Infoteca's E-Journal

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Cleaning Up Intersection of Ancient and Modern
By ETHAN BRONNER

JERUSALEM — The director of the Israel Museum was leading a visitor to see a provocative contemporary sculpture of a naked African youth when, stepping over protective cloths and around an exhibit of late Canaanite sarcophagi, he nearly ran into four workmen carrying the million-year-old horns of a wild bull.

The horns are the oldest items in the museum's collection, and something about the juxtaposition of contemporary social consciousness, ancient ceremony and prehistoric beast summed up the museum's refocused mission as it completes a three-year, $100 million renewal. As described by the director, James S. Snyder, the museum offers a series of unexpected aesthetic links across cultures and their histories, like the way 2,000-year-old carved ritual cups that are on view in the museum near the Dead Sea Scrolls are somehow evocative of Brancusi.

For the last 45 years, the Israel Museum has been both the crown jewel of this country's cultural heritage and a bit of a mess. It has the most extensive holdings of land-of-Israel archaeology anywhere (including a heel bone pierced by an iron nail with wood fragments, the world's only physical evidence of crucifixion), an encyclopedic collection of Judaica and an exceptional group of Modernist artworks. It sits on a 20-acre campus atop a hill at Jerusalem's western entrance, holding pride of place along with the architectural and national landmarks that surround it, including the Knesset, or parliament, and the Supreme Court.

But as any past visitor can attest, finding one's way around the museum's art and archaeology has not been easy. Visits have begun with an uphill trek from a parking lot exposed to the hot sun and, inside the galleries, a feeling of being overwhelmed by quantity and mildly perplexed about substance.

That is about to change. On Monday the museum opens new galleries and public spaces. There will be far fewer objects on display, with twice the space to view them, as well as richer links and explanations. In some

of the new spaces soft light enters through filtered glass walls, the Jerusalem landscape a dreamy background presence. And a climate-controlled path leads to a central concourse from which the works can be reached.

The idea is not simply to make the museum easier to navigate but also to suggest interesting connections among objects and between the particular and the universal. That is never an easy task in this city of stones, where each culture has long sought dominance and where the interplay between preservation and transformation causes endless heartache.

And today, here in the capital of the Jewish state, there is a tendency to see the world purely through Jewish history and culture. That is precisely what Mr. Snyder, an American Jew who spent 22 years at the Museum of Modern Art, has sought to avoid. Rather, he has emphasized the commonalities of cultures and tried to place Jewish history and practices in a broader and clearer context.

One example is a new display that focuses on the Byzantine era. On one side is a restored synagogue; next to it are a church and the prayer niche of a mosque. Roughly contemporary structures, they are placed in a way that highlights both their distinctiveness and their commonality.

Meanwhile, the sections that used to be devoted to Judaica and Jewish ethnography are now merged into "Jewish Art and Life," connecting the secular with the religious. The Judaica gallery used to feed inexplicably into French Impressionism. Now it sits near costumes and jewelry of the Jewish world and the early sources for modern art in Israel. A narrative arc takes shape.

"A lot of Israelis consider Tel Aviv to be the center of the country's culture, but Jerusalem is the center of the world," Mr. Snyder said. "It's a bridge that connects Africa, Asia and Europe, a multicultural city, and I feel the power of that every day."

As part of the renovation, the museum commissioned a sculpture by the Indian sculptor Anish Kapoor that stands at the top of the campus. A 16-foot-tall polished-steel hourglass called "Turning the World Upside Down, Jerusalem," it reflects and reverses the Jerusalem sky and the museum's landscape, a likely reference to the city's duality of celestial and earthly, holy and profane.

When Mr. Snyder arrived in 1996 to consider becoming the museum's director, he had never been here before. He was stunned at the power of the museum's site, built like a modular Mediterranean village in an intensely Modernist style. But he felt it was an unrealized vision and set himself the task of finishing it during his tenure. In his 13 years on the job, he has added a huge and hugely popular outdoor model of how Jerusalem is thought to have looked 2,000 years ago and has groomed and expanded the campus and its celebrated Billy Rose Art Garden, a Middle Eastern hillside with Western works by Rodin, Picasso, Henry Moore and Claes Oldenberg. The Shrine of the Book, containing the Dead Sea Scrolls, the oldest known surviving copies of biblical documents, sits next to it.

The renewal has been led by James Carpenter Design Associates of New York and Efrat-Kowalsky Architects of Tel Aviv, and their goal has been to respect the architecture originally designed by Alfred Mansfeld and Dora Gad in the late 1950s.

Mr. Snyder raised the money around the world and has added important pieces and collections. And now he has completed, on time and on budget, the biggest cultural development project in the country's history.

To some here, that makes him a local hero. But Mr. Snyder, 58, is also an anomaly, and many people do not know what to make of him. He has never acquired Israeli citizenship or learned more than basic Hebrew. In a

country where dressing up often means donning a clean T-shirt, he has kept the look of an Ivy League professor of a generation ago: tortoiseshell glasses, perfectly knotted knit tie, herringbone jacket and a crown of coiffed silver hair.

In a society built on the idea that Jews here have come home, Mr. Snyder has caused some consternation. He says his contribution to Israel is to help build a world-class institution and to urge the society to look toward the universal rather than the provincial.

He has also reached out to Israeli Arabs, recruiting the first Arab member to the executive committee of the museum's Israeli Friends group and extending educational projects to Arab school groups beyond Jerusalem, including sponsoring a Jewish-Arab sculpture project among the youth of Umm al Fahm, one of Israel's largest Arab cities. He plans to do similar work in Nazareth next year.

In the newly expanded museum, there is much more room for temporary exhibits. For the rest of the year, three of those galleries have been given over to Zvi Goldstein, Yinka Shonibare and Susan Hiller — an Israeli, a British-Nigerian and a London-based American — with each asked to do an installation using anything in the museum's collection of some 500,000 pieces.

The other day, as Mr. Snyder was avoiding the ancient bull horns, Mr. Goldstein was hard at work in his room. He had been filling it for 18 months, he said, and the objects he was mounting included drills and spears, furniture, paintings and a urinal. He selected 600 pieces for his installation.

"The goal is to show how pieces of material culture shift in meaning over time," he said, "how they can make surprising connections."

Mr. Snyder could not have said it better himself.

This article has been revised to reflect the following correction:

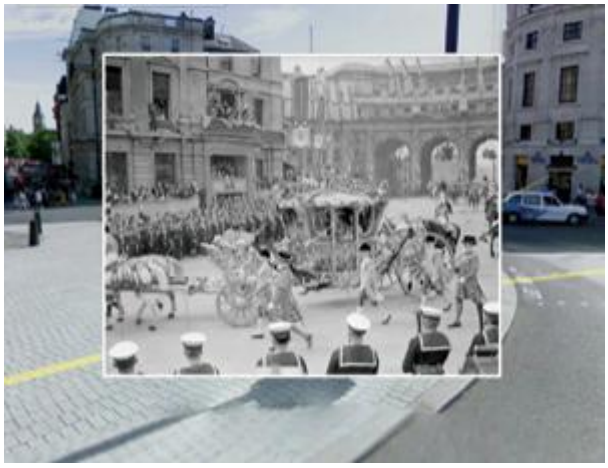
Correction: July 26, 2010

A picture caption on Wednesday with an article about the renovation of the Israel Museum in Jerusalem misstated the given name of an artist who has a large installation there and omitted the second part of the work's title. The artist is Carlos Amorales, not Claudio, and the full title is "Black Cloud (latent studio)."

http://www.nytimes.com/2010/07/21/arts/design/21museum.html

Camera app puts you in the footsteps of history

- 24 July 2010
- Magazine issue 2770.



If these cobbles could speak (Image: Historypin.com/Mirror Pix)

SUPERIMPOSING a historic photo on an up-to-date snap of the same scene is a neat way to bring history to life, as the website historypin.com demonstrates.

If you want to take a modern photo that will contrast effectively with its historical counterpart, though, you need to ensure it is taken from the same spot, and with the same zoom level. If you don't, the combined picture ends up looking disjointed, with roofs, walls and roads poorly matched.

Ensuring a modern photo is taken from the same position as its historic counterpart is tricky

Help is at hand, however, in the form of new software for digital cameras that helps people get their shot-framing spot on.

Frédo Durand and Soonmin Bae at the Massachusetts Institute of Technology in Boston, with Aseem Agarwala of Adobe Systems in San Jose, California, turned to a technique called visual homing to come up with an answer (ACM Transactions On Graphics, DOI: 10.1145/1805964.1805968). Visual homing is used in robotics to send a machine to a precise location, such as a charging station.

The team's software runs on a laptop linked to a digital camera. The software compares the camera's view to a preloaded historical scene and provides instructions to adjust the camera's position and zoom to best match the scene.

The laptop is a temporary measure, however: "We envision the tool running directly on the camera," the team says.

http://www.newscientist.com/article/mg20727704.200-camera-app-puts-you-in-the-footsteps-of-history.html

Laughter's secrets: How to make a computer laugh

- 23 July 2010 by Trevor Cox
- Magazine issue 2769.

Am I supposed to activate my laugher circuits? (Image: Peter Menzel/SPL)

It would be fun to have a robot throw its head back and guffaw convulsively. Acousticians like me, however, simply want to synthesise a convincing sound. That's a tough task, given how much our laughs and giggles can vary.

For one thing, humans can change the vowel sound of their laughs - from "tee-hee" to "ho ho ho", though "ha ha ha" is the most common (Journal of the Acoustical Society of America, vol 110, p 1581). We also vary the prosody - the stresses, rhythm and intonation - within and between laughs, helping us to convey different characteristics such as joy and ridicule (Emotion, vol 9, p 397). Shrieks of laughter, in which the vocal folds vibrate to give a distinctive pitch to the sound (see diagram), differ from snorts, grunts and pants, where the vocal folds do not vibrate. These "unvoiced" sounds seem less popular with listeners (Psychological Science, vol 12, p 252).

We want you to help us test the best in laughter synthesis in an experiment that pits examples from leading researchers against one another. Each bionic chuckle was produced using a different technique, but the goal is the same: to add laughter to synthesised speech to make it sound more natural.

Jürgen Trouvain and colleagues from the University of Saarland in Saarbrücken, Germany, for example, model the movements of the vocal tract and air flow. Grégory Beller at the Pierre and Marie Curie University in Paris, France, on the other hand, takes an algorithm that turns text into speech and then alters the prosody to try and convey different emotions.

Meanwhile Shiva Sundaram at Deutsche Telekom in Berlin, Germany, uses a technique called linear predictive speech coding to generate individual laughs ("ha"), and a simple algorithm to work out their timing. Jérôme Urbain from the University of Mons, Belgium, mixes and manipulates single laughs drawn from real laughter.

Which technique is most effective? You decide. Our online experiment, found at www.soundsfunny.org/turing/, is very simple to use. Just audition a set of sounds, and after each one say whether it was a computer or a human laughing. Can you spot the fakes?

Read more: The secrets of laughter

Trevor Cox is professor of acoustic engineering at the University of Salford, UK, and president of the UK Institute of Acoustics

http://www.newscientist.com/article/mg20727691.900-laughters-secrets-how-to-make-a-computer-laugh.html

An evil atmosphere is forming around geoengineering

- 21 July 2010 by Clive Hamilton
- Magazine issue 2769.

Krakatoa - an inspiration for more than just art? (Image: Roger-Viollet/Rex Features)

IN 1892 Edvard Munch witnessed a blood-red sunset over Oslo, Norway. Shaken by it, he wrote in his diary that he felt "a great, unending scream piercing through nature". The incident inspired him to create his most famous painting, The Scream.

The striking sunset was probably caused by the eruption of Krakatoa, which sent a massive plume of ash and gas into the upper atmosphere, turning sunsets red around the globe and cooling the Earth by more than a degree.

Now a powerful group of scientists, venture capitalists and conservative think tanks is coalescing around the idea of reproducing this cooling effect by injecting sulphur dioxide into the stratosphere to counter climate change. Despite the enormity of what is being proposed - nothing less than seizing control of the climate - the public has been almost entirely excluded from the planning.

Up to now, governments have been reluctant to talk about geoengineering. The reason is simple: apart from its unknown side effects, it would weaken resolve to reduce emissions.

But it may soon prove an irresistible fix. This form of geoengineering is extremely attractive because its costs are estimated to be trivial compared to those of cutting carbon. It also gets powerful lobbies off governments' backs, gives the green light to burning more coal, avoids the need to raise petrol taxes, permits yet more unrestrained growth and is no threat to consumer lifestyles.

No government is yet willing to lend support to geoengineering, but the day when a major nation backs it cannot be far off. It is even possible that a single nation suffering the effects of climate disruption may decide to act alone.

Indeed, Russia has already begun testing. Yuri Izrael, a scientist who is both a global-warming sceptic and a senior adviser to Prime Minister Putin, has tested the effects of aerosol spraying from a helicopter. He now plans a large-scale trial.

Izrael is the latest in a long line of scientists who have advocated planetary engineering. Two of the earliest and most aggressive were Edward Teller and Lowell Wood. Teller, who died in 2003, is often described as the "father of the hydrogen bomb" and was the inspiration for Dr Strangelove, the eponymous mad scientist of Stanley Kubrick's 1964 film. Wood was one of the Pentagon's foremost weaponeers, which led his critics to dub him "Dr Evil". He led Ronald Reagan's ill-fated Star Wars project.

Wood and Teller began promoting aerosol spraying in 1998. Reflecting the dominant opinion of the 1950s, they saw it as our duty to exert supremacy over nature. Both have long been associated with conservative think tanks that deny the existence of human-induced global warming.

A number of right-wing think tanks actively denying climate change are also promoting geoengineering, an irony that seems to escape them.

Of course, geoengineering protects their funders in the fossil fuel industries because it can be a substitute for carbon reductions and justify delay, but a deeper explanation lies in beliefs about the relationship of humans to the natural world.

While emissions reductions are an admission that industrial society has harmed nature, engineering the climate would be confirmation of our mastery over it, final proof that human ingenuity will always triumph.

Wood believes that climate engineering is inevitable. In a statement that could serve as Earth's epitaph, he declared: "We've engineered every other environment we live in, why not the planet?"

Advocates of geoengineering also court the super-rich. Wood is doubtful that governments can reach a consensus, but he sees no need for that, instead speculating about going ahead with support from a billionaire. "As far as I can determine, there is no law that prohibits doing something like this". He is right.

Perhaps the billionaire he has in mind is Bill Gates, who has been funding geoengineering research for three years. Gates is also an investor in a firm named Intellectual Ventures that is promoting a scheme called StratoShield, which would pump sulphur dioxide into the upper atmosphere through a hose held aloft by blimps.

Richard Branson has also set up his own "war room" to do battle with global warming using "market-driven solutions", including geoengineering.

The Carbon War Room website promotes a paper co-authored by Lee Lane of the American Enterprise Institute, well known for its climate scepticism. It argues that the benefits of geoengineering vastly outweigh the costs. The authors worry that ethical objections from environmental groups may block deployment, before noting with relief that "in reality, important economies remain largely beyond the influence of environmental advocacy groups".

Geoengineering is not something we should enter into lightly or without proper public consultation. If we resort to it, then the concentration of carbon dioxide will continue to rise. It would then become impossible to call a halt to sulphur injections, even for a year or two, without an immediate jump in temperature.

It's estimated that if whoever controls the scheme decided to stop, the greenhouse gases that would have built up could cause warming to rebound at a rate 10 to 20 times that of the recent past - a phenomenon referred to, apparently without irony, as the "termination problem". Once we start engineering the atmosphere we could be trapped, forever dependent on sulphur injections. More than a painting, The Scream would become a prophecy.

If we start manipulating the atmosphere, we could become forever dependent on sulphur injections
Clive Hamilton is Charles Sturt Professor of Public Ethics in the Centre for Applied Philosophy and Public Ethics at the Australian National University. His new book, Requiem for a Species, is published by Earthscan

http://www.newscientist.com/article/mg20727696.100-an-evil-atmosphere-is-forming-around-geoengineering.html

Why Money Makes You Unhappy

- By Jonah Lehrer
- July 21, 2010 |

Money is surprisingly bad at making us happy. Once we escape the trap of poverty, levels of wealth have an extremely modest impact on levels of happiness, especially in developed countries. Even worse, it appears that the richest nation in history – 21st century America – is slowly getting less pleased with life. (Or as the economists behind this recent analysis concluded: "In the United States, the [psychological] well-being of successive birth-cohorts has gradually fallen through time.")

Needless to say, this data contradicts one of the central assumptions of modern society, which is that more money equals more pleasure. That's why we work hard, fret about the stock market and save up for that expensive dinner/watch/phone/car/condo. We've been led to believe that dollars are delight in a fungible form.

But the statistical disconnect between money and happiness raises a fascinating question: Why doesn't money make us happy? One intriguing answer comes from a new study by psychologists at the University of Liege, published in Psychological Science. The scientists explore the "experience-stretching hypothesis," an idea first proposed by Daniel Gilbert. He explains "experience-stretching" with the following anecdote:

I've played the guitar for years, and I get very little pleasure from executing an endless repetition of three-chord blues. But when I first learned to play as a teenager, I would sit upstairs in my bedroom happily strumming those three chords until my parents banged on the ceiling…Doesn't it seem reasonable to invoke the experience-stretching hypothesis and say that an experience that once brought me pleasure no longer does? A man who is given a drink of water after being lost in the Mojave Desert may at that moment rate his happiness as eight. A year later, the same drink might induce him to feel no better than a two.

What does experience-stretching have to do with money and happiness? The Liege psychologists propose that, because money allows us to enjoy the best things in life – we can stay at expensive hotels and eat exquisite sushi and buy the nicest gadgets – we actually decrease our ability to enjoy the mundane joys of everyday life. (Their list of such pleasures includes "sunny days, cold beers, and chocolate bars".) And since most of our joys are mundane – we can't sleep at the Ritz every night – our ability to splurge actually backfires. We try to treat ourselves, but we end up spoiling ourselves.

The study itself is straightforward. The psychologists gathered 351 adult employees of the University of Liège, from custodial staff to senior administrators, for an online survey. (I should note that it remains unclear whether happiness and other aspects of well-being can be meaningfully measured with a multiple choice test. So caveats apply.) The scientists primed the subjects by showing them a stack of Euro bills before asking them a bunch of questions which attempted to capture their "savoring ability." Here's how the savoring test worked:

Participants are asked to imagine finishing an important task (contentment), spending a romantic weekend away (joy), or discovering an amazing waterfall while hiking (awe). Each scenario is followed by eight possible reactions, including the four savoring strategies referred to in the introduction (i.e., displaying positive emotions, staying present, anticipating or reminiscing about the event, and telling other people about the experience). Participants are required to select the response or responses that best characterize what their typical behavior in each situation would be, and receive 1 point for each savoring strategy selected.

Interestingly, the scientists found that people in the wealth condition – they'd been primed with all those Euros – had significantly lower savoring scores. This suggests that simply looking at money makes us less interested in relishing the minor pleasures of life. Furthermore, subjects who made more money in real life – the scientists asked all subjects for their monthly income – scored significantly lower on the savoring test. A subsequent experiment duplicated this effect among Canadian students, who spent less time savoring a chocolate bar after being shown a picture of Canadian dollars. The psychologists end on a bleak note:

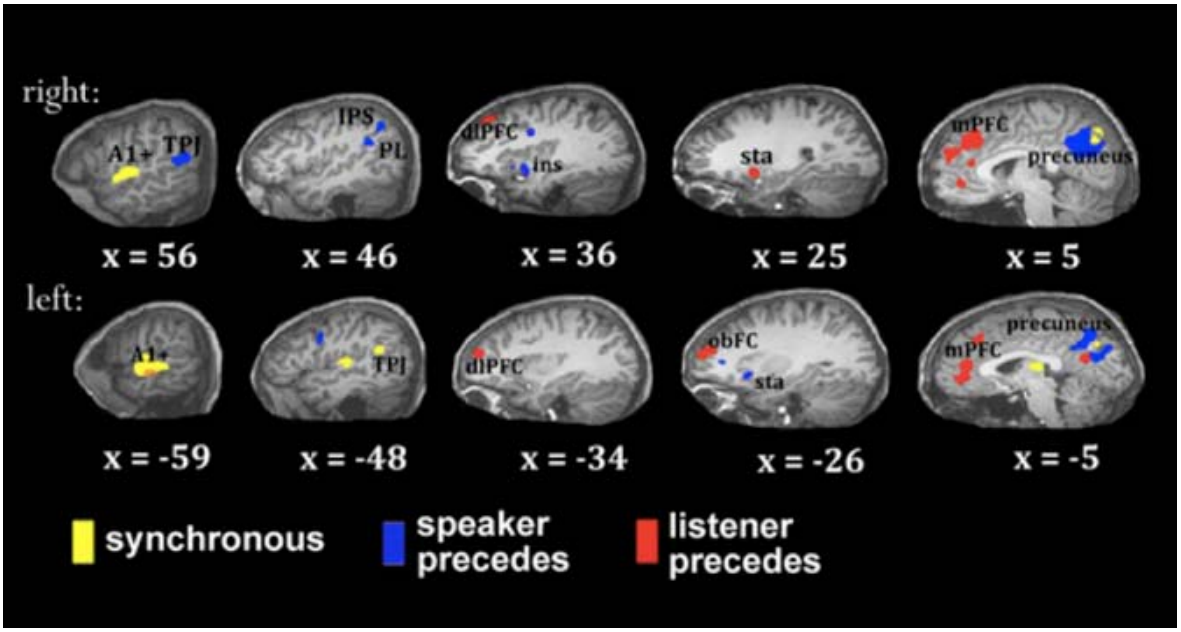
Taken together, our findings provide evidence for the provocative notion that having access to the best things in life may actually undermine one's ability to reap enjoyment from life's small pleasures. Our research demonstrates that a simple reminder of wealth produces the same deleterious effects as actual wealth on an individual's ability to savor, suggesting that perceived access to pleasurable experiences may be sufficient to impair everyday savoring. In other words, one need not actually visit the pyramids of Egypt or spend a week at the legendary Banff spas in Canada for one's savoring ability to be impaired—simply knowing that these peak experiences are readily available may increase one's tendency to take the small pleasures of daily life for granted.

This makes me think of the Amish. From a certain perspective, the Amish live without a lot of the stuff most of us consider essential. They don't use cars, reject the Internet, avoid the mall, and prefer a quiet permanence to hefty bank accounts. The end result, however, is a happiness boom. When asked to rate their life satisfaction on a scale of 1 to 10, the Amish are as satisfied with their lives as members of the Forbes 400. There are, of course, many ways to explain the contentment of the Amish. (The community has strong ties, plenty of religious faith and stable families, all of which reliably correlate with high levels of well-being.) But I can't help wonder if part of their happiness is related to experience-stretching. They don't fret about getting the latest iPhone, or eating at the posh new restaurant, or buying the au courant handbag. The end result, perhaps, is that the Amish are better able to enjoy what really matters, which is all the stuff money can't buy.

Read More http://www.wired.com/wiredscience/2010/07/happiness-and-money-2/#ixzz0upgeaRax
http://www.wired.com/wiredscience/2010/07/happiness-and-money-2/

Good Connection Really Does Lead to Mind Meld

- By Brandon Keim
- July 26, 2010 |



When two people experience a deep connection, they're informally described as being on the same wavelength. There may be neurological truth to that.

Brain scans of a speaker and listener showed their neural activity synchronizing during storytelling. The stronger their reported connection, the closer the coupling.

The experiment was the first to use fMRI, which measures blood flow changes in the brain, on two people as they talked. Different brain regions have been linked to both speaking and listening, but "the ongoing interaction between the two systems during everyday communication remains largely unknown," wrote Princeton University neuroscientists Greg Stephens and Uri Hasson in the July 27 Proceedings of the National Academy of Sciences.

They found that speaking and listening used common rather than separate neural subsystems inside each brain. Even more striking was an overlap between the brains of speaker and listener. When post-scan interviews found that stories had resonated, scans showed a complex interplay of neural call and response, as if language were a wire between test subjects' brains.

The findings don't explain why any two people "click," as synchronization is a result of that connection, not its cause. And while the brain regions involved are linked to language, their precise functions are not clear. But even if the findings are general, they support what psychologists call the "theory of interactive linguistic alignment" — a fancy way of saying that talking brings people closer by making them share a common conceptual ground.

"If I say, 'Do you want a coffee?' you say, 'Yes please, two sugars.' You don't say, 'Yes, please put two sugars in the cup of coffee that is between us,'" said Hasson. "You're sharing the same lexical items, grammatical constructs and contextual framework. And this is happening not just abstractly, but literally in the brain."

The researchers didn't test brain synchronization during phone calls or video conferencing, but Hasson speculates that "coupling would be stronger face-to-face." He also thinks dialogue will produce especially strong forms of synchronization, and plans to run scans of people engaged in deep conversation, rather than telling or listening to long stories.

"But first, we'll look at cases where there's a failure to communicate," said Hasson.

Image: Overlap between neural activation in speaker and listener./PNAS.

Read More http://www.wired.com/wiredscience/2010/07/mind-meshing/#ixzz0uphP2R8j
http://www.wired.com/wiredscience/2010/07/mind-meshing/

Attack of the L.A. Smog Archives

- By Randy Alfred
- July 26, 2010

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http://www.wired.com/thisdayintech/2010/07/gallery-smog/

Air pollution could increase risk of suicide

- 17:48 15 July 2010 by Peter Aldhous

Dirty new town (Image: Chad Ehlers/Rex Features)

Air pollution doesn't just make it hard to breathe – it may also increase the risk that people will take their own lives.

A new study in seven cities across South Korea has uncovered a clear association between suicide and spikes of particulate pollution. Meanwhile, researchers who in the 1990s linked air pollution to asthma in a large group of Taiwanese children have now found that those with the condition were subsequently more likely to have killed themselves.

Suicide is a big problem for South Korea, where the rate per 100,000 people rose from 14 in 1996 to 23 in 2006 – the largest increase in the developed world.

Soot and suicide

To examine the role of pollution, researchers led by Chang Soo Kim of Yonsei University in Seoul linked records of more than 4000 suicides to measurements of PM10 – airborne particles with a diameter of 10 micrometres or less, which include the soot from vehicle exhausts.

Kim's team found that suicides were more common in the two days following a spike in pollution. They considered PM10 measurements on a scale from the highest and lowest levels recorded, calculating that people were 9 per cent more likely to kill themselves following a spike in pollution

rising across the middle 50 per cent of recorded values. For people with cardiovascular disease, which has already been linked with particulate pollution, the increase was almost 19 per cent.

South Korea's cities, like many in Asia, are badly blighted by air pollution, and it is unclear whether the effect would be so dramatic in cities that have tighter pollution controls. "Further investigations of low-level exposure to particular matter are needed," says Kim.

Breath and mind

The Korean study appears alongside one from a team led by Ying-Chin Ko of Khaohsiung Medical University in Taiwan. In the late 1990s, Ko and his colleagues found that high levels of air pollution were associated with asthma in more than 160,000 schoolchildren.

Following up the same group more than a decade later, the researchers show that suicides were more than twice as common among those with asthma – and the more severe their symptoms at the start of the study, the higher the risk.

Scientists have only recently started to study the relationship between respiratory disease and mental health, says David Callahan at the Centers for Disease Control and Prevention in Atlanta, Georgia. Last year, his team revealed that 7.5 per cent of people with asthma in the US reported suffering serious psychological distress, compared with just 3 per cent of the population as a whole.

That's a concern, Callahan explains, because people with depression are known to be worse at managing chronic diseases by taking prescribed drugs and following other medical advice – potentially causing a spiral of physical and mental deterioration. "Now it is recognised that there is a relationship, we need to work out the chain of causality and the opportunity for intervention," he says.

Where air pollution is involved, the problem may not only be that as people's physical symptoms worsen, they become more distressed. Kim suggests that PM10s may also cause nerve inflammation, affecting mental health through a direct biological mechanism.

Journal references: American Journal of Psychiatry, Kim, DOI: 10.1176/appi.ajp2010.09050706, Ko, DOI: 10.1176/appi.ajp.2010.09101455

http://www.newscientist.com/article/dn19180-air-pollution-could-increase-risk-of-suicide.html

Super goby helps salvage ocean dead zone

- 19:00 15 July 2010 by Michael Marshall

Tougher than the rest (Image: Kim Andreassen/University of Bergen)

A resilient fish is thriving in an inhospitable, jellyfish-infested region off Africa's south-west coast. And crucially it is helping to keep the local ecosystem going, and to preserve an important fishery.

The Benguela ecosystem lies off the coast of Namibia. It exists in waters only 120 metres deep that used to be a rich sardine fishery, but in the 1960s the sardine population crashed because of overfishing and environmental factors, and the region was invaded by algal blooms and swarms of jellyfish.

The algae have used up almost all the oxygen in the water, leaving the bottom half with oxygen levels below 10 per cent, far too little for most sea creatures. At about 80 per cent, levels are almost normal in the upper waters – but those regions are thick with jellyfish and algae, and therefore unwelcoming to most other life.

What's more, when the algae die they sink to the bottom and decay, releasing large quantities of the poisonous gas hydrogen sulphide. Nevertheless, local fish called bearded gobies have flourished in Benguela. Until now, nobody has understood how they survive it.

Tough fish

Anne Utne-Palm of the University of Bergen, Norway, and colleagues surveyed Benguela's gobies. Using acoustic tracking, they found that bearded gobies spend the daylight hours at the very bottom – the only backboned animals in the area to do so. Their stomach contents reveal that they feed off dead algae fallen from the surface, and also on the jellyfish.

The team found that the gobies could survive for hours in the oxygen-poor waters. They lower their metabolic rate to do so – but despite this they remain alert and can flee predators, as tank tests revealed.

At night the gobies head up to the surface to take in oxygen. They often hide themselves in the jellyfish clouds, where predators rarely venture.

Despite this, the gobies still fall victim to predators such as horse mackerel and hake. This means that they act as a recycling system, ferrying nutrients that might otherwise be lost on the seabed back up to the surface.

"It's a lucky thing that the ecosystem had this goby," says Utne-Palm. "They bring lost resources back into the food chain."

Fish food

Daniel Jones of the National Oceanography Centre in Southampton, UK, says that low-oxygen zones like Benguela are becoming more common as a result of human activities.

"It's good to see that some ecosystems can be sustained throughout this sort of hypoxic event," he says, "but I suspect that in a lot of environments there isn't a 'super-goby' around to help out."

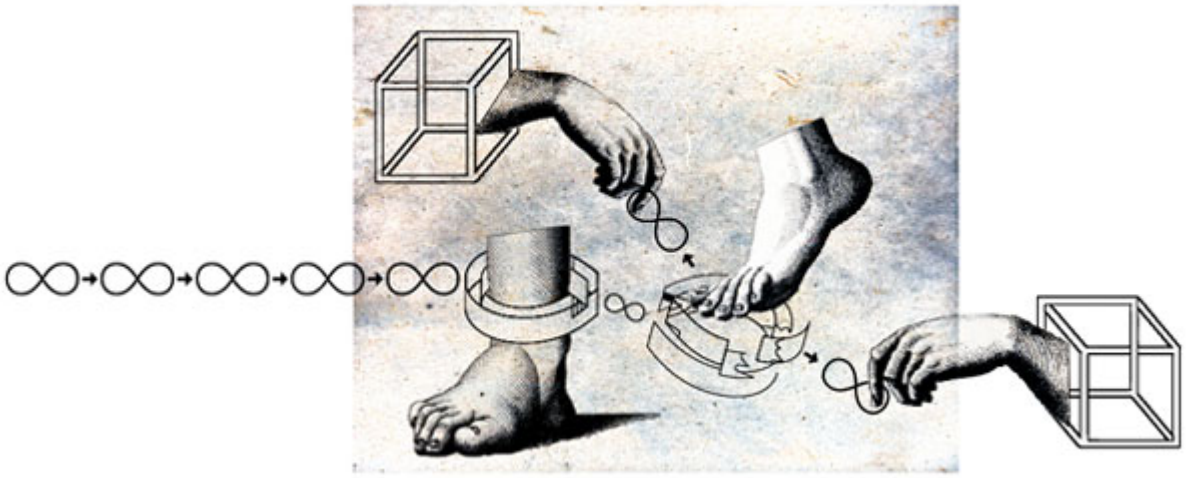
The sardines may have gone, but horse mackerel and hake survive in the area by feeding on the gobies, and are regularly fished by humans. "If it weren't for the gobies, the human fishery would be in a worse condition than it is," says Jones.

Journal reference: Science, DOI: 10.1126/science.1190708

http://www.newscientist.com/article/dn19182-super-goby-helps-salvage-ocean-dead-zone.html

The Maze of Free Will

By GALEN STRAWSON



Erin Schell

You arrive at a bakery. It's the evening of a national holiday. You want to buy a cake with your last 10 dollars to round off the preparations you've already made. There's only one thing left in the store — a 10-dollar cake.

On the steps of the store, someone is shaking an Oxfam tin. You stop, and it seems quite clear to you — it surely is quite clear to you — that it is entirely up to you what you do next. You are — it seems — truly, radically, ultimately free to choose what to do, in such a way that you will be ultimately morally responsible for whatever you do choose. Fact: you can put the money in the tin, or you can go in and buy the cake. You're not only completely, radically free to choose in this situation. You're not free not to choose (that's how it feels). You're "condemned to freedom," in Jean-Paul Sartre's phrase. You're fully and explicitly conscious of what the options are and you can't escape that consciousness. You can't somehow slip out of it.

You may have heard of determinism, the theory that absolutely everything that happens is causally determined to happen exactly as it does by what has already gone before — right back to the beginning of the universe. You may also believe that determinism is true. (You may also know, contrary to popular opinion, that current science gives us no more reason to think that determinism is false than that determinism is true.) In that case, standing on the steps of the store, it may cross your mind that in five minutes' time you'll be able to look back on the situation you're in now and say truly, of what you will by then have done, "Well, it was determined that I should do that." But even if you do fervently believe this, it doesn't seem to be able to touch your sense that you're absolutely morally responsible for what you next.

The case of the Oxfam box, which I have used before to illustrate this problem, is relatively dramatic, but choices of this type are common. They occur frequently in our everyday lives, and they seem to prove beyond

a doubt that we are free and ultimately morally responsible for what we do. There is, however, an argument, which I call the Basic Argument, which appears to show that we can never be ultimately morally responsible for our actions. According to the Basic Argument, it makes no difference whether determinism is true or false. We can't be ultimately morally responsible either way.

The argument goes like this.

(1) You do what you do — in the circumstances in which you find yourself—because of the way you then are.

(2) So if you're going to be ultimately responsible for what you do, you're going to have to be ultimately responsible for the way you are — at least in certain mental respects.

(3) But you can't be ultimately responsible for the way you are in any respect at all.

(4) So you can't be ultimately responsible for what you do.

The key move is (3). Why can't you be ultimately responsible for the way you are in any respect at all? In answer, consider an expanded version of the argument.

(a) It's undeniable that the way you are initially is a result of your genetic inheritance and early experience.

(b) It's undeniable that these are things for which you can't be held to be in any way responsible (morally or otherwise).

(c) But you can't at any later stage of life hope to acquire true or ultimate moral responsibility for the way you are by trying to change the way you already are as a result of genetic inheritance and previous experience.

(d) Why not? Because both the particular ways in which you try to change yourself, and the amount of success you have when trying to change yourself, will be determined by how you already are as a result of your genetic inheritance and previous experience.

(e) And any further changes that you may become able to bring about after you have brought about certain initial changes will in turn be determined, via the initial changes, by your genetic inheritance and previous experience.

There may be all sorts of other factors affecting and changing you. Determinism may be false: some changes in the way you are may come about as a result of the influence of indeterministic or random factors. But you obviously can't be responsible for the effects of any random factors, so they can't help you to become ultimately morally responsible for how you are.

Some people think that quantum mechanics shows that determinism is false, and so holds out a hope that we can be ultimately responsible for what we do. But even if quantum mechanics had shown that determinism is false (it hasn't), the question would remain: how can indeterminism, objective randomness, help in any way whatever to make you responsible for your actions? The answer to this question is easy. It can't.

And yet we still feel that we are free to act in such a way that we are absolutely responsible for what we do. So I'll finish with a third, richer version of the Basic Argument that this is impossible.

(i) Interested in free action, we're particularly interested in actions performed for reasons (as opposed to reflex actions or mindlessly habitual actions).

(ii) When one acts for a reason, what one does is a function of how one is, mentally speaking. (It's also a function of one's height, one's strength, one's place and time, and so on, but it's the mental factors that are crucial when moral responsibility is in question.)

(iii) So if one is going to be truly or ultimately responsible for how one acts, one must be ultimately responsible for how one is, mentally speaking — at least in certain respects.

(iv) But to be ultimately responsible for how one is, in any mental respect, one must have brought it about that one is the way one is, in that respect. And it's not merely that one must have caused oneself to be the way one is, in that respect. One must also have consciously and explicitly chosen to be the way one is, in that respect, and one must also have succeeded in bringing it about that one is that way.

(v) But one can't really be said to choose, in a conscious, reasoned, fashion, to be the way one is in any respect at all, unless one already exists, mentally speaking, already equipped with some principles of choice, "P1″ — preferences, values, ideals — in the light of which one chooses how to be.

(vi) But then to be ultimately responsible, on account of having chosen to be the way one is, in certain mental respects, one must be ultimately responsible for one's having the principles of choice P1 in the light of which one chose how to be.

(vii) But for this to be so one must have chosen P1, in a reasoned, conscious, intentional fashion.

(viii) But for this to be so one must already have had some principles of choice P2, in the light of which one chose P1.

(ix) And so on. Here we are setting out on a regress that we cannot stop. Ultimate responsibility for how one is is impossible, because it requires the actual completion of an infinite series of choices of principles of choice.

(x) So ultimate, buck-stopping moral responsibility is impossible, because it requires ultimate responsibility for how one is; as noted in (iii).

Does this argument stop me feeling entirely morally responsible for what I do? It does not. Does it stop you feeling entirely morally responsible? I very much doubt it. Should it stop us? Well, it might not be a good thing if it did. But the logic seems irresistible …. And yet we continue to feel we are absolutely morally responsible for what we do, responsible in a way that we could be only if we had somehow created ourselves, only if we were "causa sui," the cause of ourselves. It may be that we stand condemned by Nietzsche:

The causa sui is the best self-contradiction that has been conceived so far. It is a sort of rape and perversion of logic. But the extravagant pride of man has managed to entangle itself profoundly and frightfully with just this nonsense. The desire for "freedom of the will" in the superlative metaphysical sense, which still holds

sway, unfortunately, in the minds of the half-educated; the desire to bear the entire and ultimate responsibility for one's actions oneself, and to absolve God, the world, ancestors, chance, and society involves nothing less than to be precisely this causa sui and, with more than Baron Münchhausen's audacity, to pull oneself up into existence by the hair, out of the swamps of nothingness … ("Beyond Good and Evil," 1886).

Is there any reply? I can't do better than the novelist Ian McEwan, who wrote to me: "I see no necessary disjunction between having no free will (those arguments seem watertight) and assuming moral responsibility for myself. The point is ownership. I own my past, my beginnings, my perceptions. And just as I will make myself responsible if my dog or child bites someone, or my car rolls backwards down a hill and causes damage, so I take on full accountability for the little ship of my being, even if I do not have control of its course. It is this sense of being the possessor of a consciousness that makes us feel responsible for it."

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http://opinionator.blogs.nytimes.com/2010/07/22/your-move-the-maze-of-free-will/

Translating the Stories of Life Forms Etched in Stone

By SEAN B. CARROLL

In 1909, Charles Walcott, a paleontologist and secretary of the Smithsonian Institution, discovered one of the greatest and most famous fossil troves high in the Canadian Rockies on Burgess Pass in British Columbia. The slabs of Burgess Shale that Walcott excavated contained the earliest known examples at the time of many major animal groups in the fossil record, in rocks that were about 505 million years old.

Walcott's discovery was further evidence of the so-called Cambrian Explosion — the apparently abrupt appearance of complex animals in the fossil record within the Cambrian Period, from about 542 to 490 million years ago. Although not seen before on the scale documented in the Burgess Shale, the emergence of trilobites and other animals in the Cambrian was familiar to paleontologists, and had troubled Charles Darwin a great deal.

The difficulty posed by the Cambrian Explosion was that in Darwin's day (and for many years after), no fossils were known in the enormous, older rock formations below those of the Cambrian. This was an extremely unsettling fact for his theory of evolution because complex animals should have been preceded in the fossil record by simpler forms.

In "On the Origin of Species," Darwin posited that "during these vast, yet quite unknown, periods of time, the world swarmed with living creatures." But he admitted candidly, "To the question why we do not find records of these vast primordial periods, I can give no satisfactory answer."

It took a very long time, and the searching of some of the most remote places on the planet — in the Australian Outback, the Namibian desert, the shores of Newfoundland and far northern Russia — but we now have fossil records from the time immediately preceding the Cambrian. The rocks reveal a world whose oceans were teeming with a variety of life forms, including primitive animals, which is certainly good news for Darwin.

Now, this once-worrisome gap in the fossil record is a period of intense interest to geologists as well as paleontologists. The former have even given it its own division in the geological timescale. The Ediacaran Period, from 635 to 542 million years ago, is the first new geological period to be named in more than a century. Moreover, geologists have developed some intriguing theories about how dramatic changes in the Earth's climate and chemistry during the Ediacaran may have allowed for the evolution of animals.

The first major advance towards finding the earliest animal life occurred in 1946 when Reginald Sprigg, a geologist for the South Australia government, was checking out some old mines in the Ediacaran Hills of the Flinders Range several hundred miles north of Adelaide. Sprigg noticed some striking disc-shaped impressions up to four inches in diameter on the exposed surfaces of rocks nearby.

Sprigg interpreted the patterns as the fossil remains of soft-bodied creatures like jellyfish or their relatives. But when Sprigg first showed the imprints to leading authorities, they dismissed them as artifacts made by the weathering of the rocks. However, later that year, when Sprigg found the frond-like forms he called Dickinsonia , he was certain that such geometrical impressions could have been made only by living creatures.

Sprigg was excited by both the unusual appearance of the fossils and by their age, which he believed to be the beginning of the Cambrian, and made them the oldest animal forms yet seen. But despite their potential importance, Sprigg's discoveries were ignored at an international geology meeting and his paper describing the fossils was rejected by the leading journal, . Sprigg moved on to other, more rewarding pursuits in the oil, gas, and mining industries.

Scientific attention to these strange forms was not revived until a decade later when more soft-bodied forms were found in the Ediacaran Hills and in England, and their age was firmly established as actually predating the Cambrian. Deposits of similar aged forms have been discovered at Mistaken Point on the Avalon Peninsula of Newfoundland, in southern Namibia, the White Sea of Russia, and more than 30 other locations on five continents. The global distribution of these disc-, frond-, tube-, branch-, or spindle-shaped forms demonstrate that life was complex and diverse in the Ediacaran.

But finding these fossils has posed many new mysteries. Many of the creatures are so unlike modern forms that deciphering what they are and how they lived continues to challenge paleontologists. Prof. Andrew Knoll of Harvard University has likened the Ediacaran forms to a paleontological "Rorschach" test because different scientists often interpret the same fossil very differently.

Dickinsonia, for example, has been interpreted as being a relative of jellyfish, a marine worm, a lichen, or even as a member of a completely extinct kingdom. The challenge to classifying most Ediacarans is that they lack some features that are characteristic of modern animals, a mouth or an anus in the case of Dickinsonia, or the shells and hard parts typical of many Cambrian groups. But, in fact, such simple bodies are exactly what should be expected of primitive forerunners of later animals.

On the other hand, scientists have had to explain how such creatures functioned. Some of the very flat-bodied Ediacarans, for instance, lived on sediments and appear to have fed by directly absorbing nutrients by osmosis.

The kinds of animals that paleontologists have been especially eager to identify in the Ediacaran are those with bilateral body symmetry, the feature characteristic of the majority of modern animal groups, including ourselves.

Bilateral animals flourished in the Cambrian so tracing their origins is crucial to understanding the pace of animal evolution. Several bilateral Ediacaran animals have been discovered, including Kimberella, a possible mollusc. Hundreds of Kimberella specimens are known that date to about 555 million years ago, 50 million years before the animals of the Burgess Shale.

The Ediacaran fossil record thus stretches the origins of animals to well before the Cambrian Explosion. But it also raises the question of why, after more than 2.5 billion years during which microscopic life dominated the planet, larger, more complex, forms emerged at that time?

A key requirement for larger creatures is oxygen, and the dramatic history of oxygen levels is also etched in Ediacaran rocks. Geologists now understand that the earliest Ediacaran organisms were deep water creatures that emerged 575 to 565 million years ago, shortly after a major ice age ended about 580 million years ago.

Recent chemical analyses of Ediacaran sediments reveal that the deep ocean lacked oxygen before and during that ice age, then became much richer in oxygen and stayed that way after the glaciers melted . That sharp rise in oxygen may have been the catalyst to the evolution of animals, including our ancestors.

Several weeks after the publication of "On the Origin of Species" and amid a torrent of criticism, Darwin added a mischievous postscript to a letter to his friend, the geologist Charles Lyell: "Our ancestor was an animal which breathed water, had a swim-bladder, a great swimming tail, an imperfect skull & undoubtedly was an hermaphrodite! Here is a pleasant genealogy for mankind." The Ediacaran fossils tell us that Darwin was being too generous. Our earliest animal ancestor probably had no head, tail, or sexual organs, and lay immobile on the sea floor like a door mat.

http://www.nytimes.com/2010/07/27/science/27creatures.html?ref=science

Advance on AIDS Raises Questions as Well as Joy

By DONALD G. McNEIL Jr.

VIENNA — The best AIDS-prevention news in years was released here last week at a world conference on the disease: a vaginal gel, called a microbicide, that can be used without a man knowing it, gave women a 39 percent chance of avoiding infection with the deadly virus.

Thirty-nine percent is, obviously, not perfect, though the women in the South African trial who used the gel most faithfully did better, achieving 54 percent protection.

After more than a dozen microbicide failures, it was a huge relief, and led to cheering and standing ovations for the researchers here.

"This is a field that's known a lot of pain," said Catherine Hankins, chief scientific adviser for Unaids, the United Nations' AIDS-fighting agency.

There was general relief that the data was not as shaky as that of an AIDS vaccine trial released in September.

"There's a certain feeling of ease and pleasure for me as a scientist that any way you slice the data, it's statistically significant," said Dr. Anthony S. Fauci, a top AIDS expert in the United States government, which paid most of the trial's costs.

There was an unexpected bonus: the gel protected women even better against genital herpes. (The investigators were not sure why, but it contained tenofovir, an antiviral drug, and AIDS and herpes are both viral.)

Now experts are pondering the many questions raised by the news.

How much more testing will it need to win approval from drug regulators?

Would more than 1 percent tenofovir in the gel, or a two-drug mix, work better?

Can it be made cheaply enough for poor countries? (The gel costs 2 cents a dose, but the applicators are 40 cents because they are patented and were frequently redesigned to be more comfortable.)

The women had sex an average of five times a month, and were instructed to insert gel before and afterward. Would one dose, which would be easier and cheaper, work just as well?

Will it protect prostitutes, who have sex with many men in succession? Is it safe enough to use daily?

Can pregnant women use it? (Some women got pregnant and gave birth, but were taken off the gel quickly to reduce any risk.)

Would women who use it but got infected anyway develop hard-to-cure drug-resistant infections?

And, although it was tested on poor African women, might it appeal to Western women, some of whom might worry more about herpes than AIDS?

Might it also work for anal sex, and protect gay men?

The investigators and other experts said they had only partial hints of answers, but most were encouraging.

And, given that this is AIDS research, which inevitably creates controversy, some hard questions were raised.

If it was known after the first year that the gel was working, why wasn't the trial stopped?

And what will happen to the 889 African women who, in the words of Mark Harrington, an AIDS activist, "put their bodies on the line for this study"? Would they be able to keep getting the product that might have saved their lives?

Some questions were easy, said Dr. Salim Abdool Karim, a study leader and professor of epidemiology at both the University of KwaZulu-Natal in South Africa and Columbia University.

The price of a dose could fall below that of a condom because the applicators are just molded plastic and, without patents restrictions, "the Chinese could make them for half a penny," he said.

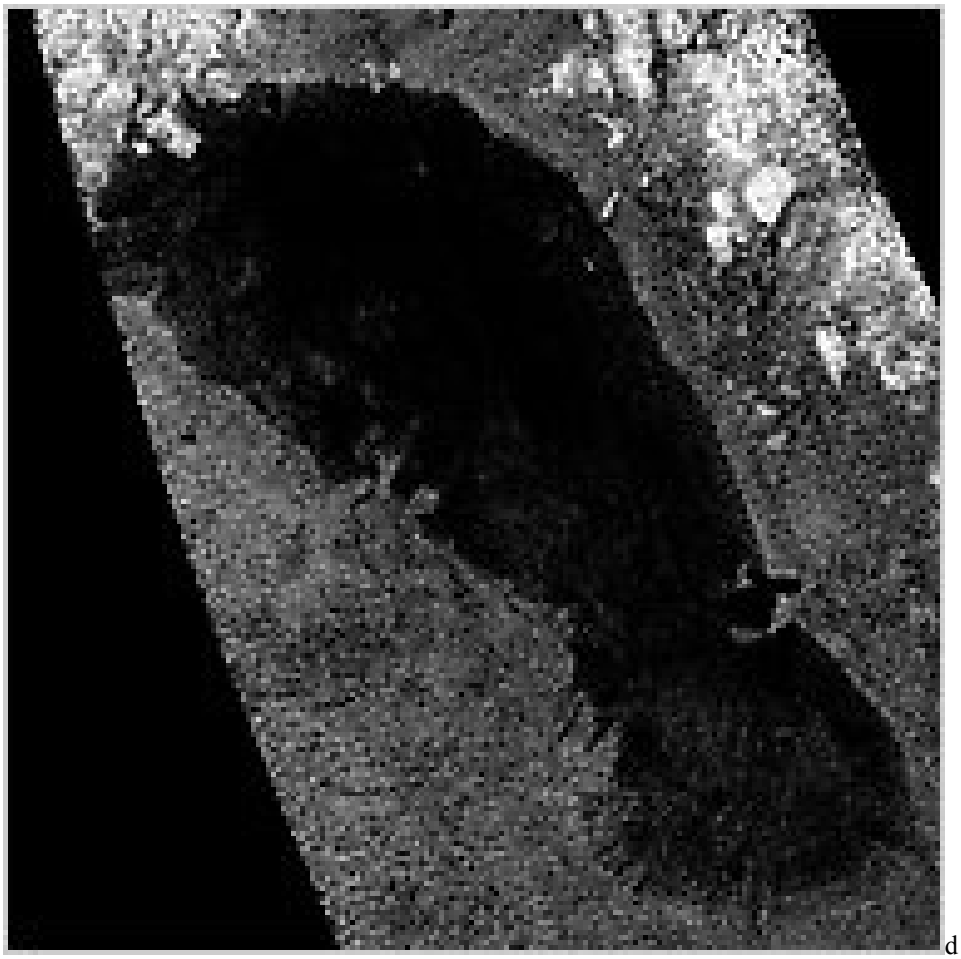
Others, like what drug and dose combinations are best and safest, must be tackled in future trials. A complex multination trial of several methods, including microbicide, is due to end in 2013, but a rapid new one may be designed as quickly as possible.

Globally, more than a million women a year die of AIDS, so speed is important.

http://www.nytimes.com/2010/07/27/health/27aids.html?_r=1&ref=science

Hints of Earth Splash a Saturnian Moon Landscape

By DENNIS OVERBYE



The lakes of southern Titan are shrinking.

The level of Ontario Lacus, the largest lake in the southern hemisphere of this Saturnian moon, has fallen by some 15 feet over the last four years, causing its shore to recede by as much as 6 miles in some places. Other lakes nearby have similarly receded, according to radar measurements made by the Cassini spacecraft.

However, if prolonged spells of 90-degree temperatures have you yearning for a refreshing icy dip, there are still plenty of bathing opportunities on Titan.

Of course the lakes there are made of liquid methane — and the 90 degrees of temperature are on the Kelvin scale, near enough to absolute zero to challenge even the most cosmically adept polar bear. The atmosphere is nitrogen and methane.

Titan is the only body in the solar system other than Earth that has been found to harbor liquid on its surface, leading many planetary scientists and aspiring astrobiologists to speculate that the same organic chemical processes that led to life on Earth are occurring in a frozen slush of hydrocarbons on Titan.

The discovery that Titan's lakes are evaporating, at least in the Southern Hemisphere, where summer just ended, suggests that there are active weather and geological cycles on Titan analogous to those on Earth. But on Titan the liquid driving those cycles is not water but methane, explained Oded Aharonson, a planetary scientist at the California Institute of Technology.

"This is a wonderful opportunity and rare in the solar system to observe a planet with working liquid on its surface, a volatile agent that is responsible for altering its geology and participating in its weather cycle by evaporating and precipitating," Dr. Aharonson said.

The research effort was led by Alexander G. Hayes, Dr. Aharonson's graduate student. Mr. Hayes was the lead author of a pair of papers, which will be published in Icarus and the Journal of Geophysical Research.

Planetary scientists have suspected that Titan might harbor exotic weather and chemistry ever since Voyager 1 flew by Saturn in 1980 and radio signals sent through Titan's atmosphere revealed a thick atmosphere of nitrogen.

In 2004 a camera known as the Imaging Science Subsystem on the Cassini spacecraft now orbiting Saturn recorded a blurry image of what looked like a lake basin about the size of Lake Ontario through Titan's hazy atmosphere. That is now named Ontario Lacus. Since then an imaging radar on Cassini has been periodically scanning Titan's terrain, a few strips at a time, during close flybys of the moon. These scans showed smooth dark areas that few scientists doubted were lakes. In January 2005, the Huygens probe landed in what looked like a fluvial plain with channels carved by methane.

Any lingering doubts were removed last year when Cassini's cameras recorded a glint of sunlight bouncing off Kraken Mare, a large lake-shaped basin near Titan's North Pole.

Lakes appear dark on the radar because if they are deeper than about 25 feet the radar waves are completely absorbed and do not come back to the spacecraft. Mr. Hayes and his colleagues were able to gauge the drop in lake levels by simply noting the shrinkage of dark nonreflecting areas and combining that with measurements of the slope of the lake bottom.

On the edges of the lake, they could see the lake bottom and thus measure its depth from altimetry, performing what Dr. Aharonson said was the first extraterrestrial bathymetry. The depth results matched the lake shrinkage. Where the slope into the methane was slow and gentle, the lakeshore receded the farthest; where there was a quick drop-off, against some mountains along the northern shore, the lake receded little.

Why should Titan be behaving like this? Dr. Aharonson said that a rough rule of thumb for hydrological systems like Earth or Titan was to expect that moisture would migrate seasonally from one hemisphere to the other, evaporating where it was summer and precipitating where it was winter. Indeed summer just ended in the southern hemisphere and the measurements show lakes were evaporating there, although there is no evidence that northern lakes are gaining yet.

But the actual dynamics of the Titanium atmosphere, he said, can be much more complicated, leading to cycles tens or hundreds of thousands of years long in which one hemisphere or the other could be wetter or colder than the other.

Because of the vagaries of its orbit around Saturn and Saturn's orbit around the sun, for example, Titan is closer to the sun during its southern summer than in its northern summer. As a result, southern summers are currently shorter and more intense than their northern counterparts. Dr. Aharonson and his colleagues argued in a recent paperthat this could cause liquid to collect more in the northern hemisphere than the southern hemisphere, leading to a net migration of methane to the north over many Titan years.

That kind of migration could explain why the area covered by lakes in the north is about 100 times the area of all the lakes in the southern hemisphere. A similar cycle in the dynamics of the Earth's orbit around the Sun leads to what are known as Milankovitch climate cycles, thought to drive the ice ages.

As evidence for this theory, Dr. Aharonson pointed out that the observed evaporation rate in Ontario Lacus, about three feet a year, is not enough to fill all the lakes in the north in one season, suggesting some longer term effect is at work. "If we wait 15 years we won't see lakes migrate down to the south," he said. But if Titan has tens of thousands of years to move the methane from one hemisphere to the other, he explained, the rate can be much smaller.

The evaporation rate, he said, also sends a strong message about what the lakes are made of, namely pure methane, as opposed to heavier ethane or some other chemical, which is less volatile. "In order to evaporate that much stuff, it has to be stuff that evaporates," he said. If there is ethane present it is well mixed, the lake is not coated with a layer of gunk.

No tar balls on Titan. Yet.

http://www.nytimes.com/2010/07/27/science/space/27titan.html?ref=science

Exploring Algae as Fuel

By ANDREW POLLACK

SAN DIEGO — In a laboratory where almost all the test tubes look green, the tools of modern biotechnology are being applied to lowly pond scum.

Foreign genes are being spliced into algae and native genes are being tweaked.

Different strains of algae are pitted against one another in survival-of-the-fittest contests in an effort to accelerate the evolution of fast-growing, hardy strains.

The goal is nothing less than to create superalgae, highly efficient at converting sunlight and carbon dioxide into lipids and oils that can be sent to a refinery and made into diesel or jet fuel.

“We’ve probably engineered over 4,000 strains,” said Mike Mendez, a co-founder and vice president for technology at Sapphire Energy, the owner of the laboratory. “My whole goal here at Sapphire is to domesticate algae, to make it a crop.”

Dozens of companies, as well as many academic laboratories, are pursuing the same goal — to produce algae as a source of, literally, green energy. And many of them are using genetic engineering or other biological techniques, like chemically induced mutations, to improve how algae functions.

“There are probably well over 100 academic efforts to use genetic engineering to optimize biofuel production from algae,” said Matthew C. Posewitz, an assistant professor of chemistry at the Colorado School of Mines, who has written a review of the field. “There’s just intense interest globally.”

Algae are attracting attention because the strains can potentially produce 10 or more times more fuel per acre than the corn used to make ethanol or the soybeans used to make biodiesel. Moreover, algae might be grown on arid land and brackish water, so that fuel production would not compete with food production. And algae are voracious consumers of carbon dioxide, potentially helping to keep some of this greenhouse gas from contributing to global warming.

But efforts to genetically engineer algae, which usually means to splice in genes from other organisms, worry some experts because algae play a vital role in the environment. The single-celled photosynthetic organisms produce much of the oxygen on earth and are the base of the marine food chain.

"We are not saying don't do this," said Gerald H. Groenewold, director of the University of North Dakota's Energy and Environmental Research Center, who is trying to organize a study of the risks. "We say do this with the knowledge of the implications and how to safeguard what you are doing."

At a meeting this month of President Obama's new bioethics commission, Allison A. Snow, an ecologist at Ohio State University, testified that a "worst-case hypothetical scenario" would be that algae engineered to be extremely hardy might escape into the environment, displace other species and cause algal overgrowths that deprive waters of oxygen, killing fish.

A week earlier, at an industry-sponsored bioenergy conference, David Haberman, an engineer who has worked on an algae project, gave a talk warning of risks. Many scientists, particularly those in the algae business, say the fears are overblown. Just as food crops cannot thrive without a farmer to nourish them and fend off pests, algae modified to be energy crops would be uncompetitive against wild algae if they were to escape, and even inside their own ponds.

"Everything we do to engineer an organism makes it weaker," said Stephen Mayfield, a professor of biology at the University of California, San Diego, and a co-founder of Sapphire. "This idea that we can make Frankenfood or Frankenalgae is just absurd."

Dr. Mayfield and other scientists say there have been no known environmental problems in the 35 years that scientists have been genetically engineering bacteria, although some organisms have undoubtedly escaped from laboratories.

Even Margaret Mellon of the Union of Concerned Scientists, who has been critical of biotech crops, said that if genetically engineered algae were to escape, "I would not lose sleep over it at all."

Still, some algae researchers worry they will be engulfed by the same backlash aimed at biotech foods and say care must be exercised. "About 40 percent of the oxygen that you and I are breathing right now comes from the algae in the oceans," the genetic scientist J. Craig Venter said at a Congressional hearing in May. "We don't want to mess up that process."

Dr. Venter's company, Synthetic Genomics, is getting $300 million from Exxon Mobil to create fuel-producing algae, in part by using synthetic genes. When the two companies cut the ribbon on a new greenhouse here earlier this month, Dr. Venter assured local dignitaries in attendance that no algae would escape. "Nothing will go into the drains, Mr. Mayor," Dr. Venter said, only half-jokingly. "San Diego is safe."

In the long run, Dr. Venter said, the algae should be given "suicide genes" that would kill them if they escaped the lab or fuel production facility. Some companies are sticking with searching for and breeding

natural strains. “Re-engineering algae seems driven more by patent law and investor desire for protection than any real requirement,” said Stan Barnes, chief executive of Bioalgene, which is one of those companies. But Dr. Venter and Mr. Mendez argue that there are huge obstacles to making algae competitive as an energy source and that every tool will be needed to optimize the strains.

Sapphire Energy seems one of the best-positioned companies to do that. The company, which is three years old, has raised $100 million from prominent investors, including Bill Gates. Sapphire is also getting $100 million in federal financing to build a demonstration project containing 300 acres of open ponds in the New Mexico desert.

The company has inserted a gene into algae that allows the organisms to make a hydrocarbon they would not naturally produce, one that would help make fuel. “You don’t want to take what algae gives you,” said Mr. Mendez, who previously worked for medical biotechnology companies. “You want to make the best product.”

The company is also developing algae that can thrive in extremely salty and exceedingly alkaline water.

It has even developed what might be called Roundup Ready algae. Like the widely grown Roundup Ready soybeans, these algae are resistant to the herbicide Roundup. That would allow the herbicide to be sprayed on a pond to kill invading wild algae while leaving the fuel-producing strain unhurt.

Not all these traits are being developed by genetic engineering, because in many cases scientists do not know what genes to use. Instead, the company screens thousands of strains each day, looking for organisms with the right properties. Those desirable traits can be further enhanced by breeding or accelerated evolution.

In one room at Sapphire’s lab, parallel tubes contain algae with identical traits growing under identical conditions. But each strain is slightly different, and only the fastest growing one — determined by which tube turns the darkest green — will be chosen for further development.

“If you can’t outcompete your wild cousin, it doesn’t make it out of this room,” said Mr. Mendez. Algae can reproduce rapidly, doubling in as little as a few hours. And they can be carried long distances by the wind. “They have the potential to blow all over the world,” said Richard Sayre of the Donald Danforth Plant Science Center in St. Louis.

Dr. Sayre, who is also chief technology officer of Phycal, an algae company, is using genetic engineering to develop algae that capture less light. Right now, he explained, algae capture more light than they need and waste a lot of it as heat. If each organism captured less, then a given amount of light could be shared by more organisms, increasing biomass production.

Instead of using open ponds, some companies are using bioreactors, which typically contain the algae in tubes. Some experts say, however, that these would not totally prevent escapes. “The idea that you can contain these things and have a large-scale system is not credible,” said John R. Benemann, an industry consultant in Walnut Creek, Calif. He said, however, that he saw absolutely no risk from genetically engineered algae.

Sapphire says it is not growing any genetically engineered algae in open ponds yet. When it is ready, it says, it will comply with all regulations.

Genetically engineered algae, whether in open ponds or enclosed bioreactors, are likely to be regulated by the Environmental Protection Agency, which now regulates genetically engineered microbes under the Toxic Substances Control Act.

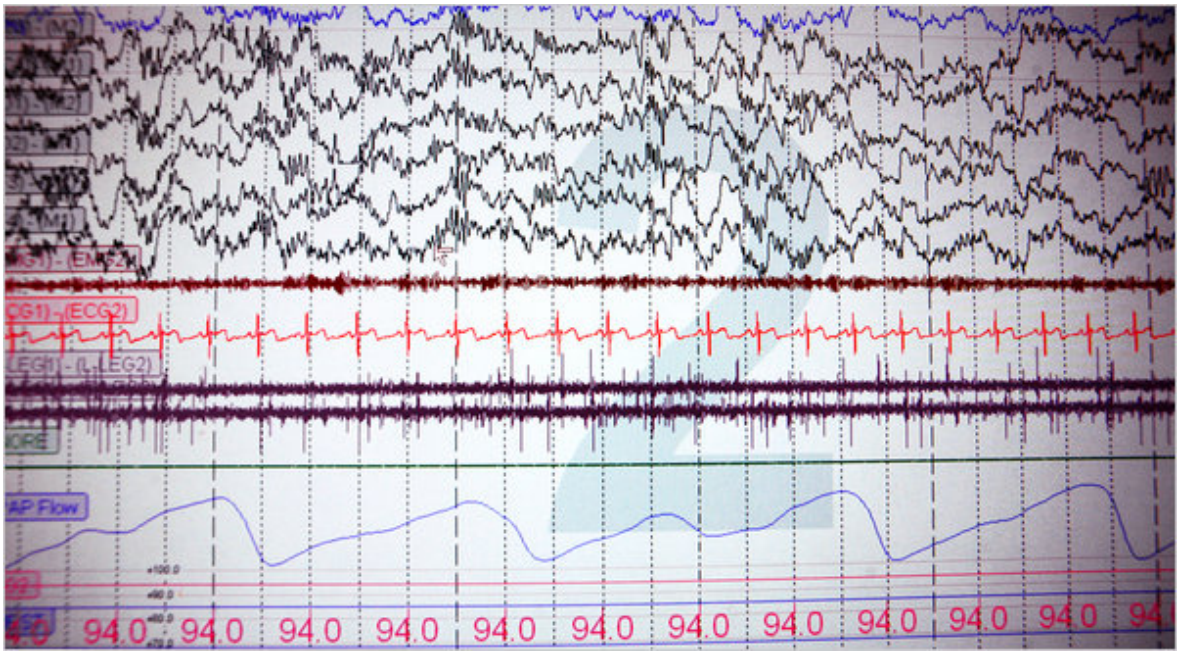
Still, there has been at least one case in which genetically modified algae seem to have fallen between the regulatory cracks. When Mera Pharmaceuticals, which is based in Hawaii, wanted to test the feasibility of producing human pharmaceuticals in genetically engineered algae in 2005, none of the three federal agencies that regulate the various areas of biotechnology — E.P.A., the Food and Drug Administration and the Agriculture Department — claimed jurisdiction.

Steven G. Chalk, acting deputy assistant secretary for renewable energy at the Energy Department, said any federally financed project, like Sapphire's New Mexico demonstration, would have to undergo an environmental assessment. But risks would be assessed case by case, he said, not for all conceivable genetically modified algae.

http://www.nytimes.com/2010/07/26/business/energy-environment/26algae.html?ref=science

Following a Script to Escape a Nightmare

By SARAH KERSHAW



ALBUQUERQUE — Her car is racing at a terrifying speed through the streets of a large city, and something gruesome, something with giant eyeballs, is chasing her, closing in fast.

It was a dream, of course, and after Emily Gurule, a 50-year-old high school teacher, related it to Dr. Barry Krakow, he did not ask her to unpack its symbolism. He simply told her to think of a new one. “In your mind, with thinking and picturing, take a few minutes, close your eyes, and I want you to change the dream any way you wish,” said Dr. Krakow, founder of the P.T.S.D. Sleep Clinic at the Maimonides Sleep Arts and Sciences center here and a leading researcher of nightmares.

And so the black car became a white Cadillac, traveling at a gentle speed with nothing chasing it. The eyeballs became bubbles, floating serenely above the city. “We call that a new dream,” Dr. Krakow told Ms. Gurule. “The bad dream is over there” — he pointed across the room — “and we’re not dealing with that. We’re dealing with the new dream.”

The technique, used while patients are awake, is called scripting or dream mastery and is part of imagery rehearsal therapy, which Dr. Krakow helped develop. The therapy is being used to treat a growing number of nightmare sufferers. In recent years, nightmares have increasingly been viewed as a distinct disorder, and researchers have produced a growing body of empirical evidence that this kind of cognitive therapy can help reduce their frequency and intensity, or even eliminate them.

The treatments are controversial. Some therapists, particularly Jungian analysts, take issue with changing nightmares’ content, arguing that dreams send crucial messages to the waking mind.

Nightmares are important because they "bring up issues in bold print," said Jane White-Lewis, a psychologist in Guilford, Conn., who has taught about dreams at the Carl Jung Institute in New York.

While Dr. White-Lewis acknowledged that she does not treat patients suffering from severe trauma, she said that if a nightmare is eliminated, "you lose an opportunity to really get some meaning out of it." Changing eyeballs into bubbles, she added, might have robbed Ms. Gurule of the chance to find out what the eyeballs were trying to tell her.

Nightmares have fascinated and perplexed people for centuries, their meaning debated by therapists and analysts of all schools of thought, their effects so powerful that one terrifying nightmare can affect a person for a lifetime. A nightmare is "a disturbing dream experience which rubs, bites and sickens our soul, and has an undercurrent of horsepower, lewd demons, aggressive orality and death," Dr. White-Lewis wrote in "In Defense of Nightmares," her contribution to a 1993 book of essays about dreams.

From 4 to 8 percent of adults report experiencing nightmares, perhaps as often as once per week or more, according to sleep researchers. But the rate is as high as 90 percent among groups like combat veterans and rape victims, Dr. Krakow said. He said treatment for post-traumatic stress needed to deal much more actively with nightmares. He and other clinicians are increasingly using imagery rehearsal therapy, or I.R.T., to treat veterans and active-duty troops in the Iraq and Afghanistan wars. Last month, Dr. Krakow conducted a workshop on imagery rehearsal and other sleep treatments for 65 therapists, sleep doctors and psychiatrists, including many working with the military. And the technique has drawn more attention from other researchers in the last several years. Anne Germain, an associate professor of psychiatry at the University of Pittsburgh School of Medicine, is comparing two treatments — behavioral therapy, including imagery rehearsal, and the blood-pressure drug prazosin, which has been found to reduce nightmares.

Preliminary results from a study of 50 veterans showed that both treatments were effective in reducing nightmares and symptoms of P.T.S.D., she said, though they differed from patient to patient. She is continuing to study what factors may lead to those differences. Deirdre Barrett, a psychologist at Harvard Medical School who is an expert on dream incubation, inducing dreams to resolve conflicts , and on the connection between trauma and dreams — said she was struck by the growing interest in nightmares as a result of war trauma and torture.

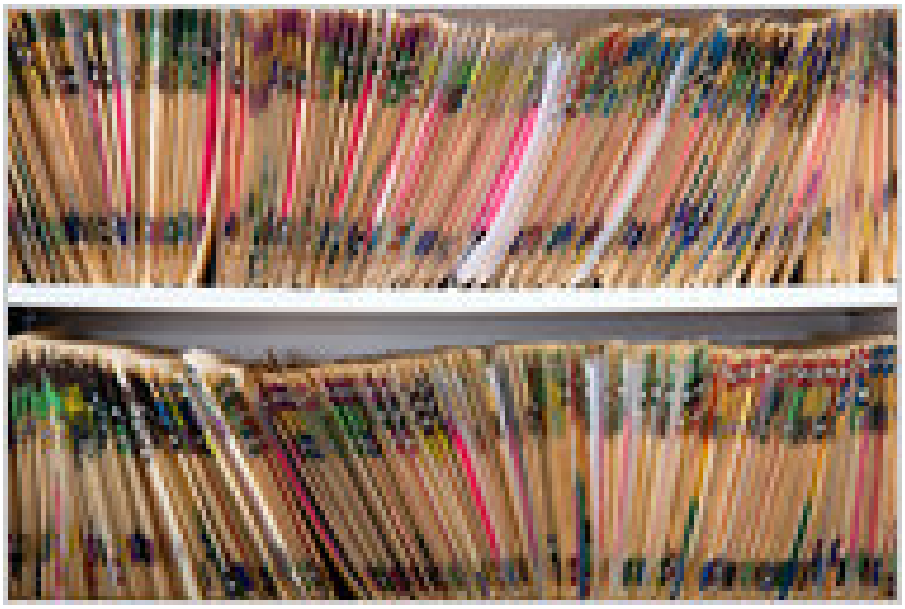
"Within the community of psychologists who have put an emphasis on dreams it used to be about interpretation," she said. "And now therapists are getting the message that you can influence dreams, ask dreams about particular issues and change nightmares." And Hollywood has just produced its own spin on the idea of controlling dreams, with the release earlier this month of "Inception" a thriller whose plot swirls through the darkest layers of the dream world. Underlying the story is the concept of lucid dreaming, another technique used by clinicians to help patients afraid of their dreams understand that they are dreaming while a dream is in progress. Dr. Barrett supports the use of Dr. Krakow's technique, although she said that ideally the nightmare work should be integrated with psychiatry and behavioral therapies to treat the underlying condition. Still, Dr. Barrett said, "Barry has made a huge contribution by getting the numbers, getting the statistics and getting the proof that it can work."

Dr. Krakow's nightmare therapy typically includes four sessions of group treatment and between one and ten individual sessions, though Dr. Krakow said between three and five sessions are usually effective. (The clinic visits are covered by insurance.)

http://www.nytimes.com/2010/07/27/health/27night.html?ref=science

Should Patients Read the Doctor's Notes?

By PAULINE W. CHEN, M.D.



Their request seemed simple enough: the patient and his wife, both in their 70s, wanted a copy of what I'd written in their medical file. During their visit, I had watched them refer to a well-thumbed collection of doctors' notes and medication lists, so when they asked for a copy of my note just before leaving, I assumed it would simply be added to the others.

But when I mentioned the request to one of the nurses outside the exam room a few minutes later, her eyes grew wide.

"Oh no, you can't do that," she said, shaking her head. "I don't think it's legal." The other doctors and nurses, attention piqued, moved closer to listen. "Send them to medical records," she urged. "He can sign the release papers there."

Another nurse in the growing crowd offered her own advice. "Do you know what's going to happen if you give them a copy now?" she asked. "They're going to start calling and e-mailing you with questions about what you wrote."

The doctors and nurses began clucking in agreement. "Think about it for a second, Pauline," one doctor said with voice lowered. "Maybe they are thinking of suing you."

There was a collective gasp from the group now gathered around me; and I could guess what they were thinking as they craned their necks to peer into the exam room where my elderly patient was busy fussing with his papers as his wife stood adjusting the canvas fishing hat on his head.

The barbarians are at the gate.

For 40 years, the tension over patient access has been playing out in hospitals, clinics and doctors' offices. Although medical records have always been accessible to clinicians, payers, auditors and even researchers, it was not until the 1970s that a few states began giving patients the same rights.

While a handful of physicians were vocal supporters of these early efforts, the majority of doctors were far less enthusiastic. They worried that their notes might become a source of unnecessary stress for patients. Read without an experienced clinician's interpretation, slight abnormalities like an elevated cell count from a viral infection could turn into a life-threatening cancer in the eyes of patients.

Even routine abbreviations and jargon like "S.O.B." (shortness of breath) and "anorexic" (a general lack of appetite, not the disease anorexia nervosa) could be confusing at best and inadvertently demeaning at worst. Doctors, already pressed for time, shuddered at the idea of suddenly being responsible for the worries of a reading public.

In 1996, despite these concerns, the Health Insurance Portability and Accountability Act, or HIPAA, gave all patients the legal right to read and even amend their own medical records. At the time, a group of national health care experts hailed this new transparency as a necessary component of better and safer care.

But today, few patients have ever laid eyes on their own records. And those who try often come back from their missions with tales of bureaucratic obstacles, ranging from exorbitant copying costs to diffident administrators. The same concerns from 40 years ago come up again and again, with little evidence to support or refute the claims of either side. Should medical records be shared as interactive documents between patients and physicians? Can transparency work, or will it end up worrying patients, muddling the patient-doctor relationship and adding more work to an already overburdened primary care work force?

Now, according to the latest issue of the Annals of Internal Medicine, the answers to these questions may finally be answered in a year's time.

This summer, researchers have begun the largest study to date of open access, aptly named Open Notes, involving over 100 primary care physicians and approximately 25,000 patients from three health care centers — the Beth Israel Deaconess Medical Center in Boston, the Geisinger Health System in Danville, Pa., and the Harborview Medical Center in Seattle. In the study, patients who have just seen their doctors will receive an e-mail message directing them to a secure Web site where they can view the signed physician notes. Patients will receive a second e-mail message two weeks prior to any return visit, reminding them that the notes from their previous visit are available for review.

Over the course of the yearlong study, funded by the Robert Wood Johnson Foundation, the Open Notes investigators hope to analyze the expectations and experiences of patients and physicians, as well as examine the number of additional phone calls, e-mail messages and visits that may arise as a result of more patients viewing their doctors' notes. In addition, a public survey on the journal's Web site will assess the opinions of any patient or doctor not enrolled in the study.

"We have one simple research question," said Dr. Tom Delbanco, a lead investigator who is a primary care physician at the Beth Israel Deaconess Medical Center. "After a year, will the patients and doctors still want to continue sharing notes?"

While enrolling patients in the study has not been difficult, finding physicians who are willing to participate has been more challenging. A few doctors were quick to sign on, but "most physicians were ambivalent at

best," noted Jan Walker, a registered nurse and health services researcher at Beth Israel Deaconess who is the study's other lead investigator. Many physicians were worried about workload and issues of clarity.

"The note is really a story," said Dr. Sara B. Fazio, a primary care physician at Beth Israel Deaconess who hesitated at first but is now one of the participating doctors. "The meaning of a story depends on the storyteller. Just because I write something down as my version of the facts doesn't mean that they will be the absolute facts or that another person could not interpret those facts differently." While physicians recognize that such differences in interpretation occur frequently, particularly across different specialties, patients may not. "A doctor's note could come across in a very unexpected way to a patient even when the doctor wrote it with the best of intentions," Dr. Fazio said.

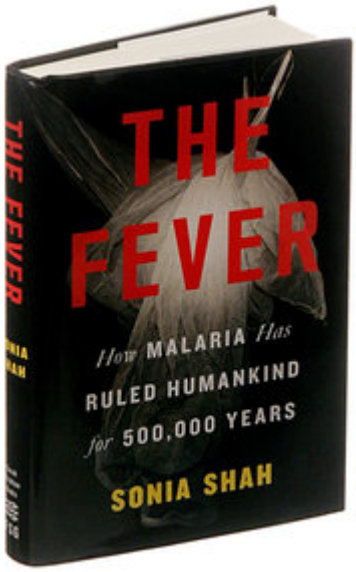
The researchers are hopeful that their study will help to settle many of the longstanding issues regarding open access, but one thing has already become apparent. For at least a few of those involved, the once sharply demarcated lines of the decades old tension have begun to fade. It is no longer so clear who exactly stands on what side of the medical records wall.

"In the end," Dr. Fazio said in an e-mail message, "we are all patients — if not now, then someday — and from that perspective it is easy to see the many reasons why this is a step in the right direction."

She added, "I suspect the physician in me will eventually be won over by that perspective given a little time."

http://www.nytimes.com/2010/07/27/health/27chen.html?ref=science

Drama! Intrigue! A Mystery? No, Malaria's Story
By ABIGAIL ZUGER, M.D.



Human history marches to the beat of what? A big brass band? A choir singing hymns? The lub-dub of the human heart? Sonia Shah's tour-de-force history of malaria will convince you that the real soundtrack to our collective fate is none of these: it is the syncopated whine-slap, whine-slap of man and mosquito duking it out over the eons.

Mosquitoes transmit dozens of infections, but none is as complicated or as sinister as malaria. Its very name (from the Italian "bad air") conjures up the wispy miasmas of a B horror movie. And indeed, this is a disease written in unnerving shades of gray. People can live with it for decades or die from it overnight. Immunity is patchy and incomplete. Drugs work, except when they don't. Vaccine makers create ever more promising failures. Over the eons malaria has arguably helped kill more people than any other force on earth.

And here is how stories about it usually begin: "Malaria is a mosquito-borne infectious disease caused by a eukaryotic protist of the genus Plasmodium ... " (this particular yawn-maker courtesy of Wikipedia). So Ms. Shah, a Boston-based journalist, has performed a real public service in telling the story of malaria with all the drama, intrigue and human interest left intact.

The little blobs of matter responsible for malaria are so devious they could give lessons to the C.I.A. Plasmodia change shape like a magician's scarves as they move from a mosquito's intestine to a mammal's bloodstream and then back again. Each of the species that cause human disease has its own "shtick," Ms. Shah's word, to keep it alive and causing trouble. The most vicious, falciparum, explodes millions of red blood cells at a shot and can kill overnight. Vivax, less dramatic but more persistent, hides in the liver and can keep a person weak and miserable for years.

The mosquito is also a sketchy character: of more than 3,000 species, only 70 members of the genus Anopheles transmit malaria parasites. Each of them has its own finicky habits: some like mucky water, some like clear water, some die in the cold, some hibernate till spring. With each minor change in mosquito behavior comes a different set of options for disease control — but the mosquitoes have a habit of changing their ways to thwart all control.

What a cascade of misery this disease has brought, dogging civilization's progress like a bad conscience. You build a dam, malaria develops upstream. You dig a canal, your expensive workers (specially imported from nonmalaria zones) drop like flies. You wage a war, and malaria kills more troops than the enemy does.

And yet, sometimes the disease has worked to its victims' advantage. Julius Caesar may have shivered with fever on his imperial couch in Rome, but malaria in the surrounding regions helped protect his empire from intruders. People lucky enough to survive childhood infections will seldom be bothered much with the disease as adults.

Ms. Shah does a virtuoso job with the frustrating history of antimalarial treatment. Quinine, one of history's great herbal drugs, potent but toxic, was extracted from tree bark well into the 20th century. Chloroquine, a synthetic derivative, was even more potent and much less toxic — it was the perfect drug, until, in the usual way of infectious diseases in our era, the malaria parasites became resistant.

That cycle has now repeated itself with every good antimalarial drug up to and including the latest, artemisinin. "It will be at least 10 years before a drug that good is discovered," mourned a World Health Organization official in 2006. "Basically we're dead."

Meanwhile, in many undeveloped parts of the world, the disease is just one of those things. Despite the urgency of the newest Gates-Clinton-Bono antimalarial cabal, people often consider it a minor malady, like a cold, and shrug at the West's obsession with taming it. According to one estimate, only 20 percent of those with malaria actually seek curative treatment, and then only a third of those take the drugs as prescribed. Life-saving insecticide-treated mosquito nets, donated by the West with much fanfare, are sometimes repurposed to catch fish.

Ms. Shah, an American of Indian descent, learned this all firsthand: "Nearly every Indian relative of mine reacted to my writing this book with mild puzzlement, as if I'd announced I was working on a book about bunions."

The only small problem with Ms. Shah's narrative is the likelihood that if you don't know your falciparum from your vivax and your merozoite from your schizont, you won't be learning it all here. The ridiculously baroque lifecycle of plasmodia are best grasped from straightforward text with lots of diagrams and tables, not poetic language with lots of adjectives.

But the technical details are easily available in a dozen other places. What is available nowhere else is Ms. Shah's riveting panorama of malaria in 21st century: babies in Malawi dying despite the best available treatment, well-financed Harvard researchers plotting a genomic attack on the disease, activists aiming to rehabilitate the pariah insecticide DDT. And then there is the casual mention of a parasite that used to cause malaria only in monkeys and is now showing up in sick people in Asia.

It is testimony to Ms. Shah's talents that even as her fluent, intelligent commentary runs on, the reader never stops hearing the ominous soundtrack in the background: Whine-slap. Whine-slap.

http://www.nytimes.com/2010/07/27/health/27zuger.html?ref=science

'Sleep control' cells allow blind mice to see

- 23 July 2010 by Sujata Gupta
- Magazine issue 2770.

WHAT happens when you take blind mice and see how they run? It turns out they can identify objects using receptors in the eye that were previously thought to have no role in forming images. Since humans possess the same receptors, the finding could point the way to giving blind people some ability to see.

Mice, and humans, have three types of light-detecting receptor in the eye. Rods and cones detect light, darkness, shape and colour, and make normal sight possible. Receptors of the third type, the melanopsin-containing ganglion cells (MCGCs), were until now thought only to respond to light over longer periods of time, to help moderate patterns of sleep and wakefulness.

To investigate their role in vision, Samer Hattar of the Krieger School of Arts and Sciences at Johns Hopkins University in Baltimore, Maryland, and colleagues engineered mice to lack rods and cones. When these mice were placed in a maze, they were able to identify a lever with a visible pattern on it which allowed them to escape. Mice that lacked rods, cones and MCGCs could not find the lever.

In another task, the team found that the MCGC mice could follow the movement of a rotating drum (Neuron, DOI: 10.1016/j.neuron.2010.05.023). This suggests MCGCs can form "low-acuity yet measurable images", Hatter says.

Tom Cronin at the University of Maryland notes that the mice in the experiment behave like people with "blindsight", who can navigate round objects without consciously perceiving them. "It's mind-boggling but I suspect that the mice are doing something like that," he says.

Hattar suggests that MCGCs may have allowed simple vision to evolve "before the introduction of the fancy photoreceptors - rods and cones". He hopes his finding might lead to ways to help blind people regain some degree of sight.

http://www.newscientist.com/article/mg20727703.200-sleep-control-cells-allow-blind-mice-to-see.html

Potential Found in a New Approach to Alzheimer's

By NICHOLAS WADE

A potentially promising approach to treating Alzheimer's disease has been developed by researchers studying sirtuin, a protein thought capable of extending lifespan in laboratory animals.

Using mice prone to developing Alzheimer's, the researchers showed that activating sirtuin suppressed the disease and that destroying sirtuin made it much worse.

The finding was made by Gizem Donmez, Leonard Guarente and colleagues at the Massachusetts Institute of Technology, who say it raises the hope of treating Alzheimer's, and possibly other neurodegenerative diseases like Parkinson's and Huntington's, with drugs that activate sirtuin.

Researchers not involved in the study agreed. "We think it is a scientifically compelling story that ties the sirtuins to the biology of Alzheimer's disease," said Dr. Dennis J. Selkoe, an Alzheimer's expert at Harvard Medical School. But the therapeutic implications, Dr. Selkoe added, "remain quite up in the air."

Another expert, Dr. Juan C. Troncoso of Johns Hopkins University School of Medicine, said the finding "opens a very good avenue, but it's not without a lot of technical challenges."

Drugs that activate sirtuin already exist, including resveratrol, a minor ingredient of red wine and other foods, and small-molecule chemicals designed to mimic resveratrol. Sirtris, the company that developed the drugs, is testing them against diabetes and other diseases. This generation of drugs does not cross the blood-brain barrier so would not work against Alzheimer's.

But George P. Vlasuk, Sirtris's chief executive, said the company had developed other sirtuin-activating chemicals that do reach the brain and are in preclinical trials. "We think it has very significant potential in neurodegenerative diseases," Dr. Vlasuk said.

Sirtuin has been the subject of intense research in the last few years because it seems to protect the body's various organs against disease by stepping up maintenance programs. The substance came to light through studies of longevity, particularly the discovery that reduced-calorie diets could lengthen the lifespan of mice by 30 percent. Sirtuin appears to convey much of the beneficial effect of such diets, even though drugs that activate sirtuin have not yet been shown to prolong mice's lifespan in experiments.

Dr. Guarente, a leading sirtuin researcher, said the protein's protective power against other diseases made him wonder if it might also help against Alzheimer's. He obtained mice that tend to develop Alzheimer's-like symptoms because they are genetically engineered to carry two mutated human genes that cause a buildup of plaque in the brain. The mice were crossed with a strain of mice in which the sirtuin-making gene is particularly active. They were also crossed with a strain in which the sirtuin gene was deleted entirely. Dr. Guarente's team could thus test the effect of having either more or less sirtuin in the brains of Alzheimer's-prone mice.

The decline in memory typical of Alzheimer's "was clearly suppressed" in the Alzheimer's-prone mice with abundant sirtuin, the M.I.T. group reports in Friday's issue of Cell, while the mice with Alzheimer's genes and no sirtuin started to lose memory at a much younger age.

The team found the sirtuin protected the mice's brains two ways. First, it activated a system called the notch pathway, which protects brain cells against stress. Second, it enhanced an enzyme whose activity avoids the buildup of the plaque characteristic of Alzheimer's and particularly of a toxic component called A-beta peptide.

Reducing the amount of A-beta peptide is helpful only in Alzheimer's but turning on the notch pathway could provide general protection for the brain. Activating sirtuin, the M.I.T. researchers conclude, "is a viable strategy to combat Alzheimer's disease and perhaps other neurodegenerative diseases."

Dr. Guarente said he was looking into whether extra sirtuin had an effect in mice made vulnerable to Parkinson's and Huntington's disease.

Activating the notch pathway with sirtuins "opens a lot of options," Dr. Troncoso said. "If we can activate the same gene we may provide a tonic for nerve cells under stress, and that may be of use in other diseases such as Huntington's and Parkinson's in which the nerve cells degenerate," he said.

Sirtuin research is a highly active field but one whose ultimate benefit remains to be seen. The sirtuins seem to be powerful players in maintaining the body's health, but many aspects of their behavior are still unclear.

Also unclear is whether sirtuin's protective effects can be elicited by drugs instead of by the usual natural stresses, like lack of nourishment. There are continuing disputes as to whether resveratrol activates sirtuin directly or indirectly. Much may depend on a Phase 2 clinical trial of resveratrol with Type 2 diabetes. The results of the trial should be known later in the year, Dr. Vlasuk said in an interview last month.

http://www.nytimes.com/2010/07/24/health/research/24alzheimers.html?ref=research

Heart problem no problem for fliers

- 24 July 2010
- Magazine issue 2770.

No extra risk to your heart (Image: Anton Badin/Plainpicture)

IT'S OK to fly even if you have serious heart problems, according to this week's advice from the British Cardiovascular Society.

Its guidelines are much more upbeat than previous reports on air travel and heart disease, which warned of heart attacks and lung failure from deep-vein thrombosis - when blood clots form, blocking veins and arteries.

"The cabin environment doesn't pose a significant risk to heart health," says lead author David Smith at the Royal Devon and Exeter NHS Foundation Trust in the UK. The key for those with a pre-existing heart condition, Smith says, is to make sure that it is fully diagnosed and under control when you fly. "It's down to how stable your condition is," he says.

People who have recently had heart attacks, for example, should make sure they take their medication, avoid caffeine and alcohol, and walk regularly during the flight. The advice is published in the journal Heart, and lists in-flight precautions for a range of heart conditions (DOI: 10.1136/hrt.2010.203091).

The report does acknowledge that the risk of clots forming in the lungs is doubled in healthy people during flights of 4 hours or more. However, this is because people are forced to sit still for hours, and the risk applies to other forms of long-haul travel, such as car or train, Smith says.

http://www.newscientist.com/article/mg20727702.600-heart-problem-no-problem-for-fliers.html

Will a second attempt at IVF be worth the effort?

- 23 July 2010
- Magazine issue 2770. Subscribe and save

WHEN IVF treatment fails, should you call it quits or try again? This tough decision could become a little easier, say Prajna Banerjee at Stanford University School of Medicine in California and colleagues, who have developed a model that can better predict the likelihood that a second IVF treatment will succeed.

Doctors typically use the woman's age as the main factor in predicting the likely outcome of IVF, but this can be unreliable. To improve on this method, Banerjee's team used clinical and embryo data from over 1600 IVF patients to identify the most influential factors determining whether a live birth will be achieved the second time around.

"While age is a major driving force towards decreased fertility, it does not have the highest importance once you have the embryo data," says Mylene Yao, who co-authored the paper. The team found the most influential factors included the number of cells that developed into early stage embryos, the thickness of the womb lining, and body mass index. When these factors were used together, the model was markedly better at predicting likely success of subsequent treatments than age-based predictions (Proceedings of the National Academy of Sciences, DOI: 10.1073/pnas.1002296107).

IVF is expensive and also carries physical and emotional costs, so many people struggle with the decision over a second attempt. "Understanding their probability of having a live birth, based on their very own clinical data, may serve to support that decision," says Yao.

http://www.newscientist.com/article/mg20727703.900-will-a-second-attempt-at-ivf-be-worth-the-effort.html

Single gene could be key to a baby's first breath

- 14:52 23 July 2010 by Catherine de Lange

It's probably the first thing you ever did by yourself, but how did you know what to do? It's long been a mystery how newborn mammals draw their first breath after life in a fluid-filled womb – and more importantly why this mechanism fatally fails in some individuals.

Now a single gene is providing some answers, which should lead to a better understanding of human diseases such as sudden infant death syndrome and sleep apnoea.

Xavier Caubit from CNRS (National Centre for Scientific Research) in Marseille, France, and colleagues knew that mice that don't have the Teashirt 3 gene (Tshz3) fail to breathe at birth and so die.

"Initially we suspected that the Tshz3 mutant embryos might have some defects in lung smooth muscle," says co-author Laurent Fasano, also from CNRS. But the researchers soon realised the problems in fact lie in the brain cells that tell muscles involved in breathing what to do.

Breath control

There are two areas in the brain known to be key for breathing. The first is a set of cells responsible for controlling muscles that open the airways and move chest muscles. The second is the respiratory rhythm generator (RRG) – a kind of pacemaker that produces an oscillating rhythm in the brainstem and controls autonomous breathing.

To test what happens to these brain areas in Tshz3 mutant mice, Caubit and his team examined the brains of mouse embryos lacking the gene at the later stages of development to see whether they were developing normally.

"We expected that some neurons could be missing," says Fassano. In fact, the RRG neurons were present, but hadn't developed properly.

"That absence of rhythmic activity [due to the faulty RRG neurons] correlates with inability to breath at birth," says Fassano. What's more, without Tshz3, brain cells responsible for the control of the upper airways were being killed off in the days before birth.

Key gene

"The really interesting thing about this research is that a single gene seems to be essential for a key component of the complex neural networks that regulate breathing," says Jeremy Ward, a respiratory cell physiologist from Kings College London who wasn't involved in the research. But can this help us to understand breathing defects in people better?

Fasano hopes so, because humans have Teashirt 3 too. This optimism is shared by paediatrician Aaron Hamvas, of Washington University in St Louis, Missouri. "Disturbances in respiratory patterns, predominantly in the form of apnoea, are seen in most premature babies and some full-term babies. Knowing the genetic basis for these types of problems will permit development of diagnostic tests and ultimately therapeutic interventions."

Journal reference: The Journal of Neuroscience, DOI: 10.1523/jneurosci.1765-10.2010

http://www.newscientist.com/article/dn19218-single-gene-could-be-key-to-a-babys-first-breath.html

Dinosaur clawprints are all over hunt site

- 11:15 23 July 2010 by James O'Donoghue

An ancient "crime scene" in Utah reveals rare evidence of a dinosaur in the act of preying on a small mammal.

A 77-million-year-old dinosaur claw mark and scratched-out digging traces were discovered next to a series of mammal burrows in Dixie National Forest by Edward Simpson, a geologist at Kutztown University in Pennsylvania, and his colleagues.

"It appears a dinosaur was digging down and trapping rodent-like mammals in a similar way to coyotes hunting around prairie dog burrows today," says Simpson. This is the first time that trace fossil evidences of predatory digging by dinosaurs for mammals has been discovered, he adds.

The size and curvature of the claw and dig marks suggest they were probably left by the feet of a maniraptoran theropod. The maniraptors were mostly carnivorous dinosaurs and include velociraptors and the ancestors of modern birds among their ranks.

No hiding place

Two types of mammal burrow were discovered, the larger occupied by rabbit-sized mammals and the smaller by shrew-sized ones. They would have lived on a sparsely vegetated, dry, sandy plain crossed by meandering streams.

The traces were preserved when sand was suddenly dumped onto the burrows during a flood. They were eventually re-exposed at the bottom of a cliff face where they were spotted by Simpson's team.

Dinosaur track expert Martin Lockley of the University of Colorado Denver agrees that the find provides convincing evidence that maniraptors were able to dig for their prey. "Hopefully this will encourage palaeontologists to look for more of this type of evidence," he says.

Journal reference: Geology, DOI: 10.1130/g31019.1

http://www.newscientist.com/article/dn19216-dinosaur-clawprints-are-all-over-hunt-site.html

O_2h no! Is our oxygen running out?

- 21 July 2010 by Stephen Battersby
- Magazine issue 2769.

Breath deep (Image: Roberto Schmidt/AFP/Getty)

I HAVE been feeling a little short of breath on mountain paths lately, and it took me ages to light the barbecue last week. I wonder why? Perhaps it's something to do with a lack of exercise, an excess of beer, some damp charcoal... But wait, there is a much simpler explanation: these days, there isn't enough oxygen in the air.

So say many websites - sites that just happen, by wild coincidence, to sell solutions to this atmospheric catastrophe in the form of "liquid oxygen" supplements, personal oxygen generators, even oxygen-laden skin-creams. As New Scientist's Feedback column has noted over the years, these snake-oil salesmen exploit a bafflingly persistent myth, that industrial activity has sucked much of the oxygen out of the air.

Some claim that a couple of hundred years ago the "natural" level of oxygen in the atmosphere was 38 per cent, others that large cities such as Tokyo, Japan, now have oxygen levels as low as 5 per cent. In fact, the oxygen content of the air worldwide is about 21 per cent, the same as it was for the Victorians,

the Romans and the Neanderthals. All those claims that the sky is falling are utter nonsense. Well, almost.

Measurable decline

It is true that human activity is causing a steady, measurable decline in the oxygen content of the world's air, although as yet this decline is negligible. But if we continue to burn fossil fuels for centuries more, levels could fall much further. Should we be worried?

Since 1989, Ralph Keeling has been monitoring oxygen levels around the globe. As well as continuous measurements at permanent monitoring stations, flasks of air are captured in some of the wilder parts of the planet, such as Cold Bay in Alaska and Cape Grim in Tasmania, and sent to Keeling's lab at the University of California, San Diego, for analysis.

Originally, Keeling measured the speed of light in the air samples with a laser beam. Because light moves faster in oxygen than nitrogen, this reveals the oxygen content. Now he and his collaborators use several methods, including mass spectroscopy and ultraviolet probes. Some of these techniques are being used on board a plane that is zigzagging from pole to pole. All the methods give the same result: the concentration of oxygen is declining everywhere at the same rate, about 20 parts per million (ppm) per year. In other words, for every million molecules of O_2 in the air in 1989, there are now only about 999,600.

This fall comes as no surprise. When you burn a hydrocarbon fuel such as oil, its hydrogen and carbon atoms combine with oxygen from the atmosphere to create water and carbon dioxide. As we drive up levels of CO_2 by burning fossil fuels, we also deplete oxygen.

Brief bonanza

In fact, Keeling's measurements have shown that oxygen is declining less rapidly than expected, probably because plants are enjoying a brief bonanza. As they have exploited the higher levels of CO_2, the total amount of biomass on the planet has increased, and in the process extra oxygen has been pumped out.

This probably won't last. Studies of Earth's past suggest that the total biomass will soon stabilise - or more likely start to decline. That means the drop in oxygen will depend largely on how much more fossil fuel we burn.

Say we guzzle all the easily accessible fuels - all the coal, oil and gas that can be economically hacked or pumped from the Earth today. In total, that is estimated to be roughly 1200 billion tonnes of carbon, mostly in the form of coal. Burning the lot would mean we lose 3600 ppm of our oxygen, so the level would fall from today's 20.95 per cent of the atmosphere down to 20.87 per cent.

Hardly suffocating, then, but that may not be the end of the story. The Earth holds other, less-accessible fuels, such as tar sands, and a more exotic possibility in the form of icy methane hydrates. In the pessimistic "A2 scenario" looked at by the Intergovernmental Panel on Climate Change, a world

undergoing slow technological change but high population growth burns 3700 billion tonnes of carbon over the next two centuries. This would translate to a loss of about 1.1 per cent of our present stock of oxygen - down to 20.7 per cent of the atmosphere.

Natural lows

To get a feel for what this would mean, bear in mind that the amount of oxygen in a given volume of air changes with atmospheric pressure, and the local pressure changes with the weather. When it is raining, one lungful of air will often have a few per cent less oxygen than on an average day - a larger reduction than in our pessimistic scenario above. Or you could get much the same reduction by climbing from sea level up a hill just 100 metres high. In other words, a fall to 20.7 per cent would make hardly any difference.

When it rains, each lungful of air contains less oxygen than normal

Estimating fuel reserves is far from a precise science, however. In fact, there is undoubtedly much, much more buried carbon than any estimates of fossil fuel reserves suggest - more than enough to consume every last bit of oxygen in the atmosphere if it was burned (see "Suffocating saurians"). Perhaps fortunately, the vast majority of this carbon is spread very thinly, forming only a very minor ingredient in rocks. It is useless as fuel, because it would take more energy to extract than would be gained by burning it.

Still, according to some analyses as much as 25,000 billion tonnes of carbon might be recoverable. These estimates are based largely on old figures for the total amount of methane hydrates that are now thought to be too high, but let's be extremely pessimistic, and assume that they are right - and that we are ingenious enough and unwise enough to extract and burn all this carbon, or trigger its release. That would consume nearly 8 per cent of our oxygen, causing levels to drop to just 19.4 per cent of the atmosphere. Surely that would cause serious problems?

Peak performance

Probably not, says physiologist Mike Grocott of University College London, who studies the effects of hypoxia on hospital patients and mountain climbers. "I'd be very surprised if there was any widespread medical effect - although I'd expect patients who already have low blood oxygen levels due to severe cardiac or respiratory conditions to be at greater risk of complications."

Athletes would find it harder to break records, says Grocott, and climbing high mountains will become a little more difficult. "Everest is already on the threshold of what's possible without supplemental oxygen. It might become impossible for most people."

Somewhat more seriously, people living in parts of the high Andes and the Himalayas would find life even tougher. Physical labour would become harder, for instance, and infant mortality would increase. That would be worrying - if it weren't for the vastly greater peril of extreme climate change caused by burning all that carbon. With the ice caps rapidly melting, today's coasts being inundated and the tropics turning into desert, the least of the world's worries will be a few wheezing yaks.

Real crisis

While there is far more reason to worry about rising CO_2 than falling O_2, we could still create a real oxygen crisis - not on land, but in the oceans. As atmospheric oxygen levels fall, less oxygen will dissolve in seawater, depleting levels slightly. Worse still, the warmer seawater gets, the less oxygen it can hold.

The effect of both these processes has been modelled by Gary Shaffer and his colleagues at the Danish Centre for Earth System Science in Humlebaek. In their worst case, based on the A2 scenario, oxygen levels in the top 500 metres of the oceans could drop by more than 20 per cent by the year 4000 (Nature Geoscience, vol 2, p 105).

"Dead zones" with almost no oxygen already make up around 2 per cent of the oceans by area, and they could expand seven-fold. "Fish can swim away, but the area of ocean they inhabit will become smaller," says Shaffer. Some species are more tolerant to low oxygen levels, and of course marine mammals and seabirds get their supply from the atmosphere, but they would all fall victim to an indirect menace. Low oxygen levels encourage the growth of bacteria that destroy nitrate - a vital nutrient for the ocean's microscopic plants, or phytoplankton. The phytoplankton are the base of the main marine food chain, eaten by zooplankton, which are eaten by fish, and so on. Take them away and the whole ecosystem collapses.

As if that weren't bad enough, the bacteria that thrive in low oxygen conditions emit a powerful greenhouse gas, nitrous oxide. If we suffocate the sea, it might take its revenge.

Suffocating saurians

Three hundred million years ago, dragonflies and millipedes grew to frankly disturbing sizes - thanks in part to levels of oxygen in the atmosphere as high as 30 per cent. What created this abundance, and what brought oxygen back down to today's less heady levels?

It is all to do with the fate of plants. Plants emit oxygen while they are photosynthesising, but the same amount of oxygen is used up if the carbon compounds they make are broken down. To boost oxygen in the long term, organic matter must be buried beyond the reach of hungry bugs and beasts. Most of the oxygen in our air came from plants whose remains - or those of the animals that fed on them - became entombed in sedimentary rocks.

As the crust shifts, however, it can bring sediments containing ancient corpses back to the surface, where they decompose, removing oxygen from the atmosphere once more. Gases from organic material buried deep in the Earth can also escape to the surface, where they react with oxygen. So oxygen levels can go down as well as up, depending on the balance between burial and exhumation.

When plants conquered the land they found new places to grow and new ways to be buried, gradually boosting atmospheric oxygen. This eventually resulted in the oxygen-rich atmosphere of the Carboniferous period around 340 to 280 million years ago. "The Carboniferous had lush swampy forests, perfect for burying carbon" says Tim Lenton of the University of East Anglia in Norwich, UK.

Later, the continents moved together to create large, dry supercontinents much less hospitable to verdant plant life. The balance swung against burial, and oxygen levels fell.

What happened next, during the age of the dinosaurs from 230 to 60 million years ago, is more controversial. According to Lenton and his colleagues, oxygen levels increased once more before falling to present day levels. However Robert Berner of Yale University thinks oxygen levels plummeted after the Carboniferous before slowly rising to present day levels (see graph). Both conclusions are based on models that are broadly similar, but involve on somewhat different assumptions.

So did the dinosaurs have to breathe heavily despite their efficient bird-like lungs, or could they take leisurely sniffs of the air? The jury is still out, though fossil charcoal shows that forest fires were common at the time. This would be difficult to explain if oxygen levels fell below 15 per cent, as Berner's model suggests, because fires should not occur below this level.

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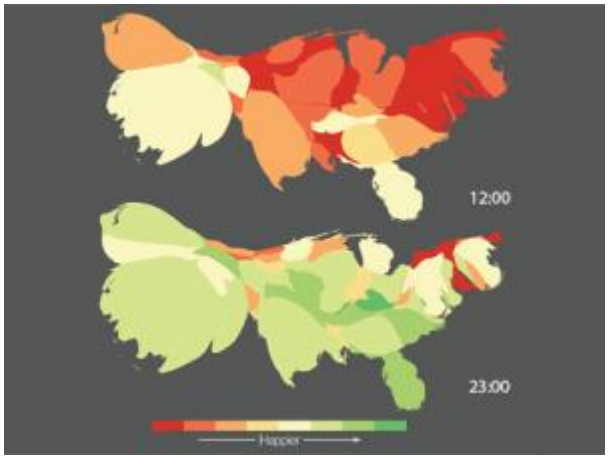
http://www.newscientist.com/article/mg20727692.000-o2h-no-is-our-oxygen-running-out.html

Twitter mood maps reveal emotional states of America

- 12:14 21 July 2010 by Celeste Biever



The mood of the nation at midday and 11 pm EST (Image: Alan Mislove/Sune Lehmann/Yong-Yeol Ahn/Jukka-Pekka Onnela/J. Niels Rosenquist, 2010)

America, are you happy? The emotional words contained in hundreds of millions of messages posted to the Twitter website may hold the answer.

Computer scientist Alan Mislove at Northeastern University in Boston and colleagues have found that these "tweets" suggest that the west coast is happier than the east coast, and across the country happiness peaks each Sunday morning, with a trough on Thursday evenings. The team calls their work the "pulse of the nation".

To glean mood from the 140-character-long messages, the researchers analysed all public tweets posted between September 2006 and August 2009. They filtered them to find tweets that contain words included in a psychological word-rating system called Affective Norms for English Words – a low-scoring word on ANEW is considered negative, a high-scoring one positive. They also filtered out tweets from users outside the US, and also from those in the US who did not include their exact location – for example, their city – in their Twitter profile.

That left 300 million tweets, each of which was awarded a mood score based on the number of positive or negative words it contained. For example, "diamond", "love" and "paradise" indicate happiness, whereas "funeral", "rape" and "suicide" are negative. "Dentist" is fairly neutral.

Finally, the researchers calculated the average mood score of all the users living in a state hour by hour and so created a timed series of mood maps. They morphed the maps so that the size of each county reflected the number of Twitter users living there (see maps, right).

Simple or sophisticated?

"The visualisations are amazing and I think it is absolutely fascinating to see the nation's mood vary in near-real time," says Johan Bollen of Indiana University in Bloomington, who was not involved in the work but who is one of several other researchers using Twitter as a tool to track the public mood.

He thinks Twitter and similar sites will spawn "sophisticated systems" for mood tracking – although paradoxically, the maps produced by Mislove's team are made by a remarkably simple method.

For example, Mislove admits that subtleties are lost because the method takes individual words out of context: if someone tweets "I am not happy", the team's method counts the tweet as positive because of the word "happy". "It's a very naive and simple approach," he says.

Nevertheless, he thinks there is good reason to suspect the results reflect real mood swings – at least among Twitter's users. For one thing, the national weekly and daily trends are also seen in individual regions, something you would not expect if the variations were random.

This is particularly marked when the daily mood maps for the west and east coasts are compared: the west coast mood follows the same pattern as the east, with the 3-hour time-zone delay, indicating that each coast experiences the same time-dependent swings.

Data overload

Mislove speculates that a signal shines though because the sheer abundance of data means that occasional misinterpretations are lost in the crowd. Bryan Routledge at Carnegie Mellon University in Pittsburgh, Pennsylvania, agrees. With colleagues, he recently used a similarly simple analysis of words in tweets to determine whether Twitter mirrors conventional opinion polls. "The volume is massive, so the subtle stuff kind of washes out," he says.

Because Twitter data is publicly available, Routledge says mood can be sampled more quickly, simply and cheaply than using traditional polling tools – albeit more crudely.

Steven Gray at University College London, who also crowdsources data through Twitter, agrees. For all of the problems with decoding the data, "Twitter offers researchers a unique, live data set that changes by the minute", he says.

http://www.newscientist.com/article/dn19200-twitter-mood-maps-reveal-emotional-states-of-america.html

Every black hole may hold a hidden universe

- 23 July 2010 by Anil Ananthaswamy
- Magazine issue 2770.

Deep inside a black hole? (Image: Serge Brunier/Clemson/NASA)

WE COULD be living inside a black hole. This head-spinning idea is one cosmologist's conclusion based on a modification of Einstein's equations of general relativity that changes our picture of what happens at the core of a black hole.

In an analysis of the motion of particles entering a black hole, published in March, Nikodem Poplawski of Indiana University in Bloomington showed that inside each black hole there could exist another universe (Physics Letters B, DOI: 10.1016/j.physletb.2010.03.029). "Maybe the huge black holes at the centre of the Milky Way and other galaxies are bridges to different universes," Poplawski says. If that is correct - and it's a big "if" - there is nothing to rule out our universe itself being inside a black hole.

In Einstein's general relativity (GR), the insides of black holes are "singularities" - regions where the density of matter reaches infinity. Whether the singularity is an actual point of infinite density or just a mathematical inadequacy of GR is unclear, as the equations of GR break down inside black holes. Either way, the modified version of Einstein's equations used by Poplawski does away with the singularity altogether.

For his analysis, Poplawski turned to a variant of GR called the Einstein-Cartan-Kibble-Sciama (ECKS) theory of gravity. Unlike Einstein's equations, ECKS gravity takes account of the spin or angular momentum of elementary particles. Including the spin of matter makes it possible to calculate a property of the geometry of space-time called torsion.

When the density of matter reaches gargantuan proportions (more than about 10^{50} kilograms per cubic metre) inside a black hole, torsion manifests itself as a force that counters gravity. This prevents matter

compressing indefinitely to reach infinite density, so there is no singularity. Instead, says Poplawski, matter rebounds and starts expanding again.

Now, in what is sure to be a controversial study, Poplawski has applied these ideas to model the behaviour of space-time inside a black hole the instant it starts rebounding (arxiv.org/abs/1007.0587). The scenario resembles what happens when you compress a spring: Poplawski has calculated that gravity initially overcomes torsion's repulsive force and keeps compressing matter, but eventually the repulsive force gets so strong that the matter stops collapsing and rebounds. Poplawski's calculations show that space-time inside the black hole expands to about 1.4 times its smallest size in as little as 10^{-46} seconds.

This staggeringly fast bounce-back, says Poplawski, could have been what led to the expanding universe we observe today.

How would we know if we are living inside a black hole? Well, a spinning black hole would have imparted some spin to the space-time inside it, and this should show up as a "preferred direction" in our universe, says Poplawski. Such a preferred direction would result in the violation of a property of space-time called Lorentz symmetry, which links space and time. It has been suggested that such a violation could be responsible for the observed oscillations of neutrinos from one type to another (Physical Review D, DOI: 10.1103/PhysRevD.74.105009).

If we are living inside a black hole, it would have imparted a 'special direction' to our universe

Sadly, there is no point in us looking for other universes inside black holes. As you approach a black hole, the increasing gravitational field makes time tick slower and slower. So, for an external observer, any new universe inside would form only after an infinite amount of time had elapsed.

http://www.newscientist.com/article/mg20727703.000-every-black-hole-may-hold-a-hidden-universe.html

Triple-slit experiment confirms reality is quantum

- 19:00 22 July 2010 by David Shiga

It is one of the all-time greatest physics experiments: such a classic that it's taken a century to go one better.

In the double-slit experiment of 1908, a photon fired at a pair of slits passed through both simultaneously and interfered with itself. This surprising effect provided one of the first clues to the weird world of quantum mechanics.

Now precise measurements have been made on a version with three slits – and they again confirm the predictions of quantum mechanics.

Why are we still testing such predictions? It is not just tilting at windmills: physicists have long struggled to unite quantum mechanics with general relativity, which describes gravity, and some believe quantum mechanics will need tweaking to make this work.

Those tweaks, some physicists have argued, might include altering a quantum dictum called Born's rule. It predicts that interference patterns from three or more slits is equivalent to combining the effects of several double-slit experiments.But although it is easy to add a third slit to the double-slit experiment, it has been more challenging to do it in a way that allows the precise measurements needed to check the validity of quantum mechanics.

"The experiment is much harder than it might seem," says James Franson of the University of Maryland, Baltimore County, who was not involved in the study. "The slightest misalignment of the slits might produce errors."Urbasi Sinha of the University of Waterloo in Ontario, Canada, and colleagues managed to do it by carving into a metal coating on a glass plate to make three equally spaced transparent slits, 30 micrometres wide and 100 micrometres apart. Then they used a laser to fire photons one at a time at the plate and recorded the pattern of light on the other side.

The result was a wavy interference pattern that matched the predictions of Born's rule to within the experiment's error margin of 1 per cent.Franson says it is important to check for deviations from what theory predicts, even though the results were unsurprising in this case. "People tend to take things for granted, but physics is an experimental science and we should test these things," he says.

Journal reference: Science, DOI: 10.1126/science.1190545

http://www.newscientist.com/article/dn19215-tripleslit-experiment-confirms-reality-is-quantum.html

Law of hurricane power discovered

- 18:00 11 July 2010 by Michael Marshall

Quite predictable (Image: Sipa Press/Rex Features)

The intensity of hurricanes follows a simple mathematical law – a finding that could help us predict how they will respond to climate change.

Álvaro Corral of the Centre for Mathematical Research in Barcelona, Spain, and colleagues looked at records of hurricanes from four ocean basins around the world between 1966 and 2007. For each known hurricane, they calculated how much energy it released, based on the wind speeds and how long the hurricane lasted.

Regardless of region, the researchers found that the proportion of rarer, strong hurricanes to more frequent, weaker ones was always the same, regardless of the ocean basin. Only the very weakest and the very strongest hurricanes did not fit the pattern, called a power law.

The team also looked at the effect of sea surface temperatures on hurricanes. The proportion of weak to strong hurricanes in each year was similar whether the year was warm or cold, but more of the most

powerful hurricanes were observed in warm years. They saw the same effect in years affected by the El Niño climate cycle.

Worse to come?

Controversy has raged for several years over whether climate change will increase the intensity of hurricanes. Corral says that the results hint that, as temperatures rise to levels humans have not experienced before, there will be more of the most powerful hurricanes. But he says it is difficult to say for sure. "We don't know what will happen if temperatures go higher than those we have had," he says.

James Elsner of Florida State University in Tallahassee, is less sanguine about the effects of climate change. "Their results show that you get more powerful hurricanes if the sea surface temperatures are higher," he says. He adds that our best theories of hurricane formation also predict that higher sea surface temperatures lead to stronger hurricanes.

Journal reference: Nature Physics, DOI: 10.1038/nphys1725

http://www.newscientist.com/article/dn19157-law-of-hurricane-power-discovered.html

Lure of Tradition: Longevity Bias Proves Persistent

If something has been around longer, it must be better. New research suggests we hold onto that bias even in instances where quality has nothing to do with longevity.

By Tom Jacobs

Telling people something has stood the test of time makes them more likely to judge it favorably, whether they are assessing art or acupuncture. (YanC/istockphoto)

For all our fascination with novelty, human beings seem to have an instinctual preference for the tried and true. That's the implication of research that finds telling people something has stood the test of time makes them more likely to judge it favorably, whether they are assessing art or acupuncture.

"The longer something is thought to exist, the better it is evaluated," write the authors of the just-published study, University of Arkansas psychologists Scott Eidelman and Jennifer Pattershall and University of Kansas psychologist Christian Crandall. In the Journal of Experimental Social Psychology, they report this dynamic holds true even in situations where longevity has no objective relationship to quality.

Eidelman and his colleagues describe five separate studies confirming this thesis. In one, 91 University of Maine students read a brief essay about acupuncture, which informed them it has been around for 250, 500, 1,000 or 2,000 years.

They then responded to three statements about the practice, including "I think acupuncture is a good technique." When their responses were tallied, a clear pattern emerged: The longer they believed acupuncture has been practiced, the more likely they were to evaluate it positively.

In another study, 29 University of Arkansas students looked at a reproduction of a relatively unknown abstract painting: "Moon Landscape" by German artist Max Beckmann. They were then presented with a questionnaire, which asked them to respond to such statements as "This painting is pleasant to look at" and "This painting is good."

A single line at the top of the questionnaire reported that the work was created in either 1905 or 2005. Those who thought it was a century old rated it "as more aesthetically pleasing" than those who thought it was a recent creation.

That same dynamic held when students were asked to rate the aesthetic value of a live oak tree, and — perhaps most strikingly — the taste of chocolate. Those informed the European candy they sampled was first sold in 1937 found it better-tasting than those who were told it debuted in 2003.

Eidelman and his colleagues note the longer-is-better bias is far from irrational; after all, time often weeds out inferior products. But in their studies, "objects and outcomes were still judged as better" even in cases where longevity was irrelevant.

Great paintings, they point out, can be created in any era, and a beautiful tree is a beautiful tree. But for the study participants, the aura of longevity increased their appeal.

"These findings speak to the lure of tradition," the researchers write — an allure marketers know well. But they add this dynamic has potentially disturbing consequences in the social realm.

"Because longevity promotes its own favorability, it may confer legitimacy on otherwise undesirable practices" such as torture, they write. "It may also add another hurdle to overcome on the road toward social change."

This helps explain why it took a half-century to overhaul the American health-care system – and why future efforts to amend established but dysfunctional systems won't be any easier. "Overcoming the status quo is tricky," the researchers conclude, "but overcoming a time-honored tradition is substantially more difficult."

http://www.miller-mccune.com/culture/lure-of-tradition-longevity-bias-proves-persistent-19502#

Observe the Child, See the Adult

A new study compares teachers' assessments of schoolchildren with interviews given by those same people as adults. It suggests our personalities are pretty much set early on.

By Tom Jacobs

At what age do our personalities form? A new study suggests that the child very much reflects the adult he will become. (istockphoto.com)

At what age do our personalities form, and how stable do they remain for the rest of our lives? When you observe a child, can you really see the man or woman they will grow into?

Such questions have longed been pondered by theorists and explored by artists, including the creators of the compelling Up series of documentaries. But hard data on the subject is, understandably, scarce.

That makes a new study, just published in the journal Social Psychological and Personality Science, unusually interesting to students of human behavior. It compares teachers' assessments of Hawaiian schoolchildren with interviews given by those same individuals as middle-aged adults.

It finds that, four decades later, the traits noticed by the teachers were still very much in evidence, albeit in somewhat different form. After more than half a lifetime, an individual "remains recognizably the same person," according to the research team, led by psychologist Christopher Nave of the University of California, Riverside.

Between 1959 and 1967, teachers in selected Hawaiian elementary schools formally evaluated the personalities of more than 2,400 students from a wide variety of ethnic backgrounds. The list of attributes they considered, such as "adaptability," "impulsivity" and "spitefulness," varied somewhat from place to place and year to year, but there was considerable overlap.

Over the past 12 years, more than 450 of those former students have visited a Honolulu clinic and "completed an extensive battery of medical, physical and cognitive measures, as well a semi-structured personality interview," the researchers report. Nave and his colleagues randomly selected 144 of them, all of whom agreed to having their interviews videotaped.

Trained undergraduate research assistants watched the tapes and evaluated the behavior of the participants using a standard set of ratings. Those scores were then compared with the evaluations made in first, second, fifth or sixth grade.

It turns out those teachers were both perceptive and prescient.

"Children rated as 'verbally fluent' (under instructions that define the term as referring to unrestrained talkativeness) displayed dominant and socially adept behavior as middle-aged adults," the researchers report. "Early 'adaptability' was associated with cheerful and intellectually curious behavior."

In contrast, "Children rated as low in 'adaptability' were observed, as adults, to say negative things about themselves, seek advice, and exhibit an awkward interpersonal style. Children rated low in 'verbal fluency' by their teachers were observed, as middle-aged adults, to seek advice, give up when faced with obstacles, and exhibit an awkward interpersonal style."

There were still other matches. "Early 'impulsivity' was associated with later talkativeness and loud speech," the researchers write. "Early-rated tendencies to 'self-minimize' (defined as 'tends to minimize one's own importance; humble; never brags of shows off') were associated with adult expressions of insecurity and humility."

Undoubtedly, more analyses will arise from this valuable data set. It would be interesting to compare the long-term accuracy of the first- and second-grade evaluations compared to those made in fifth and sixth grades.

But these results help Nave and his colleagues make their larger point: While context is a crucial component in determining how people act, personality — a fundamental force that drives behavior — appears to be a constant.

My 9- or 10-year-old self, who studiously scoured the newspaper for suitable stories and oversaw our classroom's current events bulletin board, would no doubt agree.

http://www.miller-mccune.com/culture/observe-the-child-see-the-adult-19614

Pyramid Power, or Pennies for a Pony

Whether chain letters or Bernie Madoff, scams that rely on ever-greater numbers of gullible people eventually founder.

By Peter M. Nardi

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Scams that try to trap ever-greater numbers of gullible people will eventually crumble. (McClister Photography / istockphoto.com)

When I was a kid, I read somewhere that if I put a penny in my piggy bank on day one and doubled it each day, by the end of the month I'd be a millionaire.

Wonderful, I thought. I only needed to take 127 pennies from my weekly allowance in the first week; not too bad a burden when there were only three more weeks to go before I could afford a pony for my sister's birthday! Of course, with some better math skills and skeptical thinking, it dawned on me that on day 26 I would have to put over $335,000 in the bank to reach a million the very next day, a little more than I would collect in tips on my newspaper route.

This was also my introduction to the ancient pyramids of Ponzi.

SKEPTIC'S CAFE
Peter Nardi discusses how to use our critical skills to avoid scams, respond to rumors and debunk questionable research.

Thanks to Bernie Madoff, who was sentenced to prison just over a year ago, we've all heard about the Ponzi pyramid scheme that depended on new investors paying the earnings for earlier investors' supposedly surefire moneymaking ventures.

Named after the Italian immigrant Charles Ponzi, who bilked millions from people buying his international postal coupons that he sold from his Boston office in the 1920s, these swindles depended on the trust and avarice of many, increasing at an exponential rate similar to my piggy bank scheme. Although attributed to Ponzi, this investment strategy can be traced to William F. Miller, a Brooklyn bookkeeper and Bible studies teacher, who in 1899 promised investors a return of 10 percent a week, or 520 percent a year. But Miller himself was swindled and then caught when he couldn't make the promised payments to his clients.

Lest you think these schemes existed only for the past century or so, consider the phrase "to rob Peter to pay Paul." This idiom refers to taking money from one person to pay a debt owed to another. The Oxford English Dictionary traces the phrase to John Wycliffe's Select English Works of 1380, in which the theologian writes, "Lord, how should God approve that you rob Peter and give this robbery to Paul in the name of Christ?" The concept of swindling money from some people to pay off the debts and supposed investment earnings of others probably existed even earlier, perhaps to the era of the first pyramids.

And lest you think that you are not one to fall for such financial schemes, consider the e-mail chain letters that fill many inboxes: Send this on to 10 good friends and wait for good luck to happen; failure to pass it along can only bring sorrow and bad karma. Or so we are led to believe. These harmless messages do create lots of spam and annoy your friends and colleagues, perhaps creating bad karma for those who forward them.

But how often do you feel a wee bit on alert when you choose not to send these chain e-mails on to others? Just maybe something might happen; after all, testimonials from allegedly real people who've had bad luck after they failed to pass along the chain letter are provided.

So let's put on the critical thinking hats and detect what's happening in these schemes. First of all, chain letters that require sending money or something of value are against federal postal law.

E-mail versions, which emphasize bringing luck or blessings from the Lord, are not illegal, but have similar characteristics. Invariably, the stories urge you to act quickly. They provide minimal details and vague generalizations about the good fortune of those diligent folks who forwarded the e-mail to friends and about the harm that came to those who didn't. Sally sent out the e-mails to her friends and within days she met a boyfriend and they eventually married; Roberto ignored his e-mail request to forward it and several weeks later, while crossing the street, he was hit by an out-of-control semi. Dates and locations are never specified, and the statutes of limitations for how long the curse or luck last are never specified. Correlation here always implies causation.Financial pyramid schemes consistently build on the idea of something for nothing: huge returns in a short time period for doing virtually no work. Often a secret plan or international connection is invoked, and evidence of the underlying product or investment is difficult to find.

Given the ultimately exponential number of people needed to pay off the earlier investors, pyramid plans run out of people, usually exceeding the population of the U.S. (or Albania) within a dozen levels.You should also investigate multilevel marketing plans that involve paying you commissions for selling a product and for recruiting new distributors of the product. Some of these programs require that you buy starter kits of literature and inventory while promising you quick fortunes for selling their magical diet elixirs. For legitimate multilevel marketing companies, be sure to research their plans' details, their track records and the legitimacy of the claims made about their products. Perhaps then you'll have a piggy bank with more than just pennies and legitimately get to buy your pony.

http://www.miller-mccune.com/culture/pyramid-power-or-pennies-for-a-pony-18933

Smartest Girls Find Gender Gap in Math, Science

At the highest levels of academic ability among seventh-grade students, boys still outnumber girls by more than 3-to-1 in math and science, a study finds.

By Melinda Burns

Women are still underrepresented today in science, technology, engineering and math (STEM) careers. (annedde/istockphoto)

The gender gap in math and science between the most talented seventh-grade boys and girls is much smaller today than it was 30 years ago, but there's still a big disparity, and it does not appear to be going away, a team of researchers at Duke University has found.

In a new study for the journal Intelligence, the team examined 30 years of test data from 1.6 million smart students, the top 5 percent of seventh-graders in 16 states. They focused on the most gifted students, the top 0.01 percent who in seventh grade were able to score 700 or above on SAT math section or the equivalent on the ACT in math. That's a level of performance that even most college-hopeful high school juniors do not achieve.

At these highest levels of math ability, the researchers found, seventh-grade boys outnumbered girls by 4-to-1 on the SAT and 3-to-1 on the ACT. That's a big improvement from the early 1980s, when the ratio for top-scoring math students was 13 boys to every girl, a troubling gap identified back then by other researchers and confirmed again by the Duke team. But the new study shows that today's math gender gap among the most gifted students has been in place for two decades.

In addition, the Duke team found the ratio of high-scoring boys to girls on the ACT test for scientific reasoning is 3-1 — another gender gap that has held steady for two decades. Remarkably, 18 boys scored a perfect score on that test between 1990 and 2010, compared to only one girl. The SAT and ACT tests are widely used by American colleges to help determine admissions.

The new findings run counter to previous studies (here and here) suggesting that gender differences in math and science among the best students no longer existed or were meaningful. The advantage that boys have in scientific reasoning may result from more familiarity with and interest in science, the Duke researchers said, adding, "It is possible that visits to science museums and extracurricular science classes are more common among boys and this may partly explain these results."

Highly gifted girls performed better than highly gifted boys on SAT tests for writing and verbal reasoning, obtaining scores of 700 or above, but the difference was small, the study found.

A team of four researchers from the Duke Talent Identification Program conducted the study. Since 1981, the program has held an annual talent search, giving the SAT and ACT to seventh-graders to assess their academic ability. Duke offers summer courses, independent study, study abroad and financial aid to gifted students to accelerate their education.

According to the new study, the pre-adolescent gender gap in math and science shows up most sharply at the highest levels of performance. The disparity there may help explain why women are still underrepresented today in science, technology, engineering and math (STEM) careers, the authors said. It's a gap that persists, they said, even though many girls today are encouraged to study math and science, and even though there are role models among women professionals and Nobel Prize winners in the field.

"It's apparent that there are still differences in ability levels due to gender, even as women have occupied more STEM jobs in the last 30 years," said Jonathan Wai, the lead Duke researcher. "We will continue our research, but for now it seems that ability is still a factor in the equation."

Previous studies have suggested that women are more drawn to people and men are more drawn to things, and that difference could explain the paucity of women in the fields of science and engineering. The Duke researchers agree that preferences are likely important, and they don't rule out the continued impact of biases and barriers. Why ability still seems to play a role, they don't know.

"Sex differences favoring males in math ability and science reasoning may have declined from the early 1980s to present, possibly in response to fewer barriers, more encouragement and role models provided to females, but the fact that they are still substantial and have remained relatively stable for two decades may at least partly account for the dearth of women in STEM careers …" the authors conclude.

http://www.miller-mccune.com/education/smartest-girls-find-gender-gap-in-math-science-19156

Beyond good and evil

What Hitler and Mother Teresa have in common

By Rebecca Tuhus-Dubrow | July 18, 2010

What do Gandhi and Mother Teresa have in common with Hitler and Jeffrey Dahmer? Very little, you might reply. But our perceptions of them are in certain ways surprisingly similar, according to psychologist Kurt Gray.

Though we're accustomed to classifying people as good or evil, saints or sinners, Gray draws attention to a distinction he considers even more fundamental. As we navigate the world, he argues, we categorize the entities we encounter as either "moral agents" — those who act, who are deserving of praise or blame — or "moral patients" — those who are on the receiving end of good or bad deeds. So villains and heroes wind up on one side of this divide, with victims and beneficiaries — abused children, damsels in distress — on the other.

Both Hitler and Gandhi, for all their profound differences, are moral agents, whom we see as capable of deliberate morally freighted action, self-control, and planning. One used his moral power to inspire millions of his countrymen, of course, and the other to kill them. But their agency, Gray argues, is on some level first and foremost in our images of them.

In his lab research, Gray has identified several intriguing corollaries to this hypothesis. Unsurprisingly, we tend to see moral doers as powerful, given to intention and decisiveness. But we also see the recipients as

more capable of emotions and experience. Infants are a quintessential example: They are unequipped to earn praise or blame, and highly susceptible to hunger and desire, pain and pleasure.

Moreover, we seem to subconsciously infer the inverse: Both good guys and bad guys tend to be viewed as relatively impervious. It's hard to picture Gandhi whimpering over a bruised knee. In one of Gray's studies, people like the Dalai Lama, Martin Luther King Jr., and Osama bin Laden were rated low in sensitivity to pain. Victims and beneficiaries, meanwhile, are seen as powerless, and are not deemed accountable for their own behavior. A puppy rescued from abuse, for example, is likely to be excused for its misdeeds. These are all extreme cases: In reality, of course, most people fall somewhere in between, exhibiting a nuanced combination of these traits. But Gray argues that we have a tendency to engage in "moral typecasting" — putting people in one category or the other and making corresponding assumptions.

Another basic finding is that we tend to view morality as a dyad — if someone performs a good deed, there must be a beneficiary around somewhere, while if someone suffers, there must be a culprit to blame. This suggests, for example, that a neutral figure simply standing near a villain will come across as something of a victim, instantly winning sympathy. The responses of subjects in the lab have supported this notion.

In collaboration with Harvard University professor Daniel Wegner, Gray has published several papers in journals including the Journal of Personality and Social Psychology and Science. He recently completed his graduate work at Harvard, and will start as an assistant professor at the University of Maryland next month. He recently spoke with Ideas at his Harvard office about the advantages of playing the victim, why doing good (or bad) deeds makes us physically stronger, and why most of us would rather hurt Mother Teresa than a random bank teller.

IDEAS: So you think our distinction between moral agent and patient is even more basic than the distinction between good and bad?

GRAY: The findings that I have suggest that people can flip-flop between good and bad quite easily. So if you're a hero and you do something wrong, all of a sudden you're immediately a villain. But it's much harder to become a villain or a hero and then go to victim. So people have this kind of, I'm not going to say innate, but kind of deep-seated categorization of whether you're a doer or receiver of morality.

IDEAS: What's the most surprising thing you've found?

GRAY: We're happy to reward good people when we can, let's say, but if someone has to pay the price, if someone has to feel pain and be harmed, then, because they're seen as less sensitive to pain, we pick them above your average person. So the study asked people to imagine they had pain pills, and they could divide them between a variety of people. So villains always got the most pain and the least pleasure, when we did pleasure pills, and people like orphans got the most pleasure and the least pain. But the interesting comparison was that heroes, like the Dalai Lama and Mother Teresa, got more pain and less pleasure than your kind of average person. So like a bank teller or a network administrator or someone like that. And the idea there is just because people think they can take it.

IDEAS: Do you think at the same time we might think, this person is good so doesn't really deserve this, but on the other hand, they can take it. Is that other impulse there too?

GRAY: Certainly. When we ask people to divide the pain pills, we give it to them on the clipboard, the survey, they kind of sit there, and they look at it, and they look around, and they laugh nervously, and then they circle Mother Teresa — "Well, I guess." So no one feels happy about giving an elderly nun extra pain, but they still do it.

IDEAS: So there are these obvious extreme examples, like Hitler and Mother Teresa and orphans, but don't we know rationally that most adults are both?

GRAY: You can know rationally that people are capable of both, but it's just that we have this tendency to put people in bins.

IDEAS: But even someone like a friend, or ourselves?

GRAY: I think even there it happens....If your friend is really sad, her boyfriend just broke up with her, and you're giving her advice, then all of a sudden, in that instance, she becomes typecast as a patient, and because you're close to her, you're the agent. You're like, "Oh, it's OK, and I'll take responsibility and we'll do this."

IDEAS: So, just being around someone who's sort of in victim mode can allow people to become naturally more like agents?

GRAY: Yeah, that's the idea...the idea is that you naturally take your cues from others and become the opposite.

IDEAS: Since beginning this research, have you noticed examples in your own life, your own observations?

GRAY: If you cast yourself as a victim, you always escape blame, better than someone who emphasizes their past virtue. So if you say, "Oh, it's not my fault, I was abused as a child and this and that," then you get off more than if you say, "Look at all the good I've done for society. Now I've done this one wrong thing, but my whole life of good deeds should compensate for it." Well, it turns out it doesn't.

IDEAS: Because we see that person, when they emphasize their good deeds, as an agent, and therefore they should be held accountable.

GRAY: Exactly. One example in the media — I mean, they're all the time, but David Letterman, when he was busted for sleeping with that woman on his set, he came out immediately and he says, "Listen, I'm a victim, I've been blackmailed here." And it's all about how he's been blackmailed instead of how he's been philandering.

IDEAS: Can you discuss your study on "moral transformation"?

GRAY: If you think of yourself as a good-doer, you come to possess increased agency and decreased experience. Same with an evil-doer. So what we have people do is randomly assign them to either do something good for others or receive something themselves, and then measure their physical endurance by holding a weight. And what we find is that those who are given the opportunity to help others actually become physically stronger, possess more endurance....And what we find is that those who are given the chance to do evil increase in agency in kind, but also a little bit more than those who do good.

IDEAS: Why a little bit more, do you think?

GRAY: I think it's because for the average person with a conscience, it's a little harder to do evil....I really need to overcome my qualms to do it, and once I do it, I feel like I must be even more powerful.

IDEAS: So is the takeaway that in order to maximize our power we should all be doing really bad deeds?

GRAY: I think there are reasons other than increasing agency to do good....So I think they both work in the short term, but I think the good deeds are probably a little more sustainable, and also might make you feel better about yourself in the long run.

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http://www.boston.com/bostonglobe/ideas/articles/2010/07/18/beyond_good_and_evil/?page=full

Hard to find

Why it's increasingly difficult to make discoveries – and other insights from the science of science

By Samuel Arbesman | July 18, 2010

If you look back on history, you get the sense that scientific discoveries used to be easy. Galileo rolled objects down slopes. Robert Hooke played with a spring to learn about elasticity; Isaac Newton poked around his own eye with a darning needle to understand color perception. It took creativity and knowledge to ask the right questions, but the experiments themselves could be almost trivial.

Today, if you want to make a discovery in physics, it helps to be part of a 10,000-member team that runs a multibillion dollar atom smasher. It takes ever more money, more effort, and more people to find out new things.

But until recently, no one actually tried to measure the increasing difficulty of discovery. It certainly seems to be getting harder, but how much harder? How fast does it change?

This type of research, studying the science of science, is in fact a field of science itself, and is known as scientometrics. Scientometrics may sound self-absorbed, a kind of inside baseball for scientists, but it matters: We spend billions of dollars annually on research, and count on science to do such things as cure cancer and master space travel, so it's good to know what really works.

From its early days of charting the number of yearly articles published in physics, scientometrics has broadened to yield all sorts of insights about how we generate knowledge. A study of the age at which scientists receive grants from the National Institutes of Health found that over the past decades, older scientists have become far more likely to receive grants than younger ones, suggesting that perhaps younger scientists are being given fewer chances to be innovative. In another study, researchers at Northwestern University found that high-impact research results are more likely to come from collaborative teams — often spanning multiple universities — rather than from a single scientist. In other words, the days of the lone hero scientist are vanishing, and you can measure it. Scientometrics has even given bragging tools to scientists, such as the "h-index" that measures the impact of your papers on other researchers.

With a scientometric frame of mind, I approached the question of quantifying how discovery gets harder over time. I looked at three specific areas of science, ignoring areas in which there is truly nothing left to discover — for example, in 1880, Ivar Sandström discovered the parathyroid gland, and the final major internal organ was discovered. I looked at discoveries of species of mammals, minor planets (that is, asteroids), and

chemical elements. Assuming that size is a good proxy for how easy it is to discover something, I plotted the average size of discovery over time. (The smaller a creature or an asteroid is, the harder it is to discover; in chemistry, the reverse is true, and the largest elements are the hardest to create and detect.)

What I found, using this simple proxy for difficulty, in each field — biology, astronomy, chemistry — was a curve with the same basic shape. In every case, the ease of discovery went down, and in every case it was a curve called an exponential decay.

What this means is that the ease of discovery doesn't drop by the same amount every year — it declines by the same fraction each year. For example, the discovered asteroids get 2.5 percent smaller each year. So while the ease of discovery drops off quickly as early researchers pick the low-hanging fruit, it can continue to "decay" a long time, becoming slightly harder without ever quite becoming impossible. Think about Zeno's Paradox, where the runner keeps on getting halfway closer to the finish line of the race, and thus never quite makes it to the end.The fact that discovery can become extremely hard does not mean that it stops, of course. All three of these fields have continued to be steadily productive. But it does tell us what kind of resources we may need to continue discovering things. To counter an exponential decay and maintain discovery at the current pace, you need to meet it with a scientific effort that obeys an exponential increase. To find a slightly smaller mammal, or a slightly heavier chemical element, you can't just expend a bit more effort. Sometimes you have to expend orders of magnitude more.

Sometimes, as with particle physics, this requires throwing more money at the problem — lots more money. We can also see this with some diseases, which are requiring billions of dollars to make progress toward cures. But another way to increase effort is to have more scientists working on a problem. And scientometrics has something to say about this, too. One of the first quantities to be studied in the field of scientometrics was the number of scientists over time. The first PhD's in the United States were granted by Yale University in 1861. Since that time, the number of scientists in the United States and throughout the world has increased rapidly, even exponentially in some cases, and the rate of growth has been actually faster than the growth of the general population. In fact, if you uttered the statement "90 percent of all the scientists who have ever lived are alive today" nearly any time in the past 300 years, you'd be right. Of course, growth like this is not sustainable — a long exponential increase in the number of scientists means that at some point the number of scientists would need to exceed the number of humans on earth. It doesn't take scientometrics to tell us we shouldn't hold our breath for that.

But that doesn't mean discovery will inevitably slow down. Just as science grows exponentially more difficult in some cases, affordable technology can also proceed along a similar curve, and sometimes make science a lot easier. An exponential increase in computer processing power means that problems once considered hard, like visualizing fractals, proving certain mathematical theorems, or simulating entire populations, can now be done quite easily. And sometimes discoveries can be done by being clever and more innovative, without much money. When Stanley Milgram did his famous "six degrees of separation" experiment, the one that showed everyone on earth was much more closely linked than we imagine, he did it by using not much more than postcards. And scientometrics was there, showing us all how influential that research has been.

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http://www.boston.com/bostonglobe/ideas/articles/2010/07/18/hard_to_find/

Lives of the Novelists: Somerset Maugham
By DAVID LEAVITT

THE SECRET LIVES OF SOMERSET MAUGHAM

A Biography

By Selina Hastings

Illustrated. 626 pp. Random House. $35

In 1962, William Somerset Maugham's nephew, Robin, his own literary efforts having not amounted to much, informed his wealthy and famous uncle that an American publisher, Victor Weybright, had offered him an advance of $50,000 to write Maugham's biography. "Obviously I can't afford to turn down such a good offer," the younger Maugham explained. "As you know, although I earn enough from my writing to keep me going each year, I haven't a penny of capital." The letter's affectionate tone notwithstanding, Maugham had no trouble grasping its import and responded by sending Robin a check equal to the one he would have received from Weybright. "I give you my word that I shall not write any other biography about you — ever," Robin replied. "I'm really awfully shy about all this, but I'm also very grateful."

"Shy" is a peculiar adjective to use to describe blackmail, which was, as Selina Hastings makes clear in her biography, "The Secret Lives of Somerset Maugham," Robin's intention. Himself homosexual, Robin had been privy to Maugham's erotic and emotional involvements with other men since he was a teenager, and might well have been the object of more than avuncular interest on Maugham's part. ("I'm not saying I think there was incest," Glenway Wescott recalled, "but Willie was infatuated with Robin.") Nor was Robin's word to be trusted. Ten years later, in a memoir entitled "Escape From the Shadows," he quoted his uncle as saying, "I tried to persuade myself that I was three-quarters normal and that only a quarter of me was queer — whereas really it was the other way round." Fifty thousand dollars, though enough to keep Robin quiet for Maugham's lifetime, was not enough to keep him quiet after his death.

Forty-five years later, what little remains of the fortifications with which Maugham sought to secure his post-humous reputation has been swept away. Taking advantage of the Maugham estate's decision to allow scholarly access to the author's correspondence, as well as the unearthing of a transcript of an interview with Maugham's daughter, Hastings has written a biography that does not so much give us a new Maugham as add shadings to the old one. That Maugham was, to use his own terminology, three-quarters queer will most likely provoke about as much surprise as Ricky Martin's recent announcement that he is "a fortunate homosexual man." What we get here are the details, many of them sordid: for instance, the story of Louis Legrand, or Loulou, the "ravishing 16-year-old male whore" whom Maugham and his longtime lover, Gerald Haxton, shared and also made available to the guests at Maugham's villa on Cap Ferrat, "Gerald afterward discreetly settling the bill. Both Harolds, Nicolson and Acton, became appreciative customers ('Mon cher Lulu,' wrote Nicolson from Paris, 'merci pour la soirée délicieuse'); and so, during the course of the summer, did . . . Robin."
The passage is typical of Hastings's prose style, which privileges breeziness and readability over compassion. Not that Maugham was a particularly compassionate character. "Tra-la-la, no more alimony, tra-la-la," he sang when he learned that his despised former wife, Syrie, had finally died. Upon his reunion with Alan Searle, the great love from whom he was separated for most of the Second World War and who had put on weight in the interval, he remarked acidly, "You may have looked like a Bronzino once, but now you look like a depraved Frans Hals."

Hastings, who has written biographies of Nancy Mitford and Evelyn Waugh, explains that this habit of cruelty had its origins in a cruel childhood. Born in Paris to English parents in 1874, Maugham was orphaned early on — the loss of his beloved mother was a particular blow — and sent back to England for his education. ("Of Human Bondage" is based on this period in his life.) Toward the uncle and aunt who raised him he felt no great fondness, and as soon as he could, he struck out on his own, entering into medical training at St. Thomas's Hospital in the Lambeth section of London. It was here that he learned the physician's art of observing the suffering of others, if not with dispassion, then at least with sang-froid; an art he would exploit in his fiction. Visits to the "grim houses" in which desperately poor women, as often as not, died in childbirth propelled him to write his first novel, "Liza of Lambeth," of which he later observed, "My lack of imagination . . . obliged me to set down quite straightforwardly what I had seen with my own eyes and heard with my own ears." As Maugham himself was the first to admit, invention was not his strong suit, and if, later in life, he spent so much of his time traveling, it was as much to gather material as to escape his unhappy marriage. "The writer cannot afford to wait for experience to come to him," he once wrote; "he must go out in search of it." Maugham's earliest successes were in the theater, and by the 1920s, with several plays often running simultaneously in New York and London, he had the money and leisure to devote himself to the form he loved best: the short story. Amazingly, this was an age in which stories could be cash cows. A 1923 contract with the Hearst magazines guaranteed Maugham payment of $2,500 per story, while from his most famous story, "Rain," he earned more than $1 million in royalties.

In his fiction, Maugham often sought to lay bare the hypocrisies of his characters. Renowned as a "brilliant castigator of modern morals," he excelled at dramatizing the exposure of lies and secrets, the duplicities of class and organized religion. Nor did he always take care, when using someone he knew as the basis for a character, to change details or even names. In his novel "Cakes and Ale," for instance, he modeled the sycophantic, second-rate Alroy Kear on his close friend Hugh Walpole, "palpably exposed," in Virginia Woolf's words, "as the hypocritical booming thick-skinned popular novelist." Much to Woolf's surprise, Walpole responded to this "flaying alive" not with rage but with bewilderment: "What I mind are a few little things — little things that Willie and I had together — only he and I knew — those he has put into print."

Is turnabout fair play? Perhaps. Indeed, as I read Hastings's biography (and I read it in great gulps), I could not help wondering if Maugham might deserve the "flaying alive" to which she subjects him. After all, here was a man who, despite his passionate erotic partnerships with two men, could write with detached humor that "the homosexual" has "small power of invention, but a wonderful gift for delightful embroidery"; a man who, in a late memoir, so vilified his deceased ex-wife as to provoke one friend, Rebecca West, to denounce him as "an obscene little toad" and another, Graham Greene, to dismiss the memoir as "a senile and scandalous work"; a man who tried to disown his own fragile daughter on the grounds that he had no evidence that he was actually her father. I could go on. Hastings makes a strong case against Maugham the man. Where she runs into trouble is in her halfhearted attempt to make a case for Maugham the writer. Is it, in fact, "safe to say," as she does, that Maugham "will again hold generations in thrall, that his place is assured"?

Probably not. "I know just where I stand," she quotes him as having said on more than one occasion; "in the very front row of the second-rate." If so much of Maugham's fiction comes across today as brittle, arch, world-weary and heartless, it may be precisely because he devoted more energy to maintaining his own double standard than he did to interrogating the double standards of others. He tried to have it both ways, and as his stories so amply demonstrate, those who try to have it both ways rarely come to a happy end.

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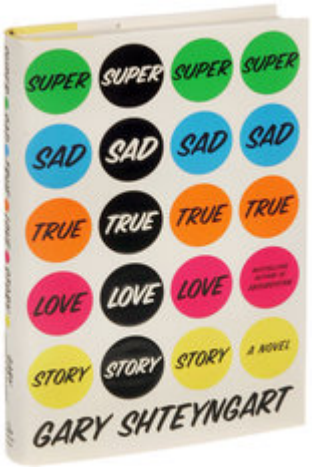
http://www.nytimes.com/2010/07/25/books/review/Leavitt-t.html?nl=books&emc=booksupdateema1

Love Found Amid Ruins of Empire
By MICHIKO KAKUTANI

SUPER SAD TRUE LOVE STORY

By Gary Shteyngart

334 pages. Random House. $26.



Gary Shteyngart's wonderful new novel, "Super Sad True Love Story," is a supersad, superfunny, superaffecting performance — a book that not only showcases the ebullient satiric gifts he demonstrated in his entertaining 2002 debut, "The Russian Debutante's Handbook," but that also uncovers his abilities to write deeply and movingly about love and loss and mortality. It's a novel that gives us a cutting comic portrait of a futuristic America, nearly ungovernable and perched on the abyss of fiscal collapse, and at the same time it is a novel that chronicles a sweetly real love affair as it blossoms from its awkward, improbable beginnings.

Mr. Shteyngart spent his earliest childhood in Leningrad, then moved with his family to the United States, and "Super Sad" reflects his dual heritage, combining the dark soulfulness of Russian literature with the antic inventiveness of postmodern American writing; the tenderness of the Chekhovian tradition with the hormonal high jinks of a Judd Apatow movie. This novel avoids the pretensions and grandiosity of Mr. Shteyngart's last book, "Absurdistan," even as it demonstrates a new emotional bandwidth and ratifies his emergence as one of his generation's most original and exhilarating writers.

"Super Sad" takes as its Romeo and Juliet, its Tristan and Iseult, a middle-aged sad sack named Lenny Abramov and a much younger beauty named Eunice Park. He is the son of Russian immigrants, she the daughter of Korean immigrants, and for all their differences, both are afflicted by a lack of self-esteem — insecurities manifested in Lenny's self-deprecating humor, his compulsive need to try to make others like him, and in Eunice's bouts of anger and self-loathing, her fear that nothing she cares about can really last. Both are burdened with their striving parents' unbearable expectations, and both are plagued by unlucky experiences in love. Slowly, haltingly, nervously, they begin to forge a partnership they hope will keep them safe in an unsafe world.

"Super Sad" takes place in the near future, and Mr. Shteyngart has extrapolated every toxic development already at large in America to farcical extremes. The United States is at war in Venezuela, and its national debt has soared to the point where the Chinese are threatening to pull the plug. There are National Guard checkpoints around New York, and riots in the city's parks. Books are regarded as a distasteful, papery-smelling anachronism by young people who know only how to text-scan for data, and privacy has become a relic of the past. Everyone carries around a device called an äppärät, which can live-stream its owner's thoughts and conversations, and broadcast their "hotness" quotient to others. People are obsessed with their

health — Lenny works as a Life Lovers Outreach Coordinator (Grade G) for a firm that specializes in life extension — and shopping is the favorite pastime of anyone with money.

It's "zero hour for our economy," says one of Lenny's friends, "zero hour for our military might, zero hour for everything that used to make us proud to be ourselves."

But while Mr. Shteyngart's descriptions of America have a darkly satiric edge, his descriptions of New York are infused with a deep affection for the city that is partly nostalgia for a vanished metropolis (in other words, Gotham as we know it today) and partly an immigrant's awestruck love for a place mythologized by books and songs and movies, by everyone from F. Scott Fitzgerald to Frank Sinatra. He writes, for instance, of the "melancholy 20th-century light" of a summer's day that can make "even the most prosaic, unloved buildings" appear "bright and nuclear at the edge of your vision."

In another chapter he conjures the green paradise of Central Park as seen through lovers' eyes: an Edenic expanse of trees and grass amid the city's glass and stone. "We headed south," Lenny says of a walk with Eunice, "and when the trees ran out, the park handed us over to the city. We surrendered to a skyscraper with a green mansard roof and two stark chimneys. New York exploded all around us, people hawking, buying, demanding, streaming. The city's density caught me unprepared, and I reeled from its imposition, its alcoholic fumes, its hubris, its loud, dying wealth."

As recounted in Lenny and Eunice's own slangy diaries and their e-mail and text messages, their relationship is like a country song — a ballad of longing turning into love turning into loss. For him, it's a case of love at first sight. For her, it takes a little longer: She has to persuade herself that Lenny's schlubby looks don't matter, that his devotion to her is real. Eunice worries that Lenny's belief that "niceness and smartness always win" in the end is hopelessly naïve, while he worries that her oppressive childhood has made her brittle and mistrustful.

Slowly, however, she falls in love with her "sweet emperor penguin," and step by step, they begin to negotiate the emotional and familial minefields that threaten their budding romance. But even as they do, the world around them is crumbling. There are riots involving LNWI's (Lower Net Worth Individuals) and rogue elements of the National Guard. New York, Los Angeles and Washington are put on red alert, and when everyone's äppärät stops working, there are rumors that Venezuela or China has detonated "a Nonnuclear Electromagnetic Pulse" in the atmosphere. Eunice is unable to reach her family in New Jersey or her best friend, Jenny, in California, and Lenny fears for his parents on Long Island.

"Things were going to get better," Lenny writes. "Someday. For me to fall in love with Eunice Park just as the world fell apart would be a tragedy beyond the Greeks."

In recounting the story of Lenny and Eunice in his antic, supercaffeinated prose, Mr. Shteyngart gives us his most powerful and heartfelt novel yet — a novel that performs the delightful feat of mashing up an apocalyptic satire with a genuine supersad true love story.

http://www.nytimes.com/2010/07/27/books/27book.html?ref=books

Giant Pandas: Landscape Has Big Effect on Movement of Genes Within Population

This is a panda. (Credit: Zhu et al., BMC Genetics)

ScienceDaily (July 26, 2010) — Genetic analysis of giant pandas has shown that features of their landscape have a profound effect on the movement of genes within their population.

Researchers writing in the open access journal BMC Genetics found that physical barriers, such as areas lacking bamboo plants and other forest foliage, can separate giant pandas into isolated genetic groups.

Fuwen Wei, from the Chinese Academy of Sciences, worked with a team of researchers to study giant pandas in the Xiaoxiangling and Daxiangling mountains. He said, "These results suggest that gene flow will be enhanced if the connectivity between the currently fragmented bamboo forests is increased. This may be of importance to conservation efforts as gene flow is one of the most important factors for maintaining genetic diversity within a species and counteracting the negative effects of habitat fragmentation."

The giant panda is one of the most endangered mammals in the world. This is the first study to demonstrate that there is a relationship between landscape features and gene flow within their population. Wei and his colleagues recovered 192 fecal samples, which were found to come from 53 unique genotypes. These 'genetic signatures' demonstrated signs of fragmentation within the panda population.

The researchers said, "It is vital to reconnect the fragmented habitats and increase the connectivity of bamboo resources within a habitat to restore population viability of the giant panda in these regions."

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by BioMed Central Limited, via AlphaGalileo.

Journal Reference:

1. Lifeng Zhu, Xiangjiang Zhan, Tao Meng, Shanning Zhang and Fuwen Wei. Landscape features influence gene flow as measured by cost-distance and genetic analyses: a case study for giant pandas in the Daxiangling and Xiaoxiangling mountains. BMC Genetics, 2010; (in press) [link]

http://www.sciencedaily.com/releases/2010/07/100722205624.htm

Rare and Common Genetic Variations Responsible for High Triglyceride Levels in Blood

ScienceDaily (July 26, 2010) — It can make blood look like cream of tomato soup. Patients with high levels of triglycerides in their blood, a disease called hypertriglyceridemia (HTG) face an increased risk for heart disease and stroke. HTG affects one in 20 people in North America and is also associated with obesity, diabetes and pancreatitis. Most people now understand the importance of LDL, the bad cholesterol and HDL, the good cholesterol, to their overall health. But high triglycerides are like the Rodney Dangerfield of the lipid world: they get less respect and notoriety compared to their cholesterol cousins.

Doctors are often uncertain about how best to treat patients with this condition. Understanding the genes that make patients susceptible to HTG could provide clues to newer, better treatments.

In a new study published online in Nature Genetics, Dr. Robert Hegele of the Robarts Research Institute, Schulich School of Medicine & Dentistry at The University of Western Ontario (London, Canada) has shown that it's a combination of both common and rare variants or 'misprints' in several genes that add up and put a patient at risk of developing HTG. Working with graduate student Christopher Johansen, Dr. Hegele used two different methods to uncover the complex genetic basis of HTG in more than 500 patients.

First, using DNA microarrays (also called gene chips) the researchers found that commonplace variants in four different genes are strongly related to having HTG. Next, using detailed DNA sequence analysis, they found that patients with HTG also had an excess of rare variants -- ones only found in one or two people -- in these same four genes. Cumulatively, the rare variants were found in 28 per cent of HTG patients, about twice the rate seen in healthy controls.

"This is one of the first studies that combined gene chips with DNA sequencing to examine the genomes of patients," explains Dr. Hegele, an endocrinologist and professor in the Departments of Biochemistry and Medicine at Western. "It was fortunate that we used both methods. Gene chip studies are popular nowadays and are effective at finding relationships between common genetic variants and disease. But gene chips cannot detect rare variants. For that, you need to do the more expensive and time-consuming method of DNA sequencing."

Scientists have long suspected that both common and rare genetic variants contribute to many diseases, but the study from the Robarts group now definitively shows that this is the case.

"It's also instructive that one single gene is not solely responsible for high triglyceride levels but rather a mosaic of both common and rare variations in several genes." Dr. Hegele adds that these rare variants now help explain the missing heritability of lipid traits. "It means that to get a full picture of a patient's genetic risk, you need to consider both common and rare variants in many genes simultaneously, and to use methods that will detect both types of variation."

The research was supported by Genome Canada through the Ontario Genomics Institute, the Canadian Institutes of Health Research, and the Heart and Stroke Foundation of Ontario. Dr. Hegele holds the Edith Schulich Vinet Canada Research Chair in Human Genetics, the Jacob J. Wolfe Distinguished Medical Research Chair and the Martha G. Blackburn Chair in Cardiovascular Research. He is also the Director of the London Regional Genomics Centre.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by University of Western Ontario, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Christopher T Johansen, Jian Wang, Matthew B Lanktree, Henian Cao, Adam D McIntyre, Matthew R Ban, Rebecca A Martins, Brooke A Kennedy, Reina G Hassell, Maartje E Visser, Stephen M Schwartz, Benjamin F Voight, Roberto Elosua, Veikko Salomaa, Christopher J O'Donnell, Geesje M Dallinga-Thie, Sonia S Anand, Salim Yusuf, Murray W Huff, Sekar Kathiresan & Robert A Hegele. Excess of rare variants in genes identified by genome-wide association study of hypertriglyceridemia. Nature Genetics, 25 July 2010 DOI: 10.1038/ng.628

http://www.sciencedaily.com/releases/2010/07/100725142612.htm

Amount of Dust, Pollen Matters for Cloud Precipitation, Climate Change

Wave cloud. (Credit: Image courtesy of Colorado State University)

ScienceDaily (July 26, 2010) — A lot of large particles of dust and pollen in the atmosphere may make your nose twitch, but they can lead directly to greater precipitation in clouds, Colorado State University atmospheric scientists have discovered for the first time.

The amount of ice crystals necessary to form precipitation in clouds is linked to the abundance of larger aerosol particles in the atmosphere, according to a study by Paul DeMott and Anthony Prenni, research scientists in the Atmospheric Science department at Colorado State. Their findings appear in this week's issue of the Proceedings of the National Academy of Sciences.

Using these new findings, a global climate model predicted that clouds have a stronger cooling effect on the globe than previously estimated. However, future increases in these ice nuclei for cold clouds would reduce the cooling impact on climate and vice versa, the scientists found.

Special particles called aerosols -- resulting from desert dust, some biological processes and possibly from pollution -- are needed as catalysts to form ice in clouds, which can influence precipitation and cloud dynamics. These particles can serve as the center, or nuclei, for cloud droplets that combine to form raindrops.

"The catalysts for most ice nuclei are primary emissions -- from pollution or sea spray or dust," DeMott said. "The bigger the particles, the better it is for ice nuclei."

At the same time, pinpointing a number of particles at a specific temperature is too simple for climate models to accurately represent what's occurring in nature, DeMott said.

Scientists have spent decades trying to understand the processes. The National Science Foundation, the National Oceanic and Atmospheric Administration, the U.S. Department of Energy and NASA have funded Colorado State's research in this area.

DeMott and Prenni analyzed data from 14 years of trips across the globe from the Amazon Rainforest in Brazil to the Arctic to Broomfield, Colo., to collect air samples in specially equipped National Center for

Atmospheric Research planes. The Colorado State scientists also developed the first instrument -for use inside the plane -- to take continuous air samples from in and around clouds and measure in real time the ice-forming ability of particles. The instrument allows the researchers to sample air and detect the total number concentrations of ice nuclei without first putting them on a filter or other processing.

How capturing air from a plane works: CSU scientists take air samples into a small chamber through a special port on the side of a C-130 plane. A diffusion chamber cools and humidifies the air and particles between two plates of ice toward conditions where ice forms, essentially "growing" clouds by simulating the conditions in the atmosphere. Researchers then evaluate how many particles will form ice crystals for specific cloud conditions. The plane then passes through the wave clouds to measure, with other instruments, how much ice really forms.

Scientists also used specialized instruments to determine the chemical makeup of the particulates forming ice.

"Ice nuclei are hard to measure -- they're microns in size like the size of a bacteria," Prenni said. "They don't make haze -- there aren't enough of them. Of all the particles in the atmosphere, one in a million particles in the atmosphere can cause ice to form."

In March, Prenni and DeMott published an article in Atmospheric Environment that examined the role biological particles -- from plants, bacteria or other living things on Earth -- play in characterizing atmospheric concentrations and types of ice nuclei. They concluded that much more work needs to be done in tandem with biologists to determine numbers and sources of these particles as a function of season and temperature range.

"The people who look at snow and find these bacteria in it don't know if the bacteria were in fact the ice nuclei or how many of them there are floating around in the air in various places/seasons," said Sonia Kreidenweis, professor of atmospheric science who works with DeMott and Prenni. "There could be too few to matter. We are actually making these measurements in the air to try to nail this down."

"We don't know if we can identify all the biological particles," DeMott said. "What are the most effective ones? Their amounts matter as well. Is there any way that they play a role in cloud processes?"

Story Source:

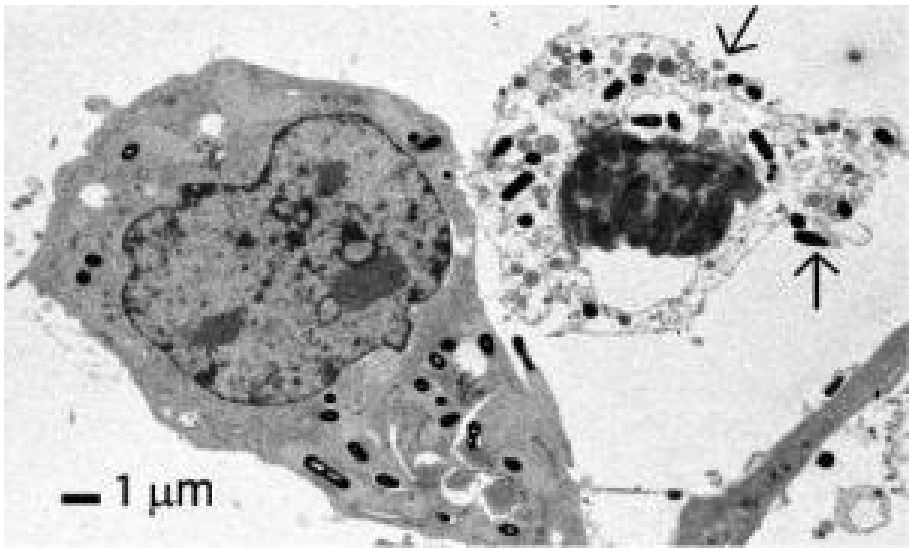
The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Colorado State University.

Journal Reference:

1. P. J. Demott, A. J. Prenni, X. Liu, S. M. Kreidenweis, M. D. Petters, C. H. Twohy, M. S. Richardson, T. Eidhammer, and D. C. Rogers. Predicting global atmospheric ice nuclei distributions and their impacts on climate. Proceedings of the National Academy of Sciences, June 7, 2010 DOI: 10.1073/pnas.0910818107

http://www.sciencedaily.com/releases/2010/06/100607165744.htm

How Cells Keep Their Guards in Check



Listeria-infected macrophage. (Credit: Copyright Max F. Perutz Laboratories)

ScienceDaily (July 26, 2010) — When cells are attacked by bacteria they use all means at their disposal to defend themselves. But cellular defence systems can damage the cells themselves and so need to be kept tightly in check. Recent results help us to understand how this is done and give pointers to new ways of combating disease.

Matthias Farlik in the group of Thomas Decker at the Centre for Molecular Biology of the University of Vienna (Max F. Perutz Laboratories) and Mathias Müller of the University of Veterinary Medicine, Vienna have published these findings in the current issue of the journal Immunity.

Cells respond to their environments in a number of different ways. In some cases they modify existing proteins but often the response entails the production of a new protein or group of proteins. A classic case of a response to an environmental cue is provided by the generation of the gas nitric oxide when cells are invaded by bacteria. Nitric oxide (NO) has a general antimicrobial activity and so represents one of the cell's first lines of defence against attack. Recent studies have shed intriguing light on the process by which NO is generated and have at the same time uncovered a new mechanism for regulating gene transcription. The results of Matthias Farlik in the group of Thomas Decker at the Centre for Molecular Biology of the University of Vienna (Max F. Perutz Laboratories) and Mathias Müller of the University of Veterinary Medicine, Vienna represent an extremely important contribution to our understanding of the molecular mechanism of transcriptional initiation. The work could potentially open up new avenues for the treatment of infections.

Cell checks two signals before starting its attack

Farlik and his colleagues have been investigating the way various signals are integrated within cells. When cells are infected by microorganisms, a number of different pathways are activated and these can combine, for example to cause the switching on of particular genes that are important for fighting the infection. Farlik has been studying the bacterial pathogen Listeria monocytogenes, one of the most virulent foodborne pathogens and the causative agent of listeriosis, which has a fatality rate of about 30%. Listeria infection causes

transcription of inducible nitric oxide synthase (iNOS), the enzyme that produces NO. Synthesis of the enzyme requires the interaction of two distinct signals, one mediated by a type of interferon (so called because it interferes with pathogens) and the other involving transcription factors that are activated by certain patterns associated with microbial pathogens. The requirement for two distinct pathways for activation makes sense to ensure that NO is not generated when it is not needed: the last thing a cell wants is to produce large quantities of a toxic gas under inappropriate circumstances, especially as NO is known to be associated with various cancers and inflammatory conditions.

As Thomas Decker puts it, "Cells must ensure that they have enough information to decide whether NO is really needed and they get this by checking the status of several different signalling pathways. The interesting question is how this happens."

What happens when the signals don't arrive at the same time?

Farlik and his colleagues have used a clever genetic trick to separate the two immunological signals for iNOS activation, enabling them to be investigated independently. It is known that gene transcription requires the assembly of a number of proteins on the so-called promoter region, the part of a gene that controls whether it is on or off. Farlik and colleagues have shown that each of the signals performs only part of the process and that both pathways must be active to form the entire complex and thus to switch on the gene. The problem is that the two signals do not always arrive at the same time. Cells solve this by an ingenious method: each of the pathways can form part of the initiation complex independently and the part-complex remains on the promoter as a sort of molecular memory. If the missing information arrives in time the gene is switched on: if not, the part-complex is removed, the initial signal is "forgotten" and the gene again cannot be switched on unless both signals are provided.

The work was funded by the Austrian Science Fund (FWF) via grants to Mathias Müller and Thomas Decker and undertaken in the framework of the Special Research Programme (SFB) "Jak-Stat-Signalling from Basics to Disease," hosted by the University of Veterinary Medicine Vienna, the University of Vienna and the Medical University of Vienna.

Story Source:

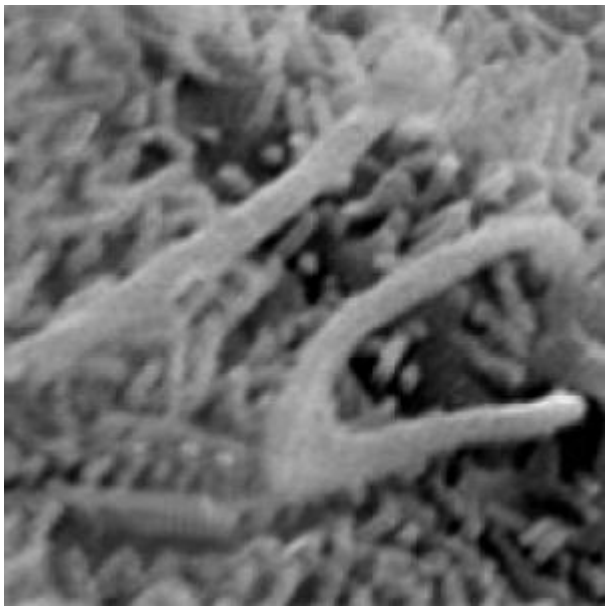
The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by University of Vienna, via AlphaGalileo.

Journal Reference:

1. Matthias Farlik, Benjamin Reutterer, Christian Schindler, Florian Greten, Claus Vogl, Mathias Müller and Thomas Decker. Nonconventional Initiation Complex Assembly by STAT and NF-kB Transcription Factors Regulates Nitric Oxide Synthase Expression. Immunity, Vol.32, issue 7, July 2010

http://www.sciencedaily.com/releases/2010/07/100715142252.htm

Important Clue to Understanding the Pathogenesis of Ciliary Disorders



If the gene is defective, double and forked cilia develop. (Credit: Developmental Cell)

ScienceDaily (July 26, 2010) — A research team led by Dr. Heiko Lickert of Helmholtz Zentrum München has pinpointed a gene that is essential for the physiologically correct disassembly of cilia. Errors in the regulation of cilia assembly are implicated in a variety of human syndromes. Until now, however, the consequences of faulty cilia disassembly have not yet been elucidated.

The findings are reported in the current issue of the journal Developmental Cell.

Scientists led by Dr. Heiko Lickert, research group leader at the Institute of Stem Cell Research of Helmholtz Zentrum München, have identified the first gene shown to regulate cilia disassembly in a living organism. If the gene is defective, double and forked cilia develop -- thus the name Pitchfork. The consequences of the mutation include typical defects in the left-right asymmetry of body organs and heart failure.

The functional investigations were conducted primarily on the mouse model, together with the Institute of Developmental Genetics and the Department of Protein Analytics of Helmholtz Zentrum München. However, Dr. Lickert and his collaboration partner Nicolas Katsanis of Duke University in the U.S. were also able to show mutations in the Pitchfork gene in patients with ciliary diseases. In humans, the substitution of merely one amino acid in the Pitchfork protein can lead to an inversed position of all internal organs (situs inversus), to kidney and liver diseases, but also to severe heart defects. "Our study" Dr. Lickert said, "provides a new entry point to understand and categorize ciliary disease."

Background

Cilia are hair-like cell protuberances, 5 to 10 µm long and 250 nm thick, which are present in almost all human or animal cells. They function like antennas in the cells and play a pivotal role in the perception of the cellular surroundings and signal transduction.

Defective cilia usually have genetic causes and severe consequences: In recent years more than 30 diseases could be traced to ciliary dysfunctions. These ciliopathies affect numerous organ systems and show diverse clinical symptoms, but the molecular and cellular basis for this is not yet understood. The resulting disorders include developmental defects such as polycystic kidney, liver and pancreas diseases (incidence 1:800) and also heart defects and adiposity. An increased risk for common diseases such as diabetes or cancer is also very probable. Despite the far-reaching significance of cilia, many aspects of the biology of these organelles are not yet known and many questions remain to be answered. These include the regulation of the body's own processes (homeostasis), signal transduction between cells, organ and embryonic development, and the assembly and disassembly of cilia in the different phases of the cell cycle.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Helmholtz Zentrum Muenchen - German Research Centre for Environmental Health.

Journal Reference:

1. Doris Kinzel, Karsten Boldt, Erica E. Davis, Ingo Burtscher, Dietrich Trumbach, Bill Diplas, Tania Attie-Bitach, Wolfgang Wurst, Nicholas Katsanis, Marius Ueffing, and Heiko Lickert. Pitchfork Regulates Primary Cilia Disassembly and Left-Right Asymmetry. Developmental Cell, 2010; 19 (1): 66 DOI: 10.1016/j.devcel.2010.06.005

http://www.sciencedaily.com/releases/2010/07/100722075221.htm

Confident Teachers Help Preschoolers More With Language and Literacy Skills

ScienceDaily (July 26, 2010) — New research suggests that pre-school students may gain more language and literacy skills if they have teachers with higher levels of confidence in their abilities.

However, in some cases students only saw gains when their teachers also had classrooms that emphasized emotional support for the children.

"Emotionally responsive relationships between teachers and children may be the way by which the self-efficacy of teachers can have a positive influence on children's literacy," said Ying Guo, co-author of the study and a postdoctoral researcher in education at Ohio State University.

The new study was published in a recent issue of the journal Teaching and Teacher Education. Guo and her co-authors examined how teachers' confidence in their teaching abilities -- what researchers refer to as "self-efficacy" -- affected children's learning progression in language and literacy skills.

The research involved a large, multi-state study that included 67 teachers and 328 of their students. Participants were followed over the course of 30 weeks.

Teachers were given a short questionnaire that measured their self-efficacy on a scale from one to five. The survey asked questions like "How much can you do to get through to the most difficult students?" and "How much can you do to keep students on task on difficult assignments?"

The level of emotional support in the classrooms was measured by trained coders who coded how teachers and students interact with each other from videotapes collected during an approximately two-hour standardized classroom observation. The coders rated the quality as low, mid, or high based on a numbering scale from one to seven.

Students were given tests of language and literacy skills at the beginning and end of the 30 week period to assess improvement.

Results indicated that students whose teachers had high self-efficacy showed gains in one measure of early literary skills called print awareness, in which students were asked questions like "Show me just one letter on this page."

However, children only showed gains in vocabulary knowledge skills when they had a classroom that offered emotional support in addition to having a teacher with high self-efficacy.

"Classroom quality is important, and students seem to learn more when they have emotional support in the classroom," Guo said.

The study found that some of the factors that affected teachers' self-efficacy were certification degree and years of experience. Teachers who possessed an elementary certification had higher levels of self-efficacy than those who possessed a pre-school certification.

While the data from this study can't explain why, the researchers speculate that the additional training needed for an elementary certificate may have led these teachers to be more confident in their teaching abilities than those with pre-school certification.

An interesting result showed that teachers who had more years of pre-school teaching experience also had lower levels of self-efficacy.

"It is not that uncommon," explained Laura Justice, co-author of the study and a professor in the School of Teaching and Learning at Ohio State.

"Fresh teachers who are straight out of training think that they can change the world. Then, when they get into the work place they realize how serious and difficult their jobs really are. This is why we think self-efficacy may decline among some pre-school teachers through the years," she added.

Some of the research Justice works on involves analyzing the factors that determine the quality of teacher instruction. One of her studies found that teachers' self-efficacy was one of the few variables that affected instructional quality. "This study looks more in depth at how teacher efficacy may contribute to classroom quality, which may contribute to children's academic achievement. This paper is bringing everything together."

This research was funded by a grant from the U.S. Department of Education.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Ohio State University. The original article was written by Jessica Orwig.

Journal Reference:

1. Ying Guo, Shayne B. Piasta, Laura M. Justice, Joan N. Kaderavek. Relations among preschool teachers' self-efficacy, classroom quality, and children's language and literacy gains. Teaching and Teacher Education, 2010; 26 (4): 1094 DOI: 10.1016/j.tate.2009.11.005

http://www.sciencedaily.com/releases/2010/06/100607151327.htm

Speeding star traced back to Milky Way's heart

- 16:04 22 July 2010 by David Shiga

Black holes are picky eaters, swallowing some stars and spitting out others. That is what is suggested by the recent mapping of the path taken by a hypervelocity star.

Models show that when a binary star approaches a supermassive black hole, the gravitational interaction between the three objects can cause one star to fall in while the other is flung out at up to 4000 kilometres per second. About 20 such hypervelocity stars have so far been detected, but their precise origin was unclear.

Now Warren Brown of the Harvard-Smithsonian Center for Astrophysics and colleagues have used red-shift data and Hubble Space Telescope images to trace the path taken by the hypervelocity star HE 0437-5439 in three dimensions. It points back to the centre of the Milky Way, so the supermassive black hole thought to exist there may have hurled the star out, the researchers conclude.

"It's definitely progress," says Julio Navarro of the University of Victoria in British Columbia, Canada, who was not involved in the study.

However, Navarro says that the uncertainty in the trajectory pieced together by Brown's team is too large to prove that the star passed close enough to the black hole to be ejected by it.

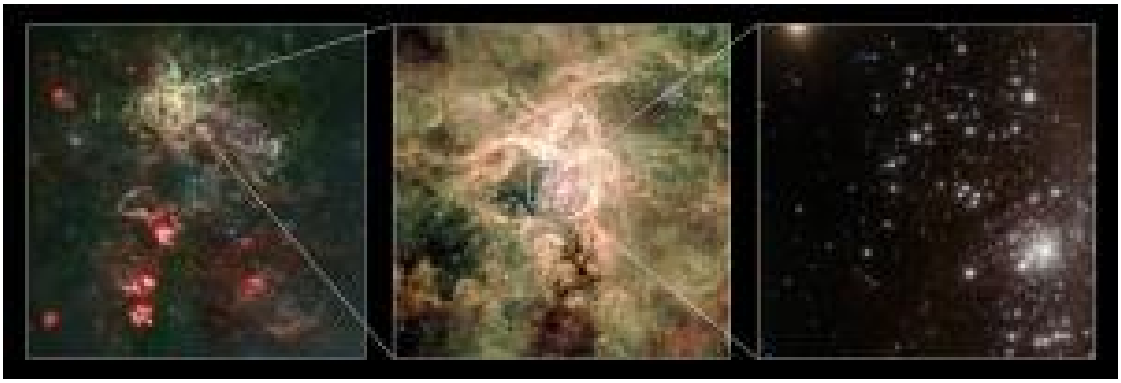
Brown admits the uncertainty is large, but says the measurements are at least precise enough to rule out a competing hypothesis: that HE 0437-5439 was thrown out the nearby Large Magellanic Cloud, which is a satellite galaxy of our Milky Way.

Journal Reference: The Astrophysical Journal Letters, in press

http://www.newscientist.com/article/dn19212-speeding-star-traced-back-to-milky-ways-heart.html

Biggest star ever found may be ticking antimatter bomb

- 12:32 21 July 2010 by Rachel Courtland



Zooming in on a massive star (Image: ESO)

Just how humungous can a star be? One more massive than any other we know has been has been identified in a nearby galaxy. At more than 250 times the mass of the sun, it may one day explode in an exotic blast that involves the creation of antimatter.

Named R136a1, the star sits toward the centre of RMC 137a, a crowded cluster of hot young stars some 165,000 light years away in the Large Magellenic Cloud, one of the Milky Way's nearest galactic neighbours.

Paul Crowther of the University of Sheffield, UK, and colleagues used the European Southern Observatory's Very Large Telescope on the mountain Paranal in Chile to study stars in the cluster, which is so tightly packed it was once thought to be a single, ultra-massive star.

The team estimate that R136a1, the brightest of the stars they studied, is about 265 times the mass of the sun, making it the most massive star ever measured. In its infancy, roughly a million years ago, the star was probably even more massive – some 320 times the mass of the sun: it will since have shed much material in hot, violent winds.

No one is sure how massive a star can be, but until now, the most massive ones seen have had about 150 times the mass of the sun. Such stars must be born in big clusters and shine only briefly before exploding, so they are expected to be rare.

Mass production

Measuring the mass of R136a1 was not straightforward. The best measurements of star masses come from observations of stars orbiting one another. But Crowther and colleagues suspect R136a1 is a single star, so they had to rely on models that relate the brightness of stars to their mass, taking account of how stars are thought to evolve with time.

That means we can't be sure just how massive R136a1 is, or how massive it was when it was born. "I think they've gotten a very believable answer," says Philip Massey of the Lowell Observatory in Flagstaff, Arizona. "It's certainly a very significant find," he adds, though he says many astronomers already suspected that 150 solar masses was not a hard limit. "I think most people will view this with glee and say 'I told you so'."

If there are more supermassive stars out there than we thought, we may have to revise estimates of how quickly galaxies form stars. That's because the light we see from galaxies could be produced by fewer, brighter stars than we thought possible, says Mark Krumholz of the University of California, Santa Cruz.

Exotic death

R136a1 and a handful of other massive stars identified by the team could also be stars to watch, as they are candidates for an exotic stellar death triggered by the creation of electrons and their antimatter counterparts. These explosions – called pair-instability supernovae – are expected to rip apart stars and could explain the properties of some recent bright supernovae.

Finding more of these massive stars may require new telescopes that can see individual stars in more distant clusters. "My suspicion is this is about as big as they get in places where we can pick out individual stars with our telescopes," Crowther says.

But such discoveries may not be far off. A new generation of telescopes is coming, such as NASA's James Webb Space Telescope, set to launch in 2014, and the planned European Extremely Large Telescope, a 42-metre telescope astronomers hope will be ready by 2018.

http://www.newscientist.com/article/dn19201-biggest-star-ever-found-may-be-ticking-antimatter-bomb.html

Comet tail confirmed on alien planet

- 13:30 16 July 2010 by Caitlin Stier

The roster of weird alien worlds has a new addition: a planet with a tail.

The gaseous extrasolar planet known as HD 209458b has been suspected of having a comet-like tail since 2003 but, being 153 light years away, it has been hard to prove.

Using the Hubble Space Telescope, Jeffrey Linsky and his team at the University of Colorado in Boulder has managed to study the mass the planet is shedding. They calculated the tail's composition, direction and speed by studying changes in its host star's ultraviolet spectra as the planet passes in front of it.

HD 209458b is similar to Jupiter in size and composition. It orbits its star in just 3.5 days and its surface is roughly 1100 °C. This intense heat is causing heavy elements like carbon and silicon to boil off, and be blown away by the solar wind.

"It's a very similar phenomenon to what happens with a comet," Linsky explains. "Except it's starting off as a gas planet as opposed to ice and the material in its outer atmosphere is being heated and lost. The wind from the star is pushing it away from the planet so we see a tail."

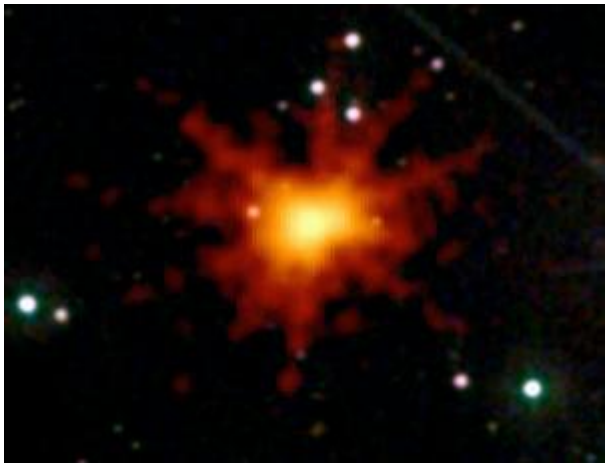
The gas trail is blowing away from the star at more than 35,000 kilometres per hour. The team estimates that the comet-like planet has a trillion years before the entire planet disappears.

Journal reference: The Astrophysical Journal, in press

http://www.newscientist.com/article/dn19185-comet-tail-confirmed-on-alien-planet.html

Deep space X-ray flash is most powerful ever recorded

- 16:46 16 July 2010 by David Shiga



The enigmatic flash appears red and yellow in this view from Swift's X-ray and ultraviolet/optical telescopes (Image: NASA/Swift/Stefan Immler)

It was bright, fierce and thankfully short. A mysterious event in a distant galaxy has blasted our solar system with the most powerful burst of X-rays ever recorded, temporarily blinding an astronomical satellite.

At 0303 GMT on 21 June, a sudden burst of X-rays struck the Swift spacecraft, the mission team reported on Wednesday.

X-rays from space are absorbed by Earth's atmosphere, so pose no danger on the ground. However, Swift orbits Earth at an altitude of 600 kilometres, where the blast was so intense that it overwhelmed the spacecraft's X-ray detector. It also confused the software that analyses the mission's data on the ground, says David Burrows of Pennsylvania State University in University Park, the mission's chief scientist.

"[The software] basically threw up its hands and said, 'Something must be wrong, because the data doesn't make sense,'" he says.

Puzzling pummelling

Swift's records show that at its peak, the burst pummelled the spacecraft with 143,000 X-ray photons per second. That made it nearly 15 times as bright as Scorpius X-1, a neutron star 9000 light years from Earth that is normally the brightest X-ray object in the sky. The burst dimmed rapidly during its first few seconds but continued glowing for about 10 minutes.

This powerful beginning was probably the most powerful X-ray flash ever recorded, Burrows says. An X-ray flash observed in 1979 may have appeared brighter – the comparison is hard to make because the 1979 flash was observed by a different spacecraft – but only because it occurred in a nearby galaxy, just 160,000 light years from Earth. By contrast, the June flash was traced to a vastly more distant galaxy 5 billion light-years away.

No one knows what caused the burst, but a clue lies in the fact that it accompanied a lengthy burst of gamma rays from deep space. Swift's purpose is to determine the origin of such bursts using three telescopes that detect gamma rays, X-rays, and ultraviolet and visible light. Long gamma-ray bursts are thought to be due to jets of matter shooting out almost at the speed of light from a star that is collapsing to form a black hole: the same type of event may have caused the recent X-ray burst.

However, shock waves from these violent events normally produce around 10 to 100 X-ray photons per second, so the Swift team is at a loss to explain why this X-ray burst was more than 1000 times brighter than this.

"We're very puzzled – we don't understand it yet," Burrows says. "Every once in a while something comes along that's completely unexpected and this is one of them."

http://www.newscientist.com/article/dn19187-deep-space-xray-flash-is-most-powerful-ever-recorded.html

Toward a New Generation of Superplastics

A substance made from natural clay (shown), the material used to make pottery, may be spinning its way toward use as an inexpensive, eco-friendly replacement for a compound widely used to make plastic nanocomposites. (Credit: iStockphoto/Henry Chaplin)

ScienceDaily (July 25, 2010) — Scientists are reporting an in-depth validation of the discovery of the world's first mass producible, low-cost, organoclays for plastics. The powdered material, made from natural clay, would be a safer, more environmentally friendly replacement for the compound widely used to make plastics nanocomposites.

A report on the research appears in ACS' Macromolecules, a bi-weekly journal.

Miriam Rafailovich and colleagues focused on a new organoclay developed and patented by a team of scientists headed by David Abecassis. The scientists explain that so-called quaternary amine-treated organoclays have been pioneering nanoparticles in the field of plastics nanotechnology. Just small amounts of the substances make plastics flame retardant, stronger, and more resistant to damage from ultraviolet light and chemicals. They also allow plastics to be mixed together into hybrid materials from plastics that otherwise would not exist.

However, quaternary amine organoclays are difficult to produce because of the health and environmental risks associated with quaternary amines, as well as the need to manufacture them in small batches. These and other disadvantages, including high cost, limit use of the materials.

The new organoclay uses resorcinol diphenyl phosphate (which is normally a flame retardant), to achieve mass producible organoclays which can be made in continuous processing. In addition these organoclays are cheaper, generate less dust, and are thermostable to much higher temperatures (beyond 600 degrees

Fahrenheit). This clay has also been proven to be superior for flame retardance applications. In addition, unlike most quaternary amine based organoclays, it works well in styrene plastics, one of the most widely used kinds of plastic.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by American Chemical Society, via EurekAlert!, a service of AAAS.

Journal Reference:

1. Seongchan Pack, Takashi Kashiwagi, Changhong Cao, Chad S. Korach, Menachem Lewin, Miriam H. Rafailovich. Role of Surface Interactions in the Synergizing Polymer/Clay Flame Retardant Properties. Macromolecules, 2010; 43 (12): 5338 DOI: 10.1021/ma100669g

http://www.sciencedