first medicine to address autism’s core symptoms.

One child in five thousand is born with fragile X syndrome, with mental effects ranging from mild learning disabilities to retardation so profound that sufferers do not speak, and physical effects that include elongated faces, prominent jaws, big ears, and enlarged testes. It mostly affects boys and earned

its name because, under a microscope, one arm of the X chromosome seems nearly broken, with part hanging by a thread.

The gene for fragile X was discovered in 1991. Work since then has found that fragile X patients seem to experience an overload of unchecked synaptic noise — synapses being the junctions between brain neurons. The Novartis drug and others like it are intended to lower the volume of this noise so memory formation and high-level thinking can take place, allowing children to develop normally.

The Novartis trial, which began in 2008 in Europe with data analysis completed this year, was too brief to observe effects on basic intelligence. Instead, researchers measured a range of aberrant behaviors like hyperactivity, repetitive motions, social withdrawal and inappropriate speech. They gave one set of patients the drug and another a placebo, and after a few weeks switched treatments, with both doctors and patients unaware of which pill was which.

The results of the trial were something of a jumble until Novartis scientists noticed that patients who had a particular, undisclosed biological trait improved far more than others. “The bottom line is that we showed clear improvements in behavior,” Dr. Fishman said.

Told of the results, two parents of a fragile X patient were euphoric.

“This is what we have been working for and hoping for since our son was diagnosed with fragile X 17 years ago,” said Katie Clapp, president and co-founder of the Fraxa Research Foundation, a nonprofit organization dedicated to financing fragile X research. “This may be the key to solving the mystery of autism and other developmental disorders.”

Geraldine Dawson, chief science officer at Autism Speaks, the world’s largest autism advocacy organization, said that a growing body of research suggests that the many genetic causes of autism all seem to affect synapses, suggesting that a treatment for one form of the disease might help others.

“The exciting thing about these results is that it is our hope that these same medications may have similar positive benefits for people with autism who don’t have fragile X syndrome,” Dr. Dawson said.

Between 10 percent and 15 percent of autism cases result from fragile X syndrome or some other known genetic defect. While fragile X is the most common inherited cause of mental retardation, Down syndrome — which also causes retardation — is more common but is not inherited.

The Novartis trial results were not published or peer reviewed, and for commercial reasons Dr. Fishman refused to divulge many details. Dr. Luca Santarelli, head of neuroscience at Roche, confirmed that Roche is in the midst of testing a similar medicine in fragile X patients at four sites in the United States.

“So far we like what we see,” Dr. Santarelli said in his only characterization of their study.

One reason for the euphoria surrounding the Novartis trial is that it was seen as an especially difficult test of the drug’s effects. For ethical reasons, Novartis tested the drug only in adults. But the company and outside researchers believe that such compounds may prove most effective in young children, whose brains are far more likely to respond rapidly when barriers to learning are removed.

“This is perhaps the most promising therapeutic discovery ever for a gene-based behavioral disease,” said Dr. Edward M. Scolnick, former research chief at Merck and now director of the Stanley Center for Psychiatric Research at the Broad Institute at Harvard and the Massachusetts Institute of Technology.

Dr. Scolnick has not seen the results of the Novartis trial, but was told of them and concluded that if the drugs work in fragile X, "there's nothing to say that they won't work in some cases of broader autism-spectrum disorders."

An Unlikely Beginning

The roots for the Novartis results began in 1982 when Stephen T. Warren, then a graduate student in genetics at Michigan State University, was looking for a job and something to research. A friend told him about fragile X and, with the same reflection he might use to pick a novel for a long flight, he decided that he wanted to find the gene that caused it.

"I had no idea how hard this would be," Dr. Warren said. Nine years later, Dr. Warren, then at Emory University, was part of an international team that won a fierce competition by isolating the gene. The discovery was front-page news around the world, and experts predicted that widespread fetal testing and therapies were in the offing.

The predictions were premature because, like most of genetic research, discovering how the flawed gene caused disease was far harder than anticipated and required multiple leaps in neurology and biology. And even with those, much remains mysterious.

Fragile X is caused by a genetic stutter in which a portion of the gene gets repeated like a scratched album. With each subsequent generation, the number of repeats tends to rise. So if a mother has 10 repeats, her child might have 11 or 12. For reasons that are not well understood, however, this process of repeat amplification can suddenly go haywire. So mothers who have 55 or more repeats tend to have children with hundreds.

In anyone with 200 or more repeats, the body shuts off the gene. Since genes are used to make proteins, this genetic silencing means the encoded protein is never made. The absence of this protein in cells causes the wide-ranging effects of fragile X syndrome. Those with 55 to 200 repeats are considered carriers, and recent research shows they can have severe neurological declines late in life that mimic Alzheimer's and Parkinson's.

Many geneticists would have moved on to other research topics after finding a disorder's underlying gene. But Dr. Warren met affected children and their parents. Instead of family pictures, Dr. Warren's desk displays a framed photo of a fragile X chromosome.

"I could not imagine telling someone like Katie Clapp that we were not going to pursue this research anymore," he said.

So he kept on. Years of work by him and others found that the protein missing in those with fragile X normally seems to act as a sort of traffic cop at brain synapses, helping to stop or slow brain signaling at crucial intervals. It does this by sopping up the genetic instructions needed to produce proteins that encourage brain signaling. Regulating this flow of electronic pulses across the brain is crucial for the brain's ability to learn and mature.

Dr. Warren was puzzling over how to recreate that synaptic traffic cop when, because of a scheduling conflict, he showed up in 2001 at the wrong scientific conference and happened to sit next to Mark F. Bear, a neuroscience professor at M.I.T. who had just given a presentation about compounds that seemed to work in synapses to speed the creation of proteins — including the one missing in fragile X patients.

The two got to talking and decided to collaborate. They found that if Dr. Bear reverse-engineered his compounds, they seemed to slow brain transmissions. Instead of a traffic cop, the brain would get speed bumps. Not ideal, but perhaps adequate in lowering the synaptic noise enough to encourage learning and the moderation of the kind of synaptic traffic jams that in fragile X children can lead to seizures.

Sure enough, mice, fish and fruit flies that through genetic engineering were made to have fragile X seemed to become normal when given Dr. Bear's compound. The Novartis compound is a member of the same drug family.

"We have been promising for a long time that unlocking the molecular basis for hereditary diseases would lead to dramatic therapeutic advances, and that promise is finally coming true," said Dr. Francis S. Collins, director of the National Institutes of Health, in discussing the science leading up to the trial. "But it has not been easy."

A Search for Treatment

A hundred years ago, Katie Clapp would have died giving birth to Andy, her child with fragile X.

"Andy's head was too big to get out without a C-section, he would have killed me, and that would have taken care of the fragile X gene," she said.

But Ms. Clapp and Andy did survive. And despite going to some of the best hospitals in the country, four years would pass before Andy's condition was properly diagnosed.

When a doctor finally thought to do a fragile X test, Ms. Clapp and her husband, Dr. Michael Tranfaglia — both Harvard graduates with post-graduate degrees — researched the disease and came to two conclusions: fragile X was potentially treatable; and only about five researchers in the world were working toward a cure.

"And I thought, what if all five walk across the street at the same time and get hit by a Mack truck?" Ms. Clapp said. "That is not going to get us there."

So the two started the Fraxa Research Foundation. Remarkably, their efforts seem to be paying off and may finally offer hope not only to those who with fragile X but to carriers like Andy's sister, Laura.

"I've always known my kids have a chance of having it," Laura, 18, said in a recent visit to the family's house. "But I'm not going to have kids for at least 10 years anyway, and they'll have a cure for by then."

She paused, looked at her mother and said: "You've got 10 years."

http://www.nytimes.com/2010/04/30/health/research/30fragile.html?nl=health&emc=healthupdateema5

By the Architects, for the People: A Trend for the 2010s

By NICOLAI OUROUSSOFF

NEWARK — Last week, when the city planning board here voted to approve construction of a four-block-long mixed-use development, the decision was barely noticed outside a small circle of civic boosters. But it was a turning point in the career of the project's architect, Richard Meier.

For decades Mr. Meier, with his trademark dark suits and leonine white hair, has been a fixture on the New York social scene, where he often rubs elbows with his moneyed clients. And his designs, from second homes in the Hamptons to international art museums, have become known for an almost unbearable, and expensive, refinement. He is the Martha Stewart of the Modernists.

But the Newark development, a complex for middle- and lower-income tenants to be known as Teachers Village, takes Mr. Meier, 75, back to his roots, to a time more than 40 years ago when he devoted as much energy to subsidized housing as to beach houses. Despite the project's modest budget of $120 million, its tautly composed and thoughtfully laid out forms reflect the same intelligence and care found in most of Mr. Meier's work. City officials are hoping its design — along with its location, a dilapidated neighborhood between City Hall and a cluster of college campuses — will help contribute to a much wider urban revival.

Teachers Village is not only the most impressive of several new initiatives in Newark, but also the most dramatic example yet of what is shaping up to be a significant and hopeful trend in architecture. After a long period in which America's greatest talents seemed to work almost exclusively at the service of the wealthy, there are signs that their efforts are trickling down to other segments of society. In New York, for example, Annabelle Selldorf, best known for the exacting precision of her gallery designs and loft renovations — and for revamping the Oak Room at the Plaza Hotel — is about to break ground on a recycling plant on the Brooklyn waterfront; she may soon start work on another in the Bronx. Michael Maltzan, the architect behind the Museum of Modern Art's temporary home in Queens during its last renovation, as well as homes for major art collectors, recently completed his second housing project for the homeless in six years, and is now working on his third.

If things continue this way, it may actually mean a renewal of architecture's onetime commitment to elevating the lives of ordinary people. Such a renewal is not likely to be as ambitious — some would say naïve — in its social aims as President Lyndon B. Johnson's War on Poverty and the Modernist

architecture that was dominant at the time. But it could lead to a fresh engagement with some of the challenges those movements took on, an engagement informed by the lessons of their failings.

Mr. Meier's career in particular neatly reflects the historical ups and downs of the past half century. In the late 1960s, he was approached by the newly created Urban Development Corporation of New York State to design a 523-unit project in the Bronx. As an alternative to the conventional tower-in-the-park model, he created three midrise buildings that were lifted up on columns to invite the neighborhood into their central courtyard.

Photos of that project, called Twin Parks, were published in Architectural Forum and The New York Times, and the state went on to hire Mr. Meier to design a vast developmental center for the mentally handicapped in the Bronx.

But by then the backlash against large-scale Modernist housing — and the government programs that paid for it — was in full swing, as even progressive projects like Mr. Meier's failed to deliver on their promises. Modernism of every stripe was condemned, sometimes unfairly, for a tabula rasa approach to planning and insensitivity to local contexts. By the Reagan era, "inner-city" housing projects had given way, as the dominant symbols of urban design, to festival marketplaces and corporate towers.

"It's always about the clients," the architect Steven Holl said in a recent interview. "Without good clients you can't have good architecture." When he first came to New York in 1977, he said, the Urban Development Corporation was working with some of the profession's most adventurous thinkers. José Luis Sert, a former dean of Harvard's graduate school of architecture, had just designed a high-density housing development for Roosevelt Island, and Peter Eisenman, a radical thinker, had recently completed a housing project in Brownsville, Brooklyn.

The building surge of the '80s produced little serious architecture, and when it began to return in the 1990s and 2000s, it was generally in the form of cultural institutions and corporate towers. Any trickling that occurred, in terms of architectural talent, tended to be up, as mainstream developers discovered that a recognizable design name could be a valuable tool in marketing luxury high-rises.

When Nicolas Berggruen, a co-developer of the Newark project and one of its main investors, first approached Mr. Meier in 2006, it was to design a luxury tower for some property he owned in Tel Aviv. The Newark project, which was begun a year later, began as a mix of condos and low- and middle-income housing anchored at one end by twin 77-story condo and office towers. But the towers, especially, turned out to be impossible to finance, and Ron Beit, Mr. Berggruen's local partner and the principal developer, began casting around for new ideas to develop the site.

"When we started to look at the area again, we realized that the middle-income had really been left out," Mr. Beit said, and teachers in particular. "There were already 1,000 charter schoolteachers here, and another 5,000 in public school," he said. "They're highly educated and urban, so they were a natural fit."

The final version of the proposal is organized around two new charter-school buildings (one housing two schools) that are to be set on either side of Halsey Street, a strip of decaying and abandoned buildings. The apartment buildings, which will serve teachers working throughout the city and range in size from 17 to 66 units, will extend from each end of this central group, like limbs reaching out into the neighborhood.

Mr. Meier has gone to greater lengths than in the past to merge his design with its context, not just by breaking it down into several buildings, but also by using strategies like a pedestrian passageway cut between two of the charter schools. In an effort to diminish the monumentality of a building that houses two schools, part of it will be clad in white metal panels, part in brick. And the few existing buildings worth preserving, including an old red-brick factory and a two-story stucco building that houses Je's Restaurant, a local landmark, will be restored.

The design incorporates some of the sensibilities that can be found in Mr. Meier's higher-end projects. The apartment buildings include small, open courtyards and outdoor terraces, bringing light deep into their interiors. In each building a ground-floor retail level is conceived as a glass band, imbuing the floors above with an air of weightlessness. This effect is reinforced by the irregular pattern of the apartment windows, which gives the facades a cubist feeling.

Mr. Meier has already completed a preliminary design for a second phase of development, with 15 additional apartment buildings that Mr. Beit said could go into construction as early as 2011. It would extend the project several blocks to the north and west, giving it the kind of critical mass that could begin to turn the area around.

If the project succeeds in revitalizing Newark's bleak downtown — or even if it simply manages not to be swallowed up by the decay around it — its most important impact may be to help open eyes again to architecture's potential role in addressing complex urban challenges.

Mr. Meier, as much as anyone, is aware of how tenuous that role can be. Recently, I drove out to the Newark site with him, and we took a short detour to the Bronx, to visit Twin Parks. The complex, once so open to the neighborhood around it, is now walled off behind chain-link fencing, giving it the air of a minimum-security prison. A steel gate, flanked by a security booth, blocks off a street that used to run through it. In an attempt to make the place feel more homey, someone has decorated the entry to the manager's office with a white picket fence.

When we left, Mr. Meier was uncharacteristically silent. "You always hope what you build has arms, that they reach out and affect others," he finally said, with obvious pain in his voice. "You want to feel you've done something that allows other positive things to happen."

http://www.nytimes.com/2010/05/04/arts/design/04meier.html?ref=design

Of Compost, Molecules and Insects, Art Is Born

By NATALIE ANGIER

The word organic means different things to different people. To the gardener it means compost heaps. To the chemist it means carbon compounds. To the artist Fabian Peña, it means American cockroaches, those chunky nocturnal charmers often seen skittering around drainpipes or on the street. “I have collected cockroaches from many different places,” Mr. Peña said. “From Cuba, Mexico, Miami, Houston, everywhere I travel.”

He kills the cockroaches with a spray, pops them into a jar, takes them back to his studio in Florida, and then puts their parts to work in his art. He glues their legs together into long, lacy cylinders that look like giant larval casings. He arranges their wings into medically precise images of a human skull, foot bones and hand bones, all scaled to his own head and appendages.

Mr. Peña likes the medium of cockroach aesthetically, the way he can use the different tones in the wings as his palette to convey light and shadow. He likes it metaphorically, how we are disgusted by something with which we have so much in common — the same taste in foods, the same easy adaptability to every possible niche. “Cockroaches are a witness to our daily lives,” Mr. Peña said. He also likes his medium pragmatically. “It’s a material that I can easily find,” he said, “and it’s cheaper than buying paint.”

Mr. Peña is among the growing ranks of artists who have gone natural, who are scavenging the world’s vivarium and rummaging through the life sciences in search of materials, ideas, cosmic verities, tragicomic homilies, personal agency, a personal agent, a way to stand out in the crowd.

Laura Splan, a Brooklyn-based artist and certified phlebotomist, decorates wallpaper with her own blood. On first seeing the wallpaper, viewers have “a pleasant visual engagement” with it, Ms. Splan said. But after learning of the main ingredient from an accompanying card, she said, a “more complicated” reaction unfolds, a blend of ick and fascination, rearing back and coming closer, and mutterings of “I sure hope she doesn’t have any blood-borne diseases.” With similar transfiguring glee, Levi van Veluw of the Netherlands treats the flesh of his face and torso as topsoil, slathering on layers of moss, grasses, leaves and florets until he looks like a kind of Julius Caesar Chia Pet.

Many examples of mulchy, redolent, unmistakably organic art are on display in a new exhibit called "Dead or Alive," at the Museum of Arts and Design in New York. The museum recently hosted a round-table luncheon in which scientists and artists addressed the hardy evergreen issue of how much the arts and sciences had in common and where they differed. The basic conclusion: both enterprises are important, difficult, creative, driven by insatiable curiosity and a desire to solve problems, but artists are allowed to make stuff up and scientists really shouldn't. Whatever the symposial chin rubbings, some practitioners of the new crossover art have serious scientific credentials and are not afraid to use them.

Lizzie Burns is a biochemist and artist affiliated with Oxford University who designs jewelry and men's ties based on the chemical structure of celebrity molecules like testosterone or dopamine. "The designs of chemical structures can have an intrinsic natural beauty and balance," she said. Not to mention a certain conceptual consistency: there's caffeine with its three reactive "hands," as she calls the little methyl groups, waving at you to wake up; the lightning-bolt zigzag of the capsaicin molecule that gives chili its fire; and the bicycle shape of Ritalin, inviting the aimless wanderer to hop aboard and ride.

Other artists have little formal scientific training but are avid autodidacts or will collaborate with scientists if it helps them hone their point. Christy Rupp worked with the paleontology department at the American Museum of Natural History to construct accurate, life-sized model skeletons of a dodo, a great auk and other birds that humans have driven to extinction. The skeletons are elegant, and beautiful to behold, and they are made of discarded chicken bones from fast food restaurants like KFC. Ms. Rupp's message: throw-away food, thrown-away species — there *is* a connection.

Jennifer Angus, who teaches textile design at the University of Wisconsin, became an amateur entomologist in the course of creating her "Victorian Fancy" series of dollhouses and installations. She builds scenes of perfect domestic felicity, but all the patterns on the walls, floors and furniture are arrangements of beautiful insects, and all the characters in the dollhouses are insects, too — electric-green beetles from Thailand, locusts from French Guiana with spectacular wings of purple and blue, striped weevils, polka-dot weevils, leaf mimics, white cicadas and frog-legged beetles that look like their name. "I wanted to create a pattern that suggests a domestic space," she said, "but of course the one thing people don't want in their house is insects."

Ms. Angus hopes to change people's arthrophobia, to "rehabilitate the image of the insect," organisms without which our crops would not be pollinated or our detritus decomposed. Some viewers will ask her, If you love insects so much, why sanction their killing? Hundreds of beauties died for the sake of your fancy! Ms. Angus will reply that she uses only adults. "They've had a chance to procreate, and most species don't live long after they've reached the adult form," she said. "Some of them don't even have the mouth parts to eat." If you're really concerned about the future of tropical insects, she will say, get involved in tropical forest conservation. Insects reproduce quickly, and they'll do fine as long as their habitat is intact.

Of course, people have always used natural materials to make their art, for the simple reason that until recently nature was all they had, said Ellen Dissanayake, a scholar on the evolution of art and author of "Homo Aestheticus: Where Art Comes From and Why," among other books. Yet from the beginning, art demanded transformation. "Even in hunter-gatherer societies, they tend to make their stuff look not organic," she said. "When they're painting, they'll use geometric shapes, make a row of triangles or circles, as though to show humans are more than nature." A chieftain in a traditional society may wear a headband of fur, feathers and the iridescent green carapaces of beetles, she said, "but all those carapaces are carefully lined up." As Ms. Dissanayake sees it, when people make art, or "artify," they follow several "aesthetic principles," whether they know it or not. "They simplify, repeat, exaggerate, elaborate and manipulate expectations," she said.

In fact, many works of organic art hew closely to Ms. Dissanayake's artifying code. The New York artist Tracy Heneberger, for example, created what looks from afar like a kind of samurai shield by arranging 1,155 sardines in a series of concentric circles and then applying multiple coats of shellac.

He got the sardines from a dealer in Chinatown, and it was a challenge, he said, finding ones of just the right length, width and straightness that still had eyes in their sockets. Helen Altman of Fort Worth, Tex., used a plastic model of a human skull purchased from a medical supply catalog to mold spices, seeds, grasses, beans, lotus leaves and the like into firm, skull-shaped packages, which she then arranges on a wall in a roughly 6-foot-by-7-foot grid. She wants viewers to approach and stick their noses into the skulls, breathe deeply of the clove, the rose, the balsa, and let death get in their face.

“It’s like the traditional sugar skulls you see in Mexico for Day of the Dead,” she said. “You make death into a sweet thing to be eaten so that people don’t fear it.” Lonneke Gordijn and Ralph Nauta of the Netherlands gathered dandelions, removed the puffy seed heads and then painstakingly glued each seed head back on; those reinforced flowers were then outfitted with LEDs and wired together in cube frames to create almost viral-looking stacks of modular dandelion lamps.

“People have this image of the dandelion as a fragile thing, you pick it up and it’s gone,” Ms. Gordijn said. “But it’s not gone. Those parachutes blow everywhere and grow everywhere. That’s how the dandelion reproduces.” The dandelion lights, she said, were designed with a similar eye on tomorrow: electronics and nature, bootstrapping each other into the future.

Fish shields, powered flowers and fragrant skulls: simple, elaborate, unexpected, exaggerated, and cycling and recycling, like a chant, or like life.

http://www.nytimes.com/2010/05/04/science/04angier.html?ref=design

Local Heroes, Far From Home

By MICHAEL KIMMELMAN

Rome

I JOINED the crowds heading into an Edward Hopper show at the Fondazione Roma the other morning. Organized in collaboration with the Whitney Museum of American Art in New York (most of the works come from there), the exhibition has been a hit here. In a country with what often seems like the most refined taste in the world and no taste at all, it owes something to a cheesy full-scale reconstruction of the "Nighthawks" diner in the first gallery. Visitors snap pictures of themselves posing beside fedora-clad mannequins slumped stiffly over the counter. There's another, better gimmick too, a room with pencils and stacks of white paper, where doodlers copy Hopper's drawings. Reproductions are projected onto the stacks, so lines can be easily traced, and people labor over their tracings, then tote them around the show like diplomas. (By people, of course, I mean me.)

Which got me thinking: Just how global is art? I quizzed some Italians and also a few New Yorkers at the exhibition, and it wasn't that the Italians didn't "get" Hopper, or didn't like him. He's world famous by now, beloved, and the Italians easily brought up the links to film noir and Antonioni. But New Yorkers, naturally, spoke quite differently about him.

Hopper's work, like all good art, remains local on some crucial level, and that's no doubt just as true for those Italian, French and German old master paintings that fill museums from Tokyo to Tulsa and epitomize what we have come to think of as universal Western art. Italians from the small Umbrian village of Montefalco will tell you that they see in the Renaissance works of Benozzo Gozzoli, their hometown hero, a landscape and light that doesn't make the same impact on people who didn't grow up there. These visceral reactions are acquired through firsthand experience.

No matter how much culture has become globalized, art retains meanings specific to a certain time and place. Good art does, anyway (which accounts for why too much not-so-good contemporary art, aimed at the global marketplace, looks generic and everywhere alike). Those meanings come, as it were, bred in the bone. Hopper is an American exemplar.

Although he visited Paris early on, he always denied any lasting French influence. But clearly he picked up plenty of ideas from Manet, Degas and Daumier, European masters of modern alienation, then did far more than merely substitute the Williamsburg Bridge and the Sheridan Theater for the Pont Neuf and Longchamp. He recognized how all those bridges and high-rises reaching for heaven and all those wide-open spaces and country barns in spring-green fields were clichés of an America whose population numbered countless people leading interior, often profoundly solitary lives. Hopper conveyed the psychological angle in silent places that he cast in a hard, melancholy light. But that light could also conjure up memories: the elevated tracks and anonymous apartment blocks, to New Yorkers who know them intimately, can invoke not just industrial sprawl or glum urbanism but also a singular beauty and dignity amplified by, and grounded in real, lived experience. We talk about the art world these days as if everyone everywhere who appreciates art belongs to the same global tribe, united by jet travel, integrated markets and the Web. But there are many art worlds, countless ones, which often don't talk to one another, don't know or care about one another, and that are no less potent because they're not, strictly speaking, universal. In Berlin, Heinrich Zille is a beloved artist, and streets, bars and restaurants are named after him. There's a Zille museum. Books, plays and movies have been written about him. Another play just opened this spring around the corner from my home in Berlin.

But outside Berlin, even in the rest of Germany, he's little known. He's Berlin's Hopper in that he grasped, in a similarly granular way, the city's inner life a century ago. Rough and affectionate, never sentimental, typically Berlin-like, his work still tends to speak more directly to old-time natives than the works of many better-known global stars like Grosz or Kirchner. He invented nothing, unlike them. He wasn't a modernist or even a great stylist. He trafficked in the same lower-class scenes of everyday life that contemporaneous artists in America like George Bellows and John Sloan painted. But he focused on places and qualities rooted in Berliners' particular self-image: on life inside the city's communal courtyards and in the rental barracks and the sweaty, smoky, beer-stained corner bars.

He called this, in his Berlin slang, his "miljöh," his milieu. And it included the alleys and tent villages on empty lots and along windswept avenues that peter out, as does so much of the city even now, into nowhere.

Zille was a minor painter and illustrator, from a ruthless global perspective, but to dismiss him, or lump him along with Sloan or Bellows as just another urban scene painter from the turn of the last century, is to miss the soul of his art and also the way much culture, globalism notwithstanding, works today.

It happens that a Henry Moore retrospective has lately opened at Tate Britain in London, the first major Moore show in decades. After the war Moore was the ultimate global sculptor, his studio churning out one after another smooth, lumpy monument to fill government buildings, housing projects and office parks around the world. He was Britain's de facto ambassador of art, its Picasso and Miró rolled into one, and his late works, anodyne abstractions, typify postwar faith in universal art representing universal values.

But after he died in 1986, it was as if everybody had had enough of him and what had become a factory line of production. His works were everywhere, but he dropped mostly off the radar of contemporary artists. The show rescues him from near-forgottenness by locating his true contribution in his British roots, as an artist who early on absorbed important lessons from Giacometti and the French Surrealists, then added a very British mix of elegance, sexual confusion and shambling abjectness to produce, before the war, objects in stone and wood that look far more memorable and unsettling than the soft-edged ones he produced afterward. The show reminds us that his breakthrough to stardom, not incidentally, came during the Blitz, with the circulation of drawings of Londoners huddling in the Underground to escape the bombs. Masses of faceless people look like cocoons or mummies, glumly suffering, except that these

drawings were promoted at the time as emblems of British fortitude. Beleaguered Britons, via Moore, became quiet heroes, modest martyrs, local versions of universal men. We like the idea of universal art because most artists make work that they hope gains universal appeal and can speak to anybody who's interested; because art's formal values are supposed to transcend borders and ages; and because we can't help fantasizing about the virtues of a global society. We imagine walking into any art museum, whether in Toronto or Timbuktu, and, up to a point at least, understanding the pictures and sculptures. But it's often what we can't understand that is most distinctive and enduring about the work.

Tourists make a beeline in foreign countries to art museums to say they've done the "Mona Lisa" and Botticelli's lady on a half shell, but also because museums promise familiarity, or a simulacrum of it. They're our 21st-century town squares and safe havens where strangers, who don't necessarily speak the language or know the city or country they're in, think that they occupy common ground with both locals and everyone else, because everybody supposedly speaks the universal language of art.

But culture's ultimate value is in difference. Art is supposed to provide us with one-of-a-kind experiences. We make and consume it to share with others, the more people the better, but also to affirm our individuality, our links to specific things, places, values and people. Universality is useful to the art market but a concept still underexamined and overrated.

There's another American art show now, at the Prado Museum in Madrid, a two-picture stellar one, juxtaposing Velázquez's "Meninas" with John Singer Sargent's portrait of the American Edward Darley Boit's daughters, from the Museum of Fine Arts, Boston. I spent a couple of hours watching tourists and schoolchildren check out the pair of paintings, which looked related (the Sargent is an explicit homage) but nonetheless like distant cousins. The comparison pointed up a trans-Atlantic gap in character and ambition beyond the obvious qualitative divide between the work of an elegant, first-rate painter of Edwardian silk and sash, and, hands down, the greatest painter of all time.

What accounted for this gap? I don't believe it was just an inferiority complex among Americans about their own (prewar) art. I think it had to do with Sargent's essential Americanness. True, he spent almost his entire life in Europe, was in some respects more British than anything else, and leaned heavily in his work on not just Velázquez but other European greats like Van Dyck, Gainsborough and Degas. In fact, you can see Degas's influence in the Boit portrait, whose figures look, as Degas's often do, psychologically disconnected, occupying a space that is ambiguous. Like Degas, Sargent was a heartless but dazzling virtuoso. But this is also a picture about new money and social ambition, an American combination. It allows a shadowy view inside one of those big new Paris apartments that rich Americans tended to occupy. To the French, who received it coolly at first, it conveyed foreignness, with its pretty, pink-cheeked, distant girls vaguely, almost offhandedly, portrayed in everyday dress, an American informality. Modern outsiders, they seem a world away from Velázquez's infanta and her court, a bunch of ultimate insiders. Or is all this reading too much into the comparison? An American who happened by suggested that the issue was simply Sargent's "republicanism": the picture projects 19th-century capitalist affluence in the midst of Old World royalty. That's right, but I'd add that the perceptual divide for an American between the paintings also depends on the American's sympathy and identification with an outsider's striving. It's about projection, in other words, which all good art provokes, whether by Sargent, Zille, Moore or Hopper, whose laconic and merciless drawings can, seen by a New Yorker passing through Rome, have a kind of Proustian eloquence. I stared at the ones he did of summer in the city and the sun splashing across Lower Manhattan before carrying my tracings of two of them to a favorite Sicilian bakery a few blocks away from the Piazza Colonna. It was unconscious, deciding to go there, but I realized it was because the cannoli reminded me of ones I fetched as a boy from a cafe on MacDougal Street, where the owner used to pack them in little white cardboard boxes tied with striped red string. I carried the pastries home to my family, past the Hopper-like brownstones, through the concrete park that faced our house, and across Sixth Avenue to our apartment, under what in my memory was forever a dusky Hopper sky.

http://www.nytimes.com/2010/05/02/arts/design/02abroad.html?ref=design

In Pursuit of Prey, Carrying Philosophy

By DWIGHT GARNER

THE FLIGHT OF THE INTELLECTUALS

By Paul Berman

299 pages. Melville House. $26.

Paul Berman's new book, "The Flight of the Intellectuals," plural, might as easily have been titled "The Flight of the Intellectual," singular. It is essentially a booklong polemic against one magazine article: a profile of the Islamic philosopher Tariq Ramadan, written by Ian Buruma, the Dutch academic and journalist, and published in The New York Times Magazine in 2007.

Mr. Berman's book has already made some noise. Writing in Slate, Ron Rosenbaum compared its stinging ambience, nostalgic to some, to one of "those old Partisan Review smackdowns," in which Dwight Macdonald or Mary McCarthy cracked some unsuspecting frenemy over the head with a bookcase and a tinkling highball glass. And for sure, everything about "The Flight of the Intellectuals" feels old school, from Mr. Berman's tone (controlled, almost tantric, high dudgeon) to the spectacle of one respected man of the left pummeling another while the blood flows freely, and no one calls the police.

Those Partisan Review fights got serious, and so does this book. Mr. Berman accuses Mr. Buruma, in his Times Magazine profile, of not scrutinizing Mr. Ramadan's family, associations or writings closely enough, of presenting him in a respectful light. Presenting him, that is, as the kind of moderate and charismatic Islamic thinker in whom the West might find a useful intermediary.

Mr. Berman's book, portions of which first appeared in The New Republic, is a patient overturning of the rocks that, he argues, Mr. Buruma failed to look under. He writes about historical figures Mr. Ramadan

professes to admire and notes the tiny degrees of separation that link them to Hitler and the Nazis during World War II. He points out Mr. Ramadan's ambiguous comments about things like 9/11, the stoning of women in Muslim countries and violence against Jews. Mr. Berman detects a kind of seventh-century barbarism lurking behind Mr. Ramadan's genial smile.

Mr. Berman branches out in his book's final third to condemn liberal intellectuals (nearly all of them but especially Mr. Buruma and the British historian Timothy Garton Ash) and their house organs, including The New York Review of Books, on another, related, account. He writes that while they have admired Mr. Ramadan, they have been inexplicably critical of Ayaan Hirsi Ali, the Somali-born Dutch intellectual who has become a major critic of Islam and, as a consequence, will probably have a large security detail for the rest of her life. Ms. Hirsi Ali's critics, who include Mr. Buruma and Mr. Garton Ash, find her personality "strident" and humorless, he writes, and feel she isn't as important as she might be because having renounced Islam, she no longer speaks to or is in touch with the Muslim hive mind.

About these criticisms of Ms. Hirsi Ali, Mr. Berman is incredulous. "A more classic example of a persecuted dissident intellectual does not exist," he notes about her. And yet, he writes, she is treated differently from Salman Rushdie, another writer who was subjected to death threats. "How times have changed!" he declaims. "The Rushdies of today find themselves under criticism, contrasted unfavorably in the very best of magazines with Tariq Ramadan," who had ties to an organization that was known to be anti-Rushdie. "Here is a reactionary turn in the intellectual world — led by people who, until just yesterday, I myself had always regarded as the best of the best."

He is withering about why this might be. Quoting another writer, he calls this "the racism of the anti-racists." As self-hating Westerners, he suggests, Mr. Buruma and Mr. Garton Ash can be seen "groveling to Ramadan, who berates the West" while attacking the Somali dissident who embraces its values.

Fear is at work too, he says. About the chill in the intellectual climate, Mr. Berman writes: "Two developments account for it — two large new realities that, condensing overhead, have altered the intellectual atmosphere down below, almost without being noticed. The first of those developments is the spectacular and intimidating growth of the Islamist movement since the time of the Rushdie fatwa. The second development is terrorism."

Mr. Berman, whose previous books include "A Tale of Two Utopias," about the 1960s, and "Terror and Liberalism," is skilled at the art of polemic: he builds his case slowly, citing the recent work of numerous scholars. There is especially fascinating material here about Hitler's plan, aided by some Islamists, to extend the Final Solution to the Middle East.

Mr. Berman can be bleakly funny. He criticizes Mr. Garton Ash for pointing out in The New York Review of Books that Ms. Hirsi Ali had been awarded the "Hero of the Month" prize from Glamour magazine, as if this were proof that she couldn't be taken seriously. Mr. Berman responds, in one of this book's more memorable utterances: "I can't help observing that here may be proof, instead, that Glamour magazine nowadays offers a more reliable guide to liberal principles than The New York Review of Books."

Mr. Berman has sensitive aesthetic as well as political antennas. For him, style makes the man. He deplores the "diffident cough" in Mr. Buruma's writing and finds him "courteous and amiable" to a fault. He's a writer, Mr. Berman says, who "would never stoop to using a strong adjective like "repulsive," or any adjective at all, unless it were presented as a double negative." He is even more brutal about Mr. Ramadan's "faux esoteric and ecumenical guru tone, suitable for all denominations."

"The Flight of the Intellectuals" is anything but diffident, and watching Mr. Berman pursue his philosophical prey is a bit like playing an academic version of a first-person-shooter video game: Modern Warfare: Bandit Pundit Edition. One's goggles begin to steam up. Being inside Mr. Berman's head can occasionally grate. As a writer he's alternately emotive and pedantic, an emo-wonk. He's self-

congratulatory about his coups of reading and synthesis, his turning up of important details in other people's footnotes. Yet his own book has no foot- or endnotes at all.

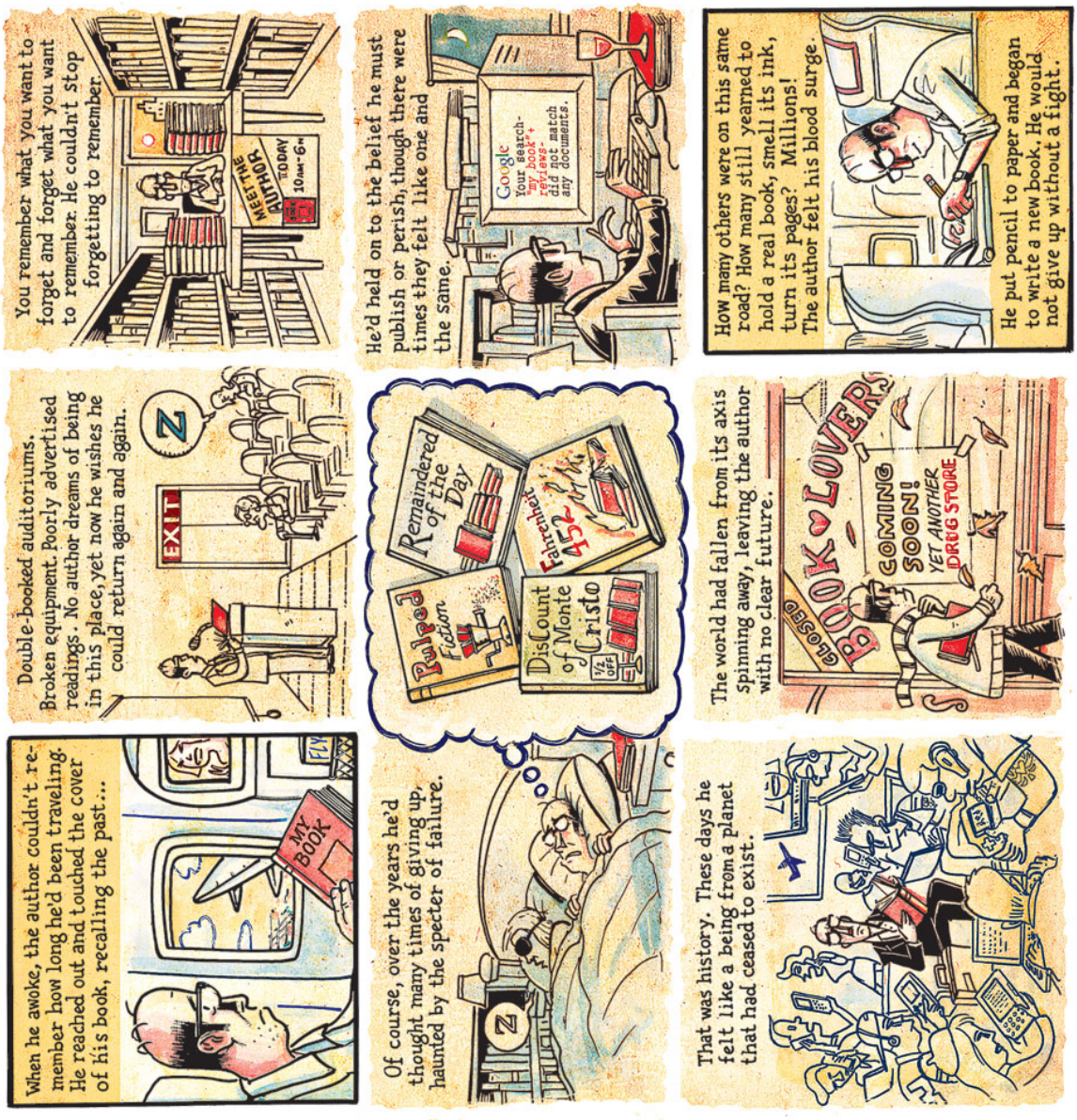
His litany of charges against the elusive Mr. Ramadan is largely circumstantial, although it must be said that the pile he amasses is plenty damning. Finally, Mr. Berman believes in straight talk and insists that we use words like "fascist" to describe some Islamist ideas rather than "totalitarian." Why? "It is because *totalitarian*, being abstract, is odorless. *Fascist* is pungent. To hear that emphatic f-sound and those double different s's is to flare your nostrils."

Mr. Berman's nostrils have flared before about fascism. He is a liberal hawk who supported the 2003 invasion of Iraq, about which he deployed that particular f-word as well. "If only people like you would wake up," he wrote in Dissent magazine in 2004, "you would see that war against the radical Islamist and Baathist movements, in Afghanistan exactly as in Iraq, is war against fascism." He may very well be right. Yet fascism is a radioactive word that requires careful handling. It can lead some people — and here's my own diffident cough — to impulsive action.

There's a good deal of inside baseball in "The Flight of the Intellectuals." Scores are settled that many readers won't know or care about. But this bracing and volatile book is an important one and devastating in its conclusions about the secret history of some Islamists and especially about the reception of Ayaan Hirsi Ali. "It was obvious that Hirsi Ali had received a dreadful treatment from journalists," Mr. Berman writes, "who ought to have known better."

http://www.nytimes.com/2010/05/03/books/03book.html?ref=books

Scenes From the Post-Print Apocalypse



http://www.nytimes.com/interactive/2010/05/02/books/review/kuper.html?ref=books

Rocks record early magnetic field

By Jonathan Amos
Science correspondent, BBC News, Vienna

Scientists have managed to push back the date for the earliest known presence of a magnetic field on Earth by about 250 million years.

The evidence is seen in tiny iron minerals that are aligned inside ancient dacite rocks from the Barberton mountains in South Africa.

Analysis of the 3.45-billion-year-old minerals indicates the strength the field was much weaker than today.

Earth's magnetic field protects all life on the planet.

It forms a shield that deflects harmful particles from the Sun around our world, and limits the ability of this "solar wind" to erode our atmosphere.

The new work by Professor John Tarduno, from the University of Rochester, US, and colleagues has been discussed at a major Earth sciences meeting in Vienna, Austria.

"Earth's magnetic field is important to us," Professor Tarduno told the European Geosciences Union meeting.

"[3.45 billion years ago] is a really critical time because it's when we start seeing the first tentative signs of life, so perhaps these two things are linked together."

The Rochester team has developed techniques for studying tiny magnetite minerals trapped inside the crystals of volcanic rock.

These minerals orientate themselves with respect to the Earth's magnetic field in a cooling magma and lock their positions once the temperature in the host rock dips below 580C.

The Barberton samples indicate the nascent field was considerably weaker than today's protective shield.

Whereas the modern boundary between our planet's magnetosphere and the solar wind might be located ordinarily at about 10 Earth radii, the ancient boundary would have been much closer - perhaps three to five Earth radii, said Professor Tarduno.

He explained that one likely effect of this would have been the production of polar lights, or auroras, at much lower latitudes as many more solar particles breached the shield to collide with atmospheric molecules.

It probably also meant the atmosphere lost more of its lighter elements, like hydrogen, faster than had previously been supposed, argued Professor Tarduno.

"What that means in an evolutionary sense to us - and this is just speculation but something we want to follow it up - is that perhaps this is suggesting the Earth was much more water-rich very early on," he said.

"If, even with this magnetic field, we are losing hydrogen and water, that would suggest the palaeo-Earth in its infant state must have had more water than we think about today."

Professor Tarduno's team is now looking back still deeper into the past for evidence of a global magnetic field.

The field is generated by convection currents in the molten-iron outer-core of the planet, and finding evidence of an even more ancient field would say much about the interior state of the young Earth.

There are volcanic rocks in Africa, India and Australia that possibly retain a record that is 3.6bn years old.

"To go back even further in time, however, we don't have the rocks available. But what we do have is certain younger sedimentary rocks that record minerals which were eroded from more ancient rocks - as old as four billion years old," Professor Tarduno told BBC News.

"We are developing techniques and we believe we can actually record the Earth's magnetic field in these minerals also."

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Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8659019.stm

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Mammoths had 'anti-freeze blood'

By Paul Rincon
Science reporter, BBC News

Mammoths had a form of "anti-freeze" blood to keep their bodies supplied with oxygen at freezing temperatures.

Nature Genetics reports that scientists "resurrected" a woolly mammoth blood protein to come to their finding.

This protein, known as haemoglobin, is found in red blood cells, where it binds to and carries oxygen.

The team found that mammoths possessed a genetic adaptation allowing their haemoglobin to release oxygen into the body even at low temperatures.

The ability of haemoglobin to release oxygen to the body's tissues is generally inhibited by the cold.

" **The resulting haemoglobin molecules are no different than 'going back in time' and taking a blood sample from a real mammoth** "
Kevin Campbell University of Manitoba

The researchers sequenced haemoglobin genes from the DNA of three Siberian mammoths, tens of thousands of years old, which were preserved in the permafrost.

The mammoth DNA sequences were converted into RNA (a molecule similar to DNA which is central to the production of proteins) and inserted into E. coli bacteria.

The bacteria faithfully manufactured the mammoth protein.

"The resulting haemoglobin molecules are no different than 'going back in time' and taking a blood sample from a real mammoth," said co-author Kevin Campbell, from the University of Manitoba in Canada.

Scientists then tested the "revived" mammoth proteins and found three distinctive changes in the haemoglobin sequence allowed mammoth blood to deliver oxygen to cells even at very low temperatures.

This is something the haemoglobin in living elephants cannot do.

"It has been remarkable to bring a complex protein from an extinct species back to life and discover important changes not found in any living species," said co-author Alan Cooper, director of the Australian Centre for Ancient DNA at the University of Adelaide.

Without their genetic adaptation, mammoths would have lost more energy in winter, forcing them to replace that energy by eating more.

The ancestors of woolly mammoths and modern-day elephants originated in equatorial Africa.

But between 1.2 and 2.0 million years ago, members of the mammoth lineage migrated to higher latitudes.

Writing in Nature Genetics, the scientists say that this genetic specialisation may have been crucial in allowing the ancestors of mammoths to exploit new, colder environments during Pleistocene times.

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Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8657464.stm

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'Long-term harm' of toddlers' TV

The more TV a toddler watches, the higher the likelihood they will do badly at school and have poor health at the age of 10, researchers warn.

The study of 1,300 children by Michigan and Montreal universities found negative effects on older children rose with every hour of toddler TV.

Performance at school was worse, while consumption of junk foods was higher.

UK experts said parents could allow young children to watch "some" high quality TV.

" **Our findings make a compelling public health argument against excessive TV viewing in early childhood** "
Dr Linda Pagani, University of Montreal

The study, part of the Quebec Longitudinal Study of Child Development Main Exposure, asked parents how much TV their children watched at 29 months (two years and five months) and 53 months (four years and five months).

On average, the two-year-olds watched just under nine hours of TV per week, while for four-year-olds the average was just under 15 hours.

But 11% of the two-year-olds and 23% of four-year-olds watched more than the recommended maximum of two hours of TV a day.

When the children were revisited at the age of 10, teachers were asked to assess the children's academic performance, behaviour and health, while body mass index (BMI) was measured at 10 years old.

Higher levels of TV viewing at two was linked to a lower level of engagement in the classroom and poor achievement in maths.

Researchers also found a decrease in general physical activity but an increase in the consumption of soft drinks and in BMI (body mass index).

'Common sense'

Dr Linda Pagani, of the University of Montreal, who led the research which was published in the journal Archives of Pediatrics & Adolescent Medicine, said: "Early childhood is a critical period for brain development and formation of behaviour.

"High levels of TV consumption during this period can lead to future unhealthy habits.

"Common sense would suggest that television exposure replaces time that could be spent engaging in other developmentally enriching activities and tasks that foster cognitive, behavioural and motor development."

And she added:"Although we expected the impact of early TV viewing to disappear after seven and a half years of childhood, the fact that negative outcomes remained is quite daunting.

"Our findings make a compelling public health argument against excessive TV viewing in early childhood."

The UK's National Literacy Trust campaigns to raise awareness of how to police a toddler's viewing.

It said that until research demonstrated that children under two might benefit from TV, parents should, "limit exposure and encourage other one-to-one language-enhancing activities that centre on talk at mealtime, bath time, shared reading and imaginative play".

But it added: "Encourage exposure to some high-quality, age-appropriate educational television for children aged two to five."

'Radical'

British Psychological Society member Dr Aric Sigman has carried out his own research, which highlighted concerns over young children watching too much TV.

He said: "My recommendation to the government five years ago, and even as recently as three years ago, that they merely issue general guidelines on the amount of TV that children watch and the age at which they start was considered radical and controversial.

"Yet a growing body of evidence is now causing governments and health authorities elsewhere to do just that, and we need to as well.

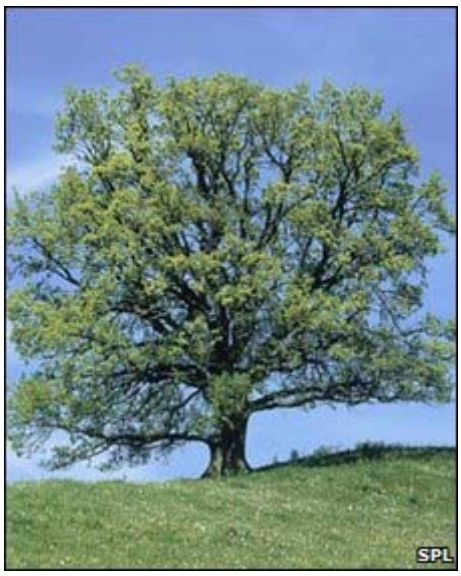
"This is yet another study reinforcing the need for our society to finally accept that quite aside from good or bad parenting, children's daily screen time is a major independent health issue."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8654963.stm

Published: 2010/05/03 23:03:30 GMT

'Green' exercise 'boosts health'

Just five minutes of exercise in a "green space" such as a park can boost mental health, researchers claim.



There is growing evidence that combining activities such as walking or cycling with nature boosts well-being.

In the latest analysis, UK researchers looked at evidence from 1,250 people in 10 studies and found fast improvements in mood and self-esteem.

The study in the Environmental Science and Technology journal suggested the strongest impact was on young people.

The research looked at many different outdoor activities including walking, gardening, cycling, fishing, boating, horse-riding and farming in locations such as a park, garden or nature trail.

The biggest effect was seen within just five minutes.

With longer periods of time exercising in a green environment, the positive effects were clearly apparent but were of a smaller magnitude, the study found.

Looking at men and women of different ages, the researchers found the health changes - physical and mental - were particularly strong in the young and the mentally-ill.

Green and blue

A bigger effect was seen with exercise in an area that also contained water - such as a lake or river.

Study leader Jules Pretty, a researcher at the University of Essex, said those who were generally inactive, or stressed, or with mental illness would probably benefit the most from "green exercise".

" **We would like to see all doctors considering exercise as a treatment where appropriate** "
Paul Farmer, Mind

"Employers, for example, could encourage staff in stressful workplaces to take a short walk at lunchtime in the nearest park to improve mental health."

He also said exercise programmes outdoors could benefit youth offenders.

"A challenge for policy makers is that policy recommendations on physical activity are easily stated but rarely adopted widely."

Paul Farmer, chief executive of mental health charity Mind, said the research is yet further evidence that even a short period of green exercise can provide a low cost and drug-free therapy to help improve mental wellbeing.

"It's important that people experiencing depression can be given the option of a range of treatments, and we would like to see all doctors considering exercise as a treatment where appropriate."

Mind runs a grant scheme for local environmental projects to help people with mental illness get involved in outdoor activities.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8654350.stm

Published: 2010/05/01 23:01:15 GMT

Test hope in painful bone disease

By Emma Wilkinson
Health reporter, BBC News

Three genes which account for 70% of cases of a painful bone condition have been identified by Scottish scientists.

It is hoped the finding could lead to a screening test for Paget's disease, which affects up to one million people in the UK, Nature Genetics reported.

The genes are thought to regulate bone repair and may explain why the bones of people with the condition become enlarged and malformed.

Screening could help doctors target preventive treatment at an early stage.

The international team led by researchers at the University of Edinburgh studied the DNA of 1,250 patients with Paget's disease to pinpoint the genes that cause the condition.

It showed three genes that were faulty more frequently in patients with the bone disease than in healthy people.

Together they account for seven in ten cases, they said.

The findings explain why many patients with Paget's disease have a family history of the condition.

" **We're hopeful this work will ultimately have a direct impact on patient care** "
Arthritis Research UK

A screening test for the genes could allow early detection of the disease and enable doctors to give preventative treatment before bones have become damaged.

It adds to another gene which had already been found in 10% of cases.

Bone turnover

In healthy people old bone is broken down and replaced with new cells as part of the normal cycle.

But this regeneration goes into overdrive in Paget's disease and patients suffer from bone pain, brittle bones susceptible to fractures, and advanced arthritis.

Researcher Dr Omar Albagha said the findings were a "major advance" in understanding why and how the disease develops.

"The three genes identified from this study contribute to 70% of the disease risk - quite unusual in common diseases.

"We are currently extending our studies to identify the genes responsible for the remaining 20% of the disease risk."

Professor Stuart Ralston, who led the project at the University of Edinburgh, said the effects of the genes were so powerful, a screening test was a real possibility.

"This is important since we know that if treatment is left too late, then irreversible damage to the bones can occur.

"If we were able to intervene at an early stage with preventative therapy, guided by genetic profiling, this would be a major advance."

There is a trial underway at Edinburgh University to determine if Paget's disease can be prevented in people with a genetic predisposition to the condition with a drug which inhibits the breakdown of bone.

Marilyn McCallum, chief executive of the Paget's Association, said the research was a "very exciting development".

"This project makes genetic testing a real possibility," she said.

A spokesman for Arthritis Research UK which funded a large part of the research said: "We're hopeful this work will ultimately have a direct impact on patient care."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8654795.stm

Published: 2010/05/02 20:15:21 GMT

Listening to (and Saving) the World's Languages

By SAM ROBERTS

The chances of overhearing a conversation in Vlashki, a variant of Istro-Romanian, are greater in Queens than in the remote mountain villages in Croatia that immigrants now living in New York left years ago. At a Roman Catholic Church in the Morrisania section of the Bronx, Mass is said once a month in Garifuna, an Arawakan language that originated with descendants of African slaves shipwrecked near St. Vincent in the Caribbean and later exiled to Central America. Today, Garifuna is virtually as common in the Bronx and in Brooklyn as in Honduras and Belize.

And Rego Park, Queens, is home to Husni Husain, who, as far he knows, is the only person in New York who speaks Mamuju, the Austronesian language he learned growing up in the Indonesian province of West Sulawesi. Mr. Husain, 67, has nobody to talk to, not even his wife or children. "My wife is from Java, and my children were born in Jakarta — they don't associate with the Mamuju," he said. "I don't read books in Mamuju. They don't publish any. I only speak Mamuju when I go back or when I talk to my brother on the telephone."

These are not just some of the languages that make New York the most linguistically diverse city in the world. They are part of a remarkable trove of endangered tongues that have taken root in New York — languages born in every corner of the globe and now more commonly heard in various corners of New York than anywhere else. While there is no precise count, some experts believe New York is home to as many as 800 languages — far more than the 176 spoken by students in the city's public schools or the 138 that residents of Queens, New York's most diverse borough, listed on their 2000 census forms.

"It is the capital of language density in the world," said Daniel Kaufman, an adjunct professor of linguistics at the Graduate Center of the City University of New York. "We're sitting in an endangerment hot spot where we are surrounded by languages that are not going to be around even in 20 or 30 years."

In an effort to keep those voices alive, Professor Kaufman has helped start a project, the Endangered Language Alliance, to identify and record dying languages, many of which have no written alphabet, and encourage native speakers to teach them to compatriots. "It's hard to use a word like preserve with a language," said Robert Holman, who teaches at Columbia and New York Universities and is working with Professor Kaufman on the alliance. "It's not like putting jelly in a jar. A language is used. Language is consciousness. Everybody wants to speak English, but those lullabies that allow you to go to sleep at

night and dream — that's what we're talking about." With national languages and English encroaching on the linguistic isolation of remote islands and villages, New York has become a Babel in reverse — a magnet for immigrants and their languages. New York is such a rich laboratory for languages on the decline that the City University Graduate Center is organizing an endangered-languages program. "The quickening pace of language endangerment and extinction is viewed by many linguists as a direct consequence of globalization," said Juliette Blevins, a distinguished linguist hired by City University to start the program.

In addition to dozens of Native American languages, vulnerable foreign languages that researchers say are spoken in New York include Aramaic, Chaldic and Mandaic from the Semitic family; Bukhari (a Bukharian Jewish language, which has more speakers in Queens than in Uzbekistan or Tajikistan); Chamorro (from the Mariana Islands); Irish Gaelic; Kashubian (from Poland); indigenous Mexican languages; Pennsylvania Dutch; Rhaeto-Romanic (spoken in Switzerland); Romany (from the Balkans); and Yiddish.

Researchers plan to canvass a tiny Afghan neighborhood in Flushing, Queens, for Ormuri, which is believed to be spoken by a small number of people in Pakistan and Afghanistan. The Endangered Language Alliance will apply field techniques usually employed in exotic and remote foreign locales as it starts its research in the city's vibrant ethnic enclaves.

"Nobody had gone from area to area looking for endangered languages in New York City spoken by immigrant populations," Professor Kaufman said. The United Nations keeps an atlas of languages facing extinction, and U.N. experts as well as linguists generally agree that a language will probably disappear in a generation or two when the population of native speakers is both too small and in decline. Language attrition has also been hastened by war, ethnic cleansing and compulsory schooling in a national tongue.

Over the decades in the secluded northeastern Istrian Peninsula along the Adriatic Sea, Croatian began to replace Vlashki, spoken by the Istrians, what is described as Europe's smallest surviving ethnic group. But after Istrians began immigrating to Queens, many to escape grinding poverty, they largely abandoned Croatian and returned to speaking Vlashki.

"Whole villages were emptied," said Valnea Smilovic, 59, who came to the United States in the 1960s with her parents and her brother and sister. "Most of us are here now in this country."

Mrs. Smilovic still speaks in Vlashki with her mother, 92, who knows little English, as well as her siblings. "Not too much, though," Mrs. Smilovic said, because her husband speaks only Croatian and her son, who was born in the United States, speaks English and a smattering of Croatian.

"Do I worry that our culture is getting lost?" Mrs. Smilovic asked. "As I get older, I'm thinking more about stuff like that. Most of the older people die away and the language dies with them." Several years ago, one of her cousins, Zvjezdana Vrzic, an Istrian-born adjunct professor of linguistics at New York University, organized a meeting in Queens about preserving Vlashki. She was stunned by the turnout of about 100 people.

"A language reflects a singular nature of a people speaking it," said Professor Vrzic, who recently published an audio Vlashki phrasebook and is working on an online Vlashki-Croatian-English dictionary.

Istro-Romanian is classified by Unesco as severely endangered, and Professor Vrzic said she believed that the several hundred native speakers who live in Queens outnumbered those in Istria. "Nobody tried to teach it to me," she said. "It was not thought of as something valuable, something you wanted to carry on to another generation."

A few fading foreign languages have also found niches in New York and the country. In northern New Jersey, Neo-Aramaic, rooted in the language of Jesus and the Talmud, is still spoken by Syrian immigrants and is taught at Syriac Orthodox churches in Paramus and Teaneck.

The Rev. Eli Shabo speaks Neo-Aramaic at home, and his children do, too, but only "because I'm their teacher," he said.

Will their children carry on the language? "If they marry another person of Syriac background, they may," Father Shabo said. "If they marry an American, I'd say no."

And on Long Island, researchers have found several people fluent in Mandaic, a Persian variation of Aramaic spoken by a few hundred people around the world. One of them, Dakhil Shooshtary, 76, a retired jeweler who settled on Long Island from Iran 45 years ago, is compiling a Mandaic dictionary.

For Professor Kaufman, the quest for speakers of disappearing languages has sometimes involved serendipity. After making a fruitless trip in 2006 to Indonesia to find speakers of Mamuju, he attended a family wedding two years ago in Queens. Mr. Husain happened to be sitting next to him. Wasting no time, he has videotaped Mr. Husain speaking in his native tongue.

"This is maybe the first time that anyone has recorded a video of the language being spoken," said Professor Kaufman, who founded a Manhattan research center, the Urban Field Station for Linguistic Research, two years ago.

He has also recruited Daowd I. Salih, 45, a refugee from Darfur who lives in New Jersey and is a personal care assistant at a home for the elderly, to teach Massalit, a tribal language, to a linguistic class at New York University. They are meticulously creating a Massalit lexicography to codify grammar, definitions and pronunciations.

"Language is identity," said Mr. Salih, who has been in the United States for a decade. "So many African tribes in Darfur lost their languages. This is the land of opportunity, so these students can help us write this language instead of losing it."

Speakers of Garifuna, which is being displaced in Central America by Spanish and English, are striving to keep it alive in their New York neighborhoods. Regular classes have sprouted at the Yurumein House Cultural Center in the Bronx, and also in Brooklyn, where James Lovell, a public school music teacher, leads a small Garifuna class at the Biko Transformation Center in East Bushwick.

Mr. Lovell, who came to New York from Belize in 1990, said his oldest children, 21-year-old twin boys, do not speak Garifuna. "They can get along speaking Spanish or English, so there's no need to as far as they're concerned," he said, adding that many compatriots feel "they will get nowhere with their Garifuna culture, so they decide to assimilate."

But as he witnessed his language fading among his friends and his family, Mr. Lovell decided to expose his younger children to their native culture. Mostly through simple bilingual songs that he accompanies with gusto on his guitar, he is teaching his two younger daughters, Jamie, 11, and Jazelle, 7, and their friends.

"Whenever they leave the house or go to school, they're speaking English," Mr. Lovell said. "Here, I teach them their history, Garifuna history. I teach them the songs, and through the songs, I explain to them what it's saying. It's going to give them a sense of self, to know themselves. The fact that they're speaking the language is empowerment in itself."

http://www.nytimes.com/2010/04/29/nyregion/29lost.html

Out of Mind, out of Sight: Blinking Eyes Indicate Mind Wandering

ScienceDaily (Apr. 30, 2010) — When your mind wanders, you're not paying attention to what's going in front of you. A new study suggests that it's not just the mind, it's the body, too; when subjects' minds wandered, they blinked more, setting up a tiny physical barrier between themselves and the outside world.

Cognitive neuroscientist Daniel Smilek, of the University of Waterloo, studies how people pay attention -- and don't. For this study, he was inspired by brain research that shows, when the mind wanders, the parts of the brain that process external goings-on are less active. "And we thought, OK, if that's the case, maybe we'd see that the body would start to do things to prevent the brain from receiving external information," Smilek says. "The simplest thing that might happen is you might close your eyes more."

So, Smilek and his colleagues, Jonathan S.A. Carriere and J. Allan Cheyne, also of the University of Waterloo, set out to look at how often people blink when their mind wanders.

Fifteen volunteers read a passage from a book on a computer. While they read, a sensor tracked their eye movements, including blinks and what word they were looking at. At random intervals, the computer beeped and the subjects reported whether they'd been paying attention to what they were reading or whether their minds were wandering -- which included thinking about earlier parts of the text.

The participants blinked more when their minds were wandering than when they were on task, the team reports in *Psychological Science*, a journal of the Association for Psychological Science. "What we suggest is that when you start to mind-wander, you start to gate the information even at the sensory endings -- you basically close your eyelid so there's less information coming into the brain," says Smilek.

This is part of a shift in how scientists are thinking about the mind, he says. Psychologists are realizing that "you can't think about these mental processes, like attention, separately from the fact that the individual's brain is in a body, and the body's acting in the world." The mind doesn't ignore the world all by itself; the eyelids help.

Story Source:

Adapted from materials provided by Association for Psychological Science, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Daniel Smilek, Jonathan S.a. Carriere, J. Allan Cheyne. **Out of Mind, Out of Sight: Eye Blinking as Indicator and Embodiment of Mind Wandering**. *Psychological Science*, 2010; DOI: 10.1177/0956797610368063

http://www.sciencedaily.com/releases/2010/04/100429153959.htm

Why genius isn't in the genes

The belief that a genius is the product of genetic make-up is as pervasive as it is wrong, according to David Shenk

Robin McKie

The Observer,

David Shenk: anyone can be a genius

Talent is like the marksman who hits the target others cannot reach; genius is like the marksman who hits a target others cannot even see. Thus Arthur Schopenhauer defined the concept of genius – as a gift displayed by semi-mystic beings whose innate qualities sets them apart from other mortals. Mozart, Einstein, Newton, George Best: all were blessed by their genes and achieved a greatness that the rest of us cannot hope to possess.

And that would seem to be that. Writer David Shenk, a contributor to the *New Yorker* and other US publications, begs to differ, however. Every human has the potential to be an Einstein, claims this affable 43-year-old in his latest book *The Genius in All of Us* (Icon). There is nothing that special about being exceptionally gifted. It is a comforting assertion. But is it justified?

You claim that everything that we have been told about genetics, talent and intelligence is wrong. Why?

My interest was sparked when I stumbled into a body of research called expertise studies. Anders Ericsson [of Florida State University] and other psychologists have examined what processes make certain people so good at some activities. They are trying to determine the ingredients of greatness, in other words.

For example, they looked at how [professional] violists practise. To the untrained eye and ear, it seems obvious: they all do a great deal of practising – hours, hours and hours. But if you look very carefully at those who end up being the best, you discover – by doing intensive tracking of them – that they do practise more, and better, than those in the class below them.

That is a theme that extends to all achievements. There is a quantitative and qualitative difference in the practice undertaken by the super-greats – say in basketball – and the mere greats. They work hard at being great. It isn't bestowed at birth.

Most people look at child geniuses like Mozart and conclude that his gifts had to be the result of fortuitous genes. Presumably you disagree?

Every piece of evidence we have about how genes work, how brains work, where musicality actually comes from, are consistent with the idea that there is nothing that mysterious about Mozart. I am not

trying to diminish his achievements, of course. But the more you look at his life, or the life of any other genius, you realise that this was a process. He reacted to an environment that was almost uniquely perfect for moulding him into a child star.

The myth of Mozart's innate talent persists because people conflate different things in his life. We know he was interested in composing early on and we know he was a prodigy as a performer. The untrained mind reacts by concluding he was born that way. And that kind of reaction has been going for a century. Every time we are confronted with prodigious talent, we say it must be genes because we cannot think of any other explanation. In fact, in the case of Mozart, it is clear his upbringing was also remarkable in terms of stimulating his abilities.

The trouble is that this problem is getting worse. The more we read about new genes being discovered for human conditions, the more our belief in genetic determinism gets stronger. Yet the vast majority of geneticists would not want that to happen.

You say Mozart's greatness was not innate but due to his drive. He practised at playing and composing better than anyone else. But who is to say that drive was not inherited? The source of his greatness would still lie in genes in that case.

I think there are genes that influence drive. But I do not think that it is a completely innate characteristic. It becomes part of our personality and psychology and all of that is developed. Resilience and motivation can appear at different stages in people's lives and often appear in response to adversity, although I accept it will be more difficult for some people to develop intense drive than others. But, fundamentally, it is a developed trait.

Do you think genetics research is going to provide us with more data that suggests that genius is acquired rather than inherited?

Modern studies are only just beginning to unravel issues about gene expression and epigenetics, the study of how the environment modifies the ways genes are expressed. Genes are constantly activated and deactivated by environmental stimuli: nutrition, hormones, nerve impulses and other genes. There is no golden genetic windfall bestowed at birth, but constant interaction between the outside world and our DNA.

In other words, your genes do not place a limit on your potential in any way?

Yes. That is right. Our genes influence our lives, but equally our lives influence our genes. And I think that that has important implications. Certainly, in the US, we tend to quietly give in to the suspicion that some people are not as capable of being educated as others.

The thing is that if we decide that we need to do a lot more to exploit human talent, then we will all benefit. These things take resources, of course. But the overall message is clear. Our problem is not that we possess inadequate genetic assets but that we are suffering from an inability, so far, to tap into what we already have.

Few of us know our true limits and the vast majority of us have not even come close to tapping what scientists call our "unactualised potential".

http://www.guardian.co.uk/theobserver/2010/may/02/david-shenk-genius-genetics

Researchers embark on 'unprecedented' tornado study

Friday, 30 April 2010 18:04 UK

By Mark Kinver Science and environment reporter, BBC News

Researchers hope the study will help improve tornado warnings and forecasts

An international team of researchers is embarking on what has been described as the most ambitious tornado study in history.

An array of instruments will be deployed across the US Great Plains, where violent twisters are more common than anywhere else on the planet.

It is hoped that the data gathered will improve tornado warnings and forecasts.

More than 100 scientists will be involved in the study, which will continue until the middle of June.

"Tornadoes rank among the most destructive weather events on Earth," said Dr David Dowell, one of the project's principal investigators and a scientist for the US National Center for Atmospheric Research (NCAR).

"It is imperative that we learn more about how they develop and why some are so powerful."

The study, Vortex2, will use a range of enhanced mobile radars and other weather-sensing equipment in order to build up a comprehensive picture of the zones where tornadoes develop.

Researchers say that rapidly changing contrasts in wind and temperatures in an area just a few miles across can spawn a tornado in a matter of minutes.

But, they added, only a small percentage of "supercell storms" generate twisters, and standard observing networks and radars struggle to pick up the atmospheric conditions that lead to the formation of a tornado.

On the road

The radar fleet for the field project includes 10 mobile radars, which will track winds and precipitation in the tornadoes and the surrounding area.

The team will also be using more than 36 portable surface weather stations, weather balloons, and they hope to send an unmanned 12ft aircraft to the edge of severe storms to collect data.

The study area stretches from West Texas to south-west Minnesota, covering more than 900 miles (1,450km).

The researchers will not have a fixed base, spending the entire six weeks on the road following outbreaks of severe weather.

The project will build on the findings from the original Vortex study, which was conducted in 1994-95 and gathered data on supercells - long-lived thunderstorms that can spawn tornadoes.

The $12m (£8m) project is primarily funded by the US National Science Foundation, and will include researchers from Europe, Canada and Australia.

http://news.bbc.co.uk/2/hi/science_and_environment/10093808.stm

Prostate cancer vaccine approved

A "vaccine" which harnesses the body's own immune system to fight prostate cancer has been approved for use by US drug regulators.

Provenge - which is designed to be used in men with advanced disease - is the first of its kind to be accepted by the Food and Drug Administration.

Each dose has to be individually tailored and it is an expensive treatment at $93,000 per patient.

It will add to, rather than replace, existing treatments, said experts.

" **There are still questions to answer, even if the treatment fulfils its early promise** "
John Neate, The Prostate Cancer Charity

Doctors have been working on therapies that prompt the immune system to fight tumours for decades.

Potential success stories include an experimental vaccine for melanoma which is in the late stages of development.

This latest therapy is made by collecting special blood cells from each patient that help the immune system recognise cancer as a threat.

These are then mixed with a protein found on most prostate cancer cells and a substance which kick-starts the immune response.

Advanced disease

The drug is not a "cure" but is used in advanced prostate cancer that has spread to other sites in the body and is no longer responding to standard hormone treatment.

Clinical trials showed that the treatment extended the lives of patients by four months.

This compares with an average of three months with chemotherapy.

Dr Phil Kantoff, an oncologist at the Dana-Farber Cancer Institute who helped run the studies of Provenge said: "The big news here is that this is the first immunotherapy to win approval, and I suspect within five to ten years immunotherapies will be a big part of cancer therapy in general."

Prostate cancer accounts for about 12% of male deaths from cancer in the UK and is the second most common cause of cancer death in men.

In older men aged 85 and over, the disease is the most common cause of all deaths from cancer.

John Neate, chief executive of The Prostate Cancer Charity, said: "The news that this type of immunotherapy may offer additional survival benefit is promising."

But he added: "There are still questions to answer, even if the treatment fulfils its early promise.

"At present, we believe there are currently no laboratories in Europe equipped to undertake this treatment.

"Furthermore, this treatment is not currently approved in the UK and it will still be some years before doctors know enough about its long term effectiveness and side effects to be confident about its potential place in the armoury against advanced prostate cancer."

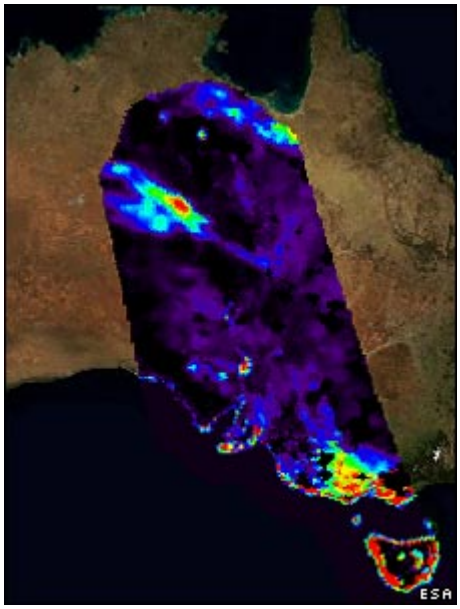
Dr Chris Parker, Cancer Research UK's prostate cancer expert said: "We hope this approval will open new avenues of research into using a patient's own immune system to treat cancer."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8654039.stm

Published: 2010/04/30 12:24:41 GMT

Water mission fights interference
By Jonathan Amos
Science correspondent, BBC News, Vienna

Europe's Smos spacecraft is returning valuable new data on the way water is cycled around the globe, despite experiencing continued interference.



The satellite was launched in November to track changes in the wetness of soils and the saltiness of the oceans using a three-armed microwave antenna.

Its detailed maps will soon begin flowing to the scientific community.

But in some parts of the world, Smos is still being blinded by radar networks, and even TV and radio links.

The radio frequency interference (RFI) is a frustration for the mission team. The part of the electromagnetic spectrum in which Smos sees the planet is supposed to be reserved for Earth observation.

Southern Europe, the Middle East and the Asian continent are particular problem zones.

"In Africa, for example, there are a couple of sources - one in Khartoum, one in South Africa," explained Dr Yann Kerr, one of the Smos principal investigators.

"They are damaging the signal over much larger areas, affecting a good part of Africa. And this is one of the areas of the world where information on soil moisture for better water resources management is crucial. So it's really a hindrance," the CESBIO, France, researcher told BBC News.

The European Space Agency satellite will complete its commissioning phase in the next month, and the first results from early observations were presented here at the European Geosciences Union meeting.

Smos carries a single instrument - an interferometric radiometer called Miras.

Some eight metres across, it has the look of helicopter rotor blades.

Miras measures changes in soil moisture and ocean salinity by observing variations in the natural microwave emission (L-band) coming up off the surface of the planet.

Tracking such trends will have wide applications, but should improve weather forecasts and warnings of extreme events, such as floods.

The early data suggests Miras is performing exceptionally well, picking out subtle features that will be of huge value to hydrologists, meteorologists, oceanographers, and many others.

Smos watched recently as large areas of eastern Australia were soaked by rainwater and then tracked how the soli dried out over the following days. And in arid areas of the continent, too, the spacecraft has demonstrated its capability.

"In several instances, we had phenomena that we identified but which seemed highly improbable," said Dr Kerr.

"We saw banana-shaped features in the data and we wondered if it was a problem with the instrument or RFI. But then we looked with rain radars and saw exactly the same pattern, so it was obviously a rain event."

In addition, Smos is returning some fascinating information on the polar regions. Scientists can discern in the satellite data where ice thins at the rocky edges of Antarctica. They can even see melt-water sitting on top of sea-ice.

Such observations will be very useful to researchers studying changes in the cryosphere.

Steady progress is being made in dealing with the man-made sources of emission that bleed across Miras's operational frequencies (1400-1427MHz).

The European Space Agency is working with authorities such as the International Telecommunications Union to try to identify and shut off offending emitters.

The Smos science team is also learning how to tune its algorithms to filter out some of the RFI.

There is considerable support coming from the US, too. The Americans are expected to launch two L-band missions of their own this decade: Smap, to measure soil moisture; and Aquarius, to monitor ocean salinity (a joint undertaking with the Argentine space agency, CONAE).

"In some ways it's a pity for Smos that we are the first L-band mission in space, because we will basically look at all these things as the first people," commented Dr Susanne Mecklenburg, the Smos mission manager.

"But of course there will be two more missions in L-band operating, and there will be more re-enforcement of the rules following this. Also, I think the Chinese are presently planning an instrument in that spectral band, so that might help us in switching off sources over Asia which is largely contaminated by RFI."

SEEING WET SOILS AND SALTY WATER

Both moisture and salinity strongly affect the electrical properties of matter
All matter emits energy in the form of electromagnetic radiation
The Smos signal is detected in the microwave portion of the spectrum
Long wavelength reception generally requires large antenna set-ups

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Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/science/nature/8661228.stm

Published: 2010/05/05 11:27:37 GMT

Bonobos shake heads to 'say no'

By Jody Bourton
Earth News reporter

Bonobos have been filmed appearing to 'say no' by shaking their heads, report scientists.

On a number of occasions, bonobos were filmed using side to side head movements to prevent others from doing something they did not want them to do.

In one film a mother is seen shaking her head to stop her infant playing with its food.

This may reflect an early precursor to head-shaking behaviour amongst humans in one of our closest relatives.

The study has been published in the journal Primates.

Disapproving look

"In bonobos, our observations are the first reported use of preventive head-shaking," say Ms Christel Schneider from the Max Planck Institute for Evolutionary Anthropology, Leipzig, Germany.

This would raise the question of whether these gestures reflect a primitive precursor of the human 'no' head-shake
Ms Christel Schneider Max Planck Institute, Germany

Ms Schneider undertook the study with Dr Josep Call of the Max Planck Institute and Dr Katja Liebal from Freie Universität, Berlin, Germany.

Ms Schneider recalls how the videos captured at Leipzig Zoo in Germany show a bonobo mother shaking her head in disapproval when her infant plays with some food.

"Ulindi, tried to stop her infant, Luiza, from playing with a piece of leek. Since Luiza took no notice despite repeated attempts to stop her, Ulindi finally shakes her head towards the infant," she says.

Ulindi eventually throws the leek away whilst the infant still tries to reach for it, the researchers report.

' No' bonobo

African great apes such as bonobos (*Pan paniscus*) and chimpanzees (*Pan troglodytes*) are known to use head gestures such as nodding, bowing and shaking to communicate with other group members.

Bonobos are already known to use head-shaking to initiate interactions with other members of the group, such as playing.

However, this is the first study to film and observe an ape shaking its head in a negative context to stop or prevent other bonobo behaviour.

The Germany-based scientists observed the behaviour whilst studying bonobos as part of wider study on the communication of great ape infants.

Using video recordings they studied the gestures and behaviour of bonobos, chimpanzees, gorillas and orangutans in six European zoos.

During the study, they witnessed four individual bonobos shaking their heads in this way on 13 different occasions.

Previously only anecdotal reports have noted individual chimpanzees shaking their head to signal 'no'.

Sophisticated ape

The researchers write how bonobos use a wide range of head gestures compared to chimpanzees, and are considered to be more sophisticated at using their head to signal meaning.

Such sophisticated communication systems may emerge because of the apparently tolerant, cooperative and egalitarian societies that bonobos live in, with their diffuse hierarchies and complex social structures.

In this way, bonobos may have developed the preventative head-shake to say 'no' and negotiate conflict situations.

The researchers are cautious to say that they cannot be sure the bonobos definitively mean 'no' when they shake their heads this way.

But it remains the best explanation so far.

More detailed research is now needed to fully establish the functional role of all forms of head gestures across ape species, they say.

The discovery may also provide a unique insight into our own head-shaking tendencies, they suggest.

"If future research can confirm the use of preventive head-shaking in our closest living relatives, the bonobos and chimpanzees, then this would raise the question of whether these gestures reflect a primitive precursor of the human 'no' head-shake," says Ms Schneider.

In short, humans may be hardwired to shake their heads to say no.

However, as Ms Schneider told BBC News, it should be noted that head shaking is not always associated with the negative.

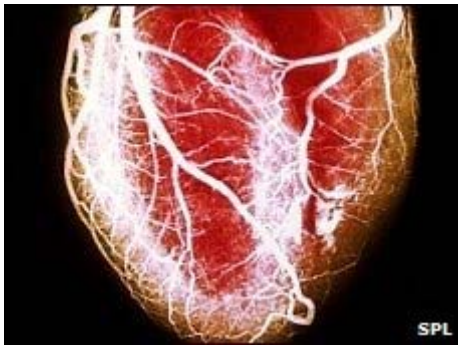
"In some cultures, e.g. Bulgaria, head-shaking can mean yes," she adds.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/earth/hi/earth_news/newsid_8659000/8659411.stm

Published: 2010/05/05 11:22:28 GMT

Women under 50 'face stress risk'
By Adam Brimelow
Health correspondent, BBC News

Stress at work raises the risk of heart disease for women under 50, a study of more than 12,000 nurses suggests.



Danish research in Occupational and Environmental Medicine concludes work pressure has a greater effect on young women than those in their 50s and 60s.

It suggests other risk factors may play a bigger role in the development of heart disease for older women.

The British Heart Foundation says people facing stress at work should try to tackle it in a positive way.

There is a lot of evidence indicating that stress at work raises the risk of heart disease in men, but there has been much less research examining the impact on women.

Risk profile

In this study, the researchers asked more than 12,000 female nurses aged between 45 and 64 about pressure at work and tracked their health for 15 years up to 2008.

" **If you feel under pressure you should try and tackle it in a positive way and get active during work hours** "
June Davison, British Heart Foundation

By then 580 nurses had been admitted to hospital with ischaemic heart disease, including 369 cases of angina and 138 heart attacks.

After accounting for risk factors such as smoking and diabetes, the researchers found that those who described pressure at work as "much too high" were 35% more likely to have developed heart disease than those who were comfortable with the pressure.

But when they broke the results down by age, they found it was only the women aged 50 and under who were affected significantly.

The researchers from Glostrup University Hospital, in Denmark, say this could be down to a changing risk-profile in different age groups.

"It seems as if the effect of work pressure has a greater impact on younger women," they said.

"This is in agreement with findings from previous studies looking at age-specific effects in both men and women.

"The lower risk among the older nurses may be due to other risk factors that become relatively more important with increasing age."

'Worrying'

June Davison, a cardiac nurse with the British Heart Foundation, said people who were stressed at work should talk to colleagues or managers about how to manage the pressures.

"If you feel under pressure you should try and tackle it in a positive way and get active during work hours," she said.

"Using the stairs and walking some of the way to work could help act as a stress buster and boost heart health too."

Josie Irwin, head of employment relations at the Royal College of Nursing, said the paper raised important concerns.

"Our latest employment survey found that 55% of nurses feel they are under too much pressure at work, making this research worrying reading," she said.

"We know that safe staffing levels are key to providing the best quality care for patients - this research also suggests under-staffing and excess pressure can have a damaging effect on nurses' health."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8663090.stm

Published: 2010/05/06 00:29:23 GMT

New hope for HIV vaccine efforts
By Helen Briggs
Health reporter, BBC News

US researchers say they are a step closer to understanding why some people have natural protection against HIV.

They believe rare individuals who progress very slowly to Aids when infected make white blood cells that are better at fighting the virus.

The findings, published in Nature, may help international efforts to design an effective Aids vaccine.

But the research team at MIT and Harvard says any such vaccine is at least a decade away.

The findings relate to so-called "elite controllers" - a small number of people who, when exposed to HIV, progress very slowly to Aids or never develop it at all.

" **It shows another piece in the puzzle of what we want a vaccine to do** "
Prof Arup Chakraborty

In the late 1990s it was discovered that these individuals - about one in 200 of those infected with HIV - carry a specific gene, known as HLA B57.

The research team, led by MIT Professor Arup Chakraborty and Harvard Professor Bruce Walker, found this gene causes the body to make more potent killer T cells - a type of white blood cell that fights infections.

This helps them to keep the HIV virus at bay, but also makes them more susceptible to autoimmune diseases, where the body's immune system turns on itself.

The work is based on computer modelling of how immune cells develop in a specialised organ of the immune system known as the thymus.

Vaccine puzzle

The researchers say the study has implications for designing an effective vaccine.

WHAT THEY DID
Developed computer models of how T cells develop in the thymus

Looked at what happens in people with the HLA B57 gene compared with others
Found individuals with the "protective" gene have T cells that are better at binding HIV

It could help them develop vaccines that provoke the same response to HIV that individuals with "natural immunity" can do on their own.

But they say even if they knew exactly what vaccine they wanted to make, it would take at least a decade to reach the hands of a healthcare worker.

Prof Bruce Walker told the BBC: "Some people are able to control HIV on their own and it's really critical for us to understand how this happens. This study takes us a step forward in understanding that."

Prof Chakraborty added: "It shows another piece in the puzzle of what we want a vaccine to do."

Genetic defences

Commenting on the study, Jason Warriner, clinical director at the Terrence Higgins Trust, said: "Anything that gives us greater insight into genetic defences related to HIV is useful in searching for a vaccine and, one day, a cure for this complex virus.

"However, these elite controllers are a tiny proportion of people and they are not immune from HIV-related illnesses.

"HIV remains the UK's fastest-growing serious health condition, with 83,000 people affected, so it is vital that people continue to use condoms to protect themselves."

The study is published online in the journal Nature.

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8663239.stm

Published: 2010/05/05 18:08:51 GMT

Lack of sleep 'poses death risk'

Getting less than six hours sleep a night can lead to an early grave, UK and Italian researchers have warned.

They said people regularly having such little sleep were 12% more likely to die over a 25-year period than those who got an "ideal" six to eight hours.

They also found an association between sleeping for more than nine hours and early death, although that much sleep may merely be a marker of ill health.

Sleep journal reports the findings, based on 1.5m people in 16 studies.

The study looked at the relationship between sleep and mortality by reviewing earlier studies from the UK, US and European and East Asian countries.

Premature death from all causes was linked to getting either too little or too much sleep outside of the "ideal" six to eight hours per night.

But while a lack of sleep may be a direct cause of ill health, ultimately leading to an earlier death, too much sleep may merely be a marker of ill health already, the UK and Italian researchers believe.

Time pressures

Professor Francesco Cappuccio, leader of the Sleep, Health and Society Programme at the UK's University of Warwick, said: "Modern society has seen a gradual reduction in the average amount of sleep people take and this pattern is more common amongst full-time workers, suggesting that it may be due to societal pressures for longer working hours and more shift-work.

"On the other hand, the deterioration of our health status is often accompanied by an extension of our sleeping time."

" **Five hours is insufficient for most people** "
Sleep expert Professor Jim Horne

If the link between a lack of sleep and death is truly causal, it would equate to over 6.3 million attributable deaths in the UK in people over 16 years of age.

Prof Cappuccio said more work was needed to understand exactly why sleep seemed to be so important for good health.

Professor Jim Horne, of the Loughborough Sleep Research Centre, said other factors may be involved rather than sleep per se.

"Sleep is just a litmus paper to physical and mental health. Sleep is affected by many diseases and conditions, including depression," he said.

And getting improved sleep may not make someone better or live longer, he said.

"But having less than five hours a night suggests something is probably not right.

"Five hours is insufficient for most people and being drowsy in the day increases your risk of having an accident if driving or operating dangerous machinery."

Story from BBC NEWS:
http://news.bbc.co.uk/go/pr/fr/-/2/hi/health/8660373.stm

Published: 2010/05/04 23:11:45 GMT

Decon Green can clean up the most toxic messes, developers claim

And it's environmentally friendly
By Rachel Ehrenberg
Web edition : Wednesday, May 5th, 2010

U.S. Army scientists have invented a new cleaning product that can decontaminate surfaces tainted with nerve gas, anthrax spores and other nasty substances — and they say it's environmentally friendly to boot.

Until now, chemical and biological warfare agents such as mustard gas, the nerve agent VX, anthrax spores or radioactive isotopes have each required their own cleaning agents, says research chemist George Wagner of the U.S. Army's Edgewood Chemical Biological Center in Aberdeen, Md. "There wasn't really any broad-spectrum decontaminant," he says. And some of the cleaners that are typically used, such as products containing chlorine bleach, aren't very environmentally friendly.

So Wagner and his colleagues set out to make a general purpose, greener cleaner. After a decade in the test kitchen, they came up with Decon Green. Not only does Decon Green work — "If the decontaminant comes into contact with the agent, it will destroy it," says Wagner — but it's also environmentally friendlier than the disinfectants it is meant to replace.

"Everything just seems to click with this one system," Wagner says.

The main ingredient in Decon Green is hydrogen peroxide, the familiar disinfectant that makes cuts fizz and a common component of household cleaners and detergents. All but one of the other ingredients, which include the food and drug additives potassium citrate and propylene glycol, are benign enough to be found in everyday cosmetics and foods, Wagner notes. The exception, Triton-X 100, is used as a dispersant in some insecticides.

The reactive oxygen in the hydrogen peroxide provides much of the cleaner's might. In some instances, such as with the nerve agent VX, it attacks a susceptible phosphorous bond. In other cases the reactive oxygen may substitute one chemical group for another, rendering an agent nontoxic. Wagner and his colleagues tested their product on several surfaces, they report in the April 7 *Industrial & Engineering Chemistry Research,* including plain panels of aluminum and panels covered in a chemically resistant paint typically used on military vehicles. Each surface was dosed with a chemical warfare agent such as the nerve agent VX, sulfur mustard gas or a G-nerve agent (the class that includes Sarin). After sitting for an hour, Decon Green was applied. On the plain aluminum panels "we got stellar marks," says Wagner. Decon Green reduced contaminant levels to well below what is considered "clean." But several washes were required to remove the chemicals from the rough surfaces of the painted panels. Testing also revealed that Decon Green kills spores of *Bacillus anthracis*, or anthrax. It also completely removed a radioactive isotope of cobalt from glass, though it was less successful in clearing the radioactive metal from rubber and steel. Any addition to the decontamination toolbox is welcome, says Ellen Raber, an environmental decontamination specialist at Lawrence Livermore National Laboratory in California. But she notes that any cleaner needs to be tested on several surfaces. "For chemical warfare agents it makes a really big difference if you are dealing with say, a concrete floor or one covered in linoleum tile." Outdoors, where surfaces such as soil get sullied, cleanup can be even more problematic. "We've looked at one-size-fits-all decontaminants," says Raber, cleaners that tackle both chemical and biological agents. Decon Green's anthrax-fighting powers fit with previous work. But its ability to fully clear chemical criminals will need further testing. "It's very difficult," Raber says, "to find something that does both."

http://www.sciencenews.org/view/generic/id/58898/title/Decon_Green_can_clean_up_the_most_toxic_messes%2C_developers_claim

Undereducated immune cells get aggressive with HIV

Scientists uncover a mechanism that may explain some resistance to the AIDS virus
By Tina Hesman Saey
Web edition : Wednesday, May 5th, 2010

A new study suggests that a lack of education allows some people who have been infected with HIV to keep the virus in check.

Not education in the traditional sense; this inadequate schooling takes place in the thymus, where immune cells are taught to distinguish friendly cells from invaders.
People with one version of a protein called HLA-B*5701 have immune cells that never fully learn this task. A new study published online May 5 in *Nature* shows how these uneducated cells help keep HIV down. The discovery may one day be helpful in designing vaccines against HIV and other viruses.

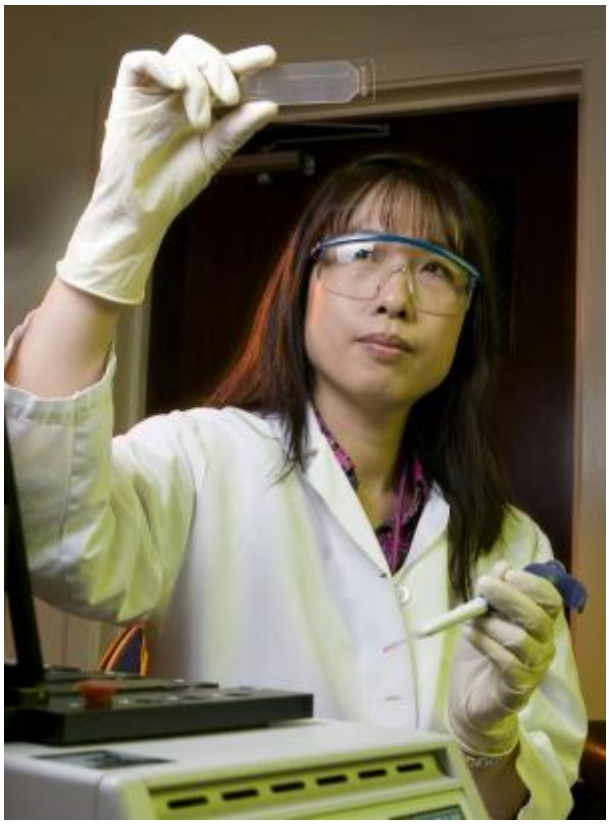
An unusual ability crops up in people who have the special protein: Their immune systems are much better at latching on to the proteins of HIV and other viruses, reports a team of researchers led by Arup Chakraborty of MIT and Bruce Walker of the Ragon Institute in Charlestown, Mass. This ability to get a death grip on viral proteins, even when the virus mutates and changes its appearance, comes from immune cells that haven't learned to recognize the body's own proteins, the team found.

Immune cells called T cells are born in the bone marrow and then travel to the thymus, where they encounter and learn to recognize the body's own proteins. Only T cells that ignore the body's own components while reacting to foreign proteins graduate from the thymus to become part of the army of immune cells that fight infection throughout the body, Chakraborty says. His team found that during their education, T cells from people with HLA-B*5701 see fewer bits of the body's own proteins. As a result, once the T cells leave the thymus, they think they see foreigners everywhere.

That can be a problem because these undereducated T cells sometimes mistake normal body proteins for invaders and attack, causing autoimmune diseases such as psoriasis and creating hypersensitivity to some drugs. But these aggressive, undereducated T cells are also better at attacking HIV.

http://www.sciencenews.org/view/generic/id/58895/title/_Undereducated_immune_cells_get_aggressive_with_HIV

New Detection Technology Identifies Bacteria, Viruses, Other Organisms Within 24 Hours



Lab biologist Crystal Jaing holds up a Microbial Detection Array slide developed by LLNL researchers that contains 388,000 probes. The array can detect or identify within a 24-hour period any of the approximately 60,000 viruses or 2,500 bacteria worldwide that have been sequenced. (Credit: Photo by Jacqueline McBride/LLNL)

ScienceDaily (May 6, 2010) — Law enforcement authorities seeking to detect bioterrorism attacks, doctors diagnosing diseases and regulatory agencies checking product safety may find a new ally in a Lawrence Livermore National Laboratory (LLNL) detection technology.

The advance, known as the Lawrence Livermore Microbial Detection Array (LLMDA), could enable law enforcement, medical professionals and others to detect within 24 hours any virus or bacteria that has been sequenced and included among the array's probes.

Developed between October 2007 and February 2008, the LLMDA detects viruses and bacteria with the use of 388,000 probes that fit in a checkerboard pattern in the middle of a one-inch wide, three-inch long glass slide.

The current operational version of the LLMDA contains probes that can detect more than 2,000 viruses and about 900 bacteria.

"The ability to detect the major bacterial and viral components of any sample can be used in countless different ways," said Tom Slezak, LLNL's associate program leader for Informatics. "This is important because it fills a cost-performance gap that is relevant to many missions: biodefense, public health and product safety."

In the area of biodefense, current systems are centered upon the detection of smaller prioritized sets of high-risk pathogens, rather than testing for a much broader spectrum of organisms.

"The LLMDA allows us to not only identify the biological pathogens on a priority screening list, but also any other already-sequenced bacteria or virus in a sample that you might not have been expecting to find, including possible novel or emerging pathogens," Slezak said.

Current plans call for the detection array to be evaluated for operational bioforensic use at the Frederick, Md.-based National Biodefense Analysis and Countermeasures Center of the U.S. Department of Homeland Security.

As the cost of the array is reduced, the LLMDA technology could be used to improve public health diagnostics, Slezak said, adding that dozens of bacteria and viruses can be detected in a single test from the entire spectrum of sequenced organisms.

One advantage of the Livermore array is that it provides researchers with the capability of detecting pathogens over the entire range of known viruses and bacteria. Current multiplex polymerase chain reaction (PCR) techniques can at most offer detection from among 50 organisms in one test.

In April, in a *Journal of Virology* article, Livermore researchers working with a scientist from the San Francisco-based Blood Systems Research Institute said they used the LLMDA technology to confirm the presence of an apparently benign pig virus in a vaccine.

The pig virus, porcine circovirus-1 (PCV-1), was unexpectedly found in GlaxSmithKline's Rotarix vaccine, which is used to prevent diarrhea in babies.

"One result of this research is that it demonstrates how modern technologies could change and drastically improve product safety," Slezak said.

While product safety rules require demonstrating that a list of known contaminants is not present, Slezak said the use of modern advances in DNA sequencing and arrays would allow manufacturers to identify the potential presence of contaminating biological material present in quantities large enough to be of potential concern.

"For each bacteria or virus that has been sequenced anywhere in the world, we have several dozen squares on the checkerboard that will identify sequences from that organism," Slezak explained.

Currently, Slezak's team is testing a next-generation LLMDA that boasts 2.1 million probes. This version contains probes representing about 178,000 viral sequences from some 5,700 viruses, and about 785,000 bacterial sequences from thousands of bacteria.

The latest LLMDA version also encompasses fungi and protozoa -- with probes representing about 237,000 fungal sequences from thousands of fungi and about 202,000 protozoa sequences from 75 protozoa.

As a screening tool, Slezak sees the LLMDA as occupying niche roles between PCR machines and sequencing.

The LLMDA process starts with the purification of DNA or RNA from a sample, such as sputum or blood. The sample is next labeled with a fluorescent dye and hybridized on the microarray at 42 degrees C or about 107.6 degrees Fahrenheit. In turn, a fluorescent scanner and analysis software are used to detect the probes that have lit up, identifying the presence of viral or bacterial sequences.

The Livermore team plans to update probes on the array with new sequences of bacteria, viruses and other microorganisms from GenBank and other public databases about once per year, in addition to using sequences obtained from collaborators for their probes.

LLNL's current collaborators include the University of California, San Francisco; the Blood Systems Research Institute; the University of Texas Medical Branch (Galveston); the National Institute for Public Health and the Environment of Bilthoven, the Netherlands; the Statens Serum Institut of Copenhagen, Denmark; the University of California, Davis; Imigene; the U.S. Food & Drug Administration; and the Marine Mammal Center of Sausalito, Calif.

A computer scientist and the team's leader, Slezak came up with the idea for the LLMDA in 2003. His team includes biologist Crystal Jaing, who leads the microarray lab work and manages the collaborations; bioinformaticist Shea Gardner, who designed the array; biostatistician Kevin McLoughlin, who designed the analysis software; and James B. Thissen, who performs the microarray experiments.

Story Source:

Adapted from materials provided by DOE/Lawrence Livermore National Laboratory, via EurekAlert!, a service of AAAS.

Journal Reference:

1. J. G. Victoria, C. Wang, M. S. Jones, C. Jaing, K. McLoughlin, S. Gardner, E. L. Delwart. **Viral nucleic acids in live-attenuated vaccines: detection of minority variants and an adventitious virus.**. *Journal of Virology*, 2010; DOI: 10.1128/JVI.02690-09

http://www.sciencedaily.com/releases/2010/05/100505143126.htm

Reveal-All Scanner for Works of Art

The mobile scanner at work on a test wall. A software system reveals the structure of the concealed paintings. (Credit: Copyright Fraunhofer IWS)

ScienceDaily (May 6, 2010) — Painted-over murals were thought to be irretrievably lost because conventional methods are seldom suitable to rendering the hidden works visible without causing damage. Research scientists now aim to reveal the secrets of these paintings non-destructively using terahertz beams.

Many church paintings are hidden from sight because they were painted over centuries ago. In the 16th century, for instance, Reformation iconoclasts sought to obscure the religious murals, while in later times the iconoclast images often were painted over once again. Several layers of paintings from various epochs can now be found superimposed on top of each other. If mechanical methods are used to uncover these pictures there is always a risk that the original work will be damaged. What's more, the more recent layers and pictures on top of the original, which are also worthy of preservation, would be destroyed. Research scientists at the Fraunhofer Institute for Material and Beam Technology IWS in Dresden are now working on a non-destructive method for rendering these works visible, which involves the use of terahertz (THz) radiation. In the TERAART project funded by the German federal ministry of education and research (BMBF) they are cooperating with Dresden University of Technology, the FIDA Institute for Historic Preservation in Potsdam and the Dresden Academy of Fine Arts.

"We use THz radiation because it can penetrate the plaster and lime wash even if the layer is relatively thick. Unlike UV radiation for example, THz radiation does not damage the work of art. Infrared beams cannot be considered because they do not penetrate deep enough. Microwaves offer no alternative either, because they do not achieve the necessary width and depth resolution," explains Dr. Michael Panzner, scientist at the IWS. A mobile system that can be used anywhere was developed to conduct the examinations. It consists of a scanner with two measuring heads which travels contactlessly over the wall.

One measuring head transmits the radiation, the other picks up the reflected beams. The researchers were supported by the Fraunhofer Institute for Physical Measurement Techniques IPM, which built the adapted THz component.

"To produce the THz radiation we use a femtosecond laser incorporating the design principle of a fiber laser. The THz time domain spectroscopy technique applied by us utilizes the short electromagnetic pulses with a duration of just one to two picoseconds produced by the femtosecond laser. Each layer and each pigment reflects these pulses differently so that both a picture contrast as well as depth information can be obtained," says Panzner. "The measured results provide information for example about the thickness of the layers, what pigments were used and how the colors are arranged. A specially developed software system puts the measured results together to form a picture displaying the structure of the concealed paintings."

On a test wall, on which paintings in various types of paint were painted over with distemper, the scientists have already succeeded in revealing the structures of the concealed pictures. The next step will be to conduct a practical test in a church. The experts are also confident of being able to use THz radiation to detect the presence of carcinogenic biocides on and in works of art made of wood or textiles. "Preservationists will be very interested in our reveal-all-scanner for works of art," affirms Panzner.

Story Source:

Adapted from materials provided by Fraunhofer-Gesellschaft.

http://www.sciencedaily.com/releases/2010/05/100503111742.htm

Extended Hepatitis C Treatment After Liver Transplant May Benefit Patients

ScienceDaily (May 6, 2010) — Extending hepatitis C treatment for liver transplant patients beyond current standards results in high clearance rates of the hepatitis C virus from the blood, and a low relapse rate, according to a study by Henry Ford Hospital.

"We found that patients who achieved a sustained virological response were more likely to have had extended treatment after transplant," says Matthew Moeller, M.D., gastroenterology fellow at Henry Ford Hospital and lead author of the study.

"In the study, we saw a trend toward decreased mortality as sustained virological response was found to be associated with a 100 percent five-year survival rate vs. 86 percent for those without."

Although, statistically insignificant, the trend could show significance with longer follow-up and a larger sample size, explains Dr. Moeller.

Study results were presented May 2 at the Digestive Diseases Week conference in New Orleans.

The study looked at 241 consecutive liver transplant patients from 1999-2006. Patients were offered treatment if they tested positive for hepatitis C, had recurrent hepatitis C with at least Stage I fibrosis on biopsy, and stable immunosuppression for a minimum of three months. Patients received either non-pegylated interferon tiw or pegylated interferon weekly in combination with ribavirin.

Of the study patients with hepatitis C, 66 were eligible for treatment, and 22 achieved sustained virological response. Only two patients (8 percent) relapsed. This is in contrast to typical relapse rates of 30-35 percent in non-transplant patients treated with standard therapy. Genotype 1 patients failed more than genotype 2 or 3 patients in achieving sustained virological response (27 percent vs. 70 percent).

Dr. Moeller notes that 35 percent of patients who went on to achieve sustained virological response first became virus-negative at or following week 24.

"Our results suggest that even if patients are positive at week 24, there is still a 35 percent chance that they can achieve sustained viral clearance with extended treatment," says Dr. Moeller.

According to the U.S. Department of Health & Human Services, more than 16,000 liver transplants were performed last year and there are currently almost 18,000 Americans on the liver transplant list.

Story Source:

Adapted from materials provided by Henry Ford Health System.

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Scientists Unlock the Secret of How Cells Maintain the Spatial Distribution of Proteins

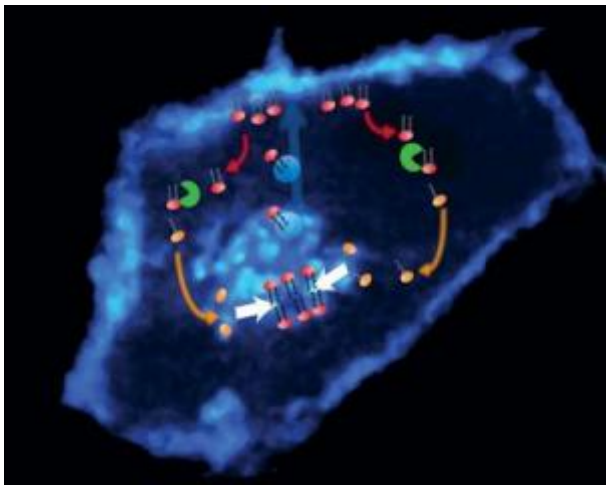

Image of the spatial distribution of the Ras protein (fluorescent blue), which is embedded in the cell membrane (edge) and the Golgi-apparatus (center). This photo montage shows how the distribution patterns of Ras are kept in balance: the Ras, equipped with a lipid anchor (red), is transported in membrane vesicles (blue circles) from the Golgi-apparatus to the cell membrane. The enzyme APT1 (green) removes the palmitoylation anchor in those Ras-molecules, which build up in other membranes. The depalmitoylated Ras (orange) then swim freely throughout the cell and are absorbed into the Golgi apparatus, and the cycle can start all over again. Cells thus use a simple principle to transport Ras and other palmitoylated proteins to their destination: a localised distribution centre (Golgi), directed transport to the target destination as well as universal removal of target marks (depalmitoylierung) and subsequent reintegration into the transport cycle. (Credit: Philippe Bastiaens, Max Planck Institute of Molecular Physiology)

ScienceDaily (May 6, 2010) — All life on earth is threatened by chaos. In this sense, a cell is like a ship which could at any moment sink in a sea of chaos. It must constantly consume energy to maintain the same level of order to avoid going under -- metaphorically speaking, the infiltrating water of chaos needs to be pumped out, permanently.

Scientists from the Max Planck Institute of Molecular Physiology in Dortmund have now discovered how cells ensure the correct distribution of proteins throughout their interior. What they have found is that many of the proteins which need to be transported to the cell membrane are furnished with a kind of anchor consisting of a fatty acid, which serves to embed the proteins in the cell membrane. But since the membrane is also from where they gain access to the cell organelle, the anchor is removed from the proteins after a short while. So the cell adopts an unspecific approach to plugging this leak, unlike when transporting them to the membrane. In discovering this, the scientists have lifted the lid on the simple principle that cells use to control the complex localisation of proteins and thereby maintain a high level of order.

Furthermore, these findings may also pave the way for new methods of cancer therapy: in an additional study the scientists successfully managed to jumble the spatial distribution of the cancer protein Ras using a new inhibitor, thereby disrupting its transforming signals.

The research is published in the journals *Cell* (23 April 2010) and *Nature Chemical Biology* (25 April 2010).

Within a cell there are a huge number of substances that need to be transported. An organelle known as the Golgi apparatus serves as the 'shunting yard' for the process. Proteins and other substances are made ready to do their respective jobs and prepared for transportation inside the Golgi, which is surrounded by

a membrane of its own. Little bubbles (vesicles) are pinched off from the membrane and directed towards their ultimate destinations. Many of the proteins which need to be transported to the cell membrane are first furnished with a molecule of fatty acid, or lipid.

This process, known as palmitoylation, equips the membrane proteins with a kind of address label and ships them off to the cell membrane. The cell uses this directed transportation from the Golgi apparatus to the cell membrane as a means of countering the permanent 'leakage' into other membranes that occurs. This is important because, besides the cell membrane, the cell is filled with membranes from organelles connected to one another via vesicles. Consequently, palmitoylated membrane proteins, originally intended for the cell membrane only, also reach other locations. With time, these proteins would then be distributed randomly throughout the cell.

The scientists in Dortmund were able to use cutting-edge microscopy techniques to monitor customised molecular probes in living cells and thereby analyse the location and the transportation of palmitoylated proteins in real time. What they found is that palmitoylation takes place predominantly at the Golgi apparatus. From there, palmitoylated proteins reach the cell membrane on the surface of the vesicles that are pinched off. In order to prevent the proteins from building up in other membranes, special enzymes remove the lipid anchor from all palmitoylated proteins indiscriminately. The proteins then swim freely throughout the cell until they find themselves thrown back into the transport mechanism of the Golgi apparatus.

In this way, the cell ensures that misdirected proteins are quickly and continually fed back into the transport network and conveyed to their correct destination. "A state of this kind, one which is not in equilibrium and can only be sustained by constant energy consumption, is what characterises all life -- in contrast to complex non-living systems like crystals, which occupy a state of equilibrium with minimal energy consumption," explains Philippe Bastiaens, Head of the Department of Systemic Cell Biology at the Max Planck Institute of Molecular Physiology. Thus, the scientists have discovered a fundamental principle of life.

Complex task, simple solution

But how does the cell know which proteins need to be addressed to the cell membrane whilst they are in the Golgi apparatus? According to the scientists, any protein can obtain a lipid anchor if it has the amino acid called cysteine readily accessible on its surface. It would then be transported automatically to the cell membrane. Such transportation therefore does not require any receptors which specifically bind to the protein at the cellular site where it is supposed to go.

This is a fascinating example of how complex processes can be controlled with simple physical and chemical rules. At first glances, it would appear to be enormously challenging to identify the proteins that need to be transported to a certain location, to spot any that have been transported to the wrong place and to stop them radiating off from their ultimate destination. Yet the cell manages this in a really simple way without any additional receptors or regulatory mechanisms. Other self-organising systems, too -- such as insect colonies -- often work on relatively simple principles. They would otherwise be unable to handle the multitude of tasks they need to perform.

"These findings represent a milestone. They will change the way research in cellular biology is done. It's only when we as scientists understand the principles by which life works that we are truly able to understand life. Focussing on the many different signalling pathways within the cell doesn't really help that much," says Philippe Bastiaens.

New substance inhibits cancer protein

The research group even went a step further, laying the foundations for the findings to potentially be applied in cancer therapy. The Ras protein is a prominent representative of the palmitoylated proteins.

Mutations in the ras gene can be found in many tumours. However, it is only able to function fully when it is embedded in the cell membrane and does not get into any other membranes. So the scientists developed an inhibitor they called palmostatin B to counteract the enzyme responsible for detaching the lipid anchor. When the enzyme is switched off, the palmitoylated Ras remains embedded in the cell membrane, from whence it gets into the membrane of other cellular organelles.

"This was a brand new approach -- and it actually goes against common sense. That's why it was never taken any further in pharmaceutical research. What we did was this: instead of inhibiting directed transportation from the Golgi apparatus, we promoted random distribution within the cell," explains Herbert Waldmann, Head of the Department of Chemical Biology at the Max Planck Institute in Dortmund.

For the first time ever, the scientists using palmostatin B were able to inhibit the Ras protein without switching it off completely. If Ras is completely inactivated, even healthy cells die. By contrast, random distribution within the cell suppresses only the harmful impact of the mutated Ras protein. Cancer cells thus become normal cells again. Thanks to this discovery, Ras-dependent tumours could one day be treated in a manner that does not damage healthy cells.

Story Source:

Adapted from materials provided by Max-Planck-Gesellschaft.

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How Dark Chocolate May Guard Against Brain Injury from Stroke

A compound in dark chocolate may protect the brain after a stroke by increasing cellular signals already known to shield nerve cells from damage, new research shows. (Credit: iStockphoto/Lasse Kristensen)

ScienceDaily (May 5, 2010) — Researchers at Johns Hopkins have discovered that a compound in dark chocolate may protect the brain after a stroke by increasing cellular signals already known to shield nerve cells from damage.

Ninety minutes after feeding mice a single modest dose of epicatechin, a compound found naturally in dark chocolate, the scientists induced an ischemic stroke by essentially cutting off blood supply to the animals' brains. They found that the animals that had preventively ingested the epicatechin suffered significantly less brain damage than the ones that had not been given the compound.

While most treatments against stroke in humans have to be given within a two- to three-hour time window to be effective, epicatechin appeared to limit further neuronal damage when given to mice 3.5 hours after a stroke. Given six hours after a stroke, however, the compound offered no protection to brain cells.

Sylvain Doré, Ph.D., associate professor of anesthesiology and critical care medicine and pharmacology and molecular sciences at the Johns Hopkins University School of Medicine, says his study suggests that epicatechin stimulates two previously well-established pathways known to shield nerve cells in the brain from damage. When the stroke hits, the brain is ready to protect itself because these pathways -- Nrf2 and heme oxygenase 1 -- are activated. In mice that selectively lacked activity in those pathways, the study found, epicatechin had no significant protective effect and their brain cells died after a stroke.

The study now appears online in the *Journal of Cerebral Blood Flow and Metabolism*.

Eventually, Doré says, he hopes his research into these pathways could lead to insights into limiting acute stroke damage and possibly protecting against chronic neurological degenerative conditions, such as Alzheimer's disease and other age-related cognitive disorders.

The amount of dark chocolate people would need to consume to benefit from its protective effects remains unclear, since Doré has not studied it in clinical trials. People shouldn't take this research as a free pass to go out and consume large amounts of chocolate, which is high in calories and fat. In fact, people should be reminded to eat a healthy diet with a variety of fruits and vegetables.

Scientists have been intrigued by the potential health benefits of epicatechin by studying the Kuna Indians, a remote population living on islands off the coast of Panama. The islands' residents had a low incidence of cardiovascular disease. Scientists who studied them found nothing striking in the genes and realized that when they moved away from Kuna, they were no longer protected from heart problems.

Researchers soon discovered the reason was likely environmental: The residents of Kuna regularly drank a very bitter cocoa drink, with a consistency like molasses, instead of coffee or soda. The drink was high in the compound epicatechin, which is a flavanol, a flavanoid-related compound.

But Doré says his research suggests the amount needed could end up being quite small because the suspected beneficial mechanism is indirect. "Epicatechin itself may not be shielding brain cells from free radical damage directly, but instead, epicatechin, and its metabolites, may be prompting the cells to defend themselves," he suggests.

The epicatechin is needed to jump-start the protective pathway that is already present within the cells. "Even a small amount may be sufficient," Doré says.

Not all dark chocolates are created equally, he cautions. Some have more bioactive epicatechin than others.

"The epicatechin found in dark chocolate is extremely sensitive to changes in heat and light" he says. "In the process of making chocolate, you have to make sure you don't destroy it. Only few chocolates have the active ingredient. The fact that it says 'dark chocolate' is not sufficient."

The new study was supported by grants from the National Institutes of Health and the American Heart and Stroke Association.

Other Johns Hopkins researchers on the study include Zahoor A. Shah, Ph.D.; Rung-chi Li, Ph.D.; Abdullah S. Ahmad, Ph.D.; Thomas W. Kensler, Ph.D.; and Shyam Biswal, Ph.D.

Story Source:

Adapted from materials provided by Johns Hopkins Medical Institutions, via EurekAlert!, a service of AAAS.

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Scientists Describe the Nest of an Uncommon Solitary Bee

A solitary female bee from species Osmia avosetta carries a petal into nest that she's constructing underground. (Credit: J.G. Rozen)

ScienceDaily (May 5, 2010) — In a rare coincidence, researchers working in both Turkey and Iran discovered on the same day how a rare species of bee builds its underground nests. The females from the solitary species *Osima (Ozbekosima) avoseta* line the nest's brood chambers with petals of pink, yellow, blue, and purple flowers. The chambers provide nutrients for the larvae to grow and mature and protect the next generation as they wait out the winter.

The new research was published this February in *American Museum Novitates*.

"It was absolute synchronicity that we all discovered this uncommon behavior on the same day," says Jerome Rozen, curator in the Division of Invertebrate Zoology at the American Museum of Natural History. Rozen and colleagues were working near Antalya, Turkey while another group of researchers were in the field in Fars Province, Iran. "I'm very proud of the fact that so many authors contributed to this paper."

Bees are the most important animal pollinators living today, and many flowering plants depend on bees to reproduce. But nearly 75% of bee species -- and there are about 20,000 species described -- are solitary. This means that for the majority of bees, a female constructs a nest for herself and provisions each chamber in the nest with food for the larval stage of her brood. When each chamber is ready, the female deposits an egg and closes the nest if there is only one chamber to a nest. The nests -- found in the open in the ground -- need to be protected from any number of potential threats to their physical structure like compaction of the soil, desiccation, or excessive heating. The survival of solitary bee species also depends on protection from molds, viruses, bacteria, parasites, and predators.

In *O. avosetta*, the female builds a nest in one or two vertical chambers close to the surface, or between 1.5 and 5 cm below ground. Entering from the top, the adult female lines each chamber with overlapping petals, starting at the bottom. The female then ferries claylike mud to the nest, plasters a thin layer (about 0.5 mm thick) on the petals, and finishes the lining with another layer of petals. The nest is essentially a petal sandwich, built in the dark.

When the physical structure is ready, female *O. avosetta* gather provisions of a sticky mix of nectar and pollen and place it on the chamber's floor. An egg is deposited on its surface, and the chamber is closed by carefully folding the petals at the top. The nest is capped with a plug of mud, sealing the young bee in a humid chamber that becomes rigid and protects the larvae as it eats its rations, spins a cocoon, and falls into a 10-month sleep until spring. The nests of the species can be parasitized by a wasp that lays an egg in the brood chamber and kills the *O. avosetta* egg with enlarged jaws and then devours the provisions.

"In this species, a female shingles the wall of her brood chambers with large pieces of petals or with whole petals, often of many hues," says Rozen. "Unfortunately, her larvae never enjoy the brilliant colors of the nest's walls because they have no eyes -- and, anyhow, they would need a flashlight!"

In addition to Rozen, authors include Hikmet Özbek of Atatürk University's Department of Plant Protection in Erzurum, Turkey; John S. Ascher of the Division of Invertebrate Zoology at the Museum; Claudio Sedivy and Andreas Müller of ETH Zurich's Applied Entomology in Zürich, Switzerland; Christophe Praz of Cornell University's Department of Entomology in Ithaca, New York; and Alireza Monfared of Yasouj University's Department of Plant Protection in Yasouj, Iran. Funding for this research came from Robert G. Goelet, the American Museum of Natural History, and other individuals and institutions.

Story Source:

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http://www.sciencedaily.com/releases/2010/05/100504124736.htm

How World's Smallest 'Coffee Ring' May Help Biosensors Detect Disease

Coffee ring formation at decreasing droplet size. When using 100 nanometer-sized particles, the smallest coffee ring is about 10 micrometers in diameter, which is about one-tenth the diameter of a human hair. (Credit: Image courtesy of UCLA)

ScienceDaily (May 5, 2010) — The field of biosensing has recently found an unlikely partner in the quest for increased sensitivity: coffee rings. The next time you spill your coffee on a table, look at the spot left after the liquid has evaporated, and you'll notice it has a darker ring around its perimeter that contains a much higher concentration of particles than the center.

Because this "coffee ring" phenomenon occurs with many liquids after they have evaporated, scientists have suggested that such rings can be used for examining blood or other fluids for disease markers by using biosensing devices. But a better understanding of how these rings behave at the micro- and nano-scale would probably be needed for practical bionsensors.

"Understanding micro- and nano-particle transportation within evaporating liquid droplets has great potential for several technological applications, including nanostructure self-assembly, lithography patterning, particle coating, and biomolecule concentration and separation," said Chih-Ming Ho, the Ben Rich-Lockheed Martin Professor at the UCLA Henry Samueli School of Engineering and Applied Science and director of the UCLA Center for Cell Control. "However, before we can engineer biosensing devices to do these applications, we need to know the definitive limits of this phenomenon. So our research turned to physical chemistry to find the lowest limits of coffee-ring formation."

A research group led by Ho, a member of the National Academy of Engineering, has now found the definitive microscopic minimal threshold of coffee-ring formation, which can be used to set standards for biosensor devices for multiple disease detection, as well as other uses. The research appears in the current issue of the *Journal of Physical Chemistry B* and is available online.

"If we consider human blood, or saliva, it has a lot of micro- and nano-scale molecules or particles that carry important health information," said Tak-Sing Wong, one of the researchers and a postdoctoral scholar in UCLA Engineering's department of mechanical and aerospace engineering. "If you put this blood or saliva on a surface, and then it dries, these particles will be collected in a very small region in the ring. By doing so, we can quantify these biomarkers by various sensing techniques, even if they are very small and in a small amount in the droplets."

As water evaporates from a droplet, particles that are suspended inside the liquid move to the droplet's edges. Once all the water has evaporated, the particles are concentrated in a ring around the stain that is

left behind. However, if a droplet is small enough, the water will evaporate faster than the particles move. Rather than a ring, there will be a relatively uniform concentration in the stain, as the particles have not had enough time to move to the edges while still in the liquid.

"It is the competition between the timescale of the evaporation of the droplet and the timescale of the movement of the particles that dictates coffee-ring formation," said Xiaoying Shen, the paper's lead author and a senior microelectronics major at Peking University in China, who worked on these experiments while at the UCLA Cross Disciplinary Scholars in Science and Technology (CSST) program last summer.

To determine the smallest droplet size that would still show a coffee ring after evaporation, the research team manufactured a special surface coated in a checkerboard pattern that featured alternating hydrophilic, or water-loving, material and hydrophobic, or water-repelling, material.The group then placed latex particles, ranging in size from 100 nanometers to 20 nanometers, in water. The particles were similar in size to disease-marker proteins that biosensors would look for.The group washed the new surface with the particle-infused water. The remaining water lined up as droplets on the hydrophilic spots, much like checkers on a checkerboard. The group repeated the experiments with smaller grid patterns until the coffee-ring phenomenon was no longer evident. For the 100-nanometer sized particles, this occurred at a droplet diameter of approximately 10 micrometers, or about 10 times smaller than the width of a human hair. At this point, the water evaporated before the particles had enough time to move to the perimeter.

"Knowing the minimum size of this so-called coffee ring will guide us in making the smallest biosensors possible," Wong said. "This means that we can pack thousands, even millions, of small micro-biosensors onto a lab-on-a-chip, allowing one to perform a large number of medical diagnostics on a single chip. This may also open the doors to potentially detecting multiple diseases in one sitting."

"There's another important advantage -- this whole process is very natural, it's just evaporation," Wong added. "We don't need to use additional devices, such as an electrical power source or other sophisticated instruments to move the particles. Evaporation provides a very simple way of concentrating particles and has potential in medical diagnosis. For example, researchers at Vanderbilt University were recently awarded a Gates Foundation Research Fund for proposing the use of the coffee-ring phenomenon for malaria detection in developing countries."The researchers are currently optimizing the ring formation parameters and will then explore the application of this approach toward biosensing technologies that are being developed in Ho's laboratory.The research was supported by the Center for Cell Control through the National Institutes of Health's Roadmap for Nanomedicine and by the Center for Scalable and Integrated Nanomanufacturing through the National Science Foundation. Shen received financial support from UCLA's Cross Disciplinary Scholars in Science and Technology (CSST) program.

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Adapted from materials provided by University of California - Los Angeles. Original article written by Matthew Chin.

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One Sleepless Night Can Induce Insulin Resistance in Healthy People

New research shows that just one night of short sleep duration can induce insulin resistance, a component of type 2 diabetes. (Credit: iStockphoto/Sharon Dominick)

ScienceDaily (May 5, 2010) — According to a new study accepted for publication in The Endocrine Society's *Journal of Clinical Endocrinology & Metabolism* (JCEM), just one night of short sleep duration can induce insulin resistance, a component of type 2 diabetes.

"Sleep duration has shortened considerably in western societies in the past decade and simultaneously, there has been an increase in the prevalence of insulin resistance and type 2 diabetes," said Esther Donga, MD of the Leiden University Medical Center in The Netherlands and lead author of the study. "The co-occurring rises in shortened sleep and diabetes prevalence may not be a coincidence. Our findings show a short night of sleep has more profound effects on metabolic regulation than previously appreciated."

Previous studies have found that reductions in sleep duration over multiple nights result in impaired glucose tolerance, but this is the first study to examine the effects of only a single night of partial sleep restriction on insulin sensitivity.

In this study, researchers examined nine healthy subjects, once after a night of normal sleep duration (approximately eight hours), and once after a night of four hours of sleep. Insulin sensitivity of each study participant was measured using the hyperinsulinemic euglycemic clamp method. This method uses catheters to infuse glucose and insulin into the bloodstream and then determines insulin sensitivity by measuring the amount of glucose necessary to compensate for an increased insulin level without causing hypoglycemia.

"Our data indicate that insulin sensitivity is not fixed in healthy subjects, but depends on the duration of sleep in the preceding night," said Donga. "In fact it is tempting to speculate that the negative effects of

multiple nights of shortened sleep on glucose tolerance can be reproduced, at least in part, by just one sleepless night."

Donga adds that further studies are needed to evaluate whether interventions aimed at improving sleep duration may be beneficial in stabilizing glucose levels in patients with diabetes.

Other researchers working on the study include: Marieke van Dijk, J. Gert van Dijk, Neinke Biermasz, Gert-Jan Lammers, Klaas van Kralingen, Eleonara Corssmit and Johannes Romijn of Leiden University Medical Center in The Netherlands.

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Adapted from materials provided by The Endocrine Society, via EurekAlert!, a service of AAAS.

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http://www.sciencedaily.com/releases/2010/05/100505091632.htm

Researchers Discover Pathogens Floating on Tiny Clumps of Aquatic Detritus

Islands of germs: aquatic pathogens hitch a ride on tiny floating clumps called marine snow. (Credit: WHOI)

ScienceDaily (May 5, 2010) — Researchers have found evidence that "marine snow"--aggregates of organic material floating in water bodies--may act as microscopic, island-like refuges for pathogens, or disease-causing organisms. This detritus may skew water sampling procedures and mathematical models used to predict the transmission of waterborne diseases to humans.

The scientists responsible for these findings, funded by a National Science Foundation (NSF)-National Institutes of Health (NIH) Ecology of Infectious Diseases (EID) grant, published their results in the journal *Aquatic Microbial Ecology*.

The findings are the first to compare the existence of pathogens on marine snow with the way insects, amphibians and other creatures establish homes and persist on remote islands in the oceans.

Theories in island biogeography--the study of the factors that affect species richness on islands--also apply to microscopic drifting aggregates, according to Maille Lyons, a scientist at Old Dominion University (ODU) and lead author of the paper, with ODU co-authors Fred Dobbs and Holly Gaff. Other authors are J. Evan Ward of the University of Connecticut; Randall Hicks of the University of Minnesota, Duluth; and John Drake of the University of Georgia.

"These predictions help explain whether and for how long bacteria can thrive on an individual aggregate," said Lyons, "and the relationship between the size of the aggregate and the diversity of species found on it."

"This study shows that theory developed for the 'macroscopic' world applies equally to the microscopic one," said Sam Scheiner, program director in NSF's Division of Environmental Biology, which co-funds the EID program with NSF's Directorate for Geosciences.

"It allows scientists to link the small to the large," said Scheiner, "and to provide predictive tools for understanding disease transmission."

Aggregates are made up of small bits of detritus and other components--some of which are living organisms--that usually aren't visible to the naked eye. When these tiny components come in contact with each other, they clump together.

The scientists are evaluating the degree to which detritus-based organic aggregates provide a favorable microclimate for aquatic pathogens.

These "refuges" seem to protect pathogens from stressors such as sunlight and salinity changes, and from predators. They also may provide sources of nourishment for the pathogens.

"If the microclimate is favorable, aggregates likely facilitate the persistence, prevalence and dispersal of aquatic pathogens," said Dobbs.

The researchers found an increased metabolic response, and diversity of bacteria, on individual organic aggregates compared to the surrounding water, indicating that aggregates may be potential reservoirs and vectors for aquatic pathogens.

Current models of the transmission of waterborne diseases and illnesses, however, don't consider the benefits microorganisms gain from hitching a ride on marine snow.

"We've shown, for example, that vibrios [a type of pathogen] proliferate in aggregates and decline in adjacent, aggregate-free water," the journal paper states.

When water sampling is conducted--to determine whether recreational waters should be open to swimmers, or whether shellfish beds should be closed to fishers--aggregates lend a hit-or-miss aspect to the testing.

A sample might include only water without aggregates, giving false-negative results that no danger exists.

"The presence or absence of a single aggregate in an environmental water sample," said Dobbs, "could drastically alter the measure of bacterial concentrations."

Story Source:

Adapted from materials provided by National Science Foundation.

Journal Reference:

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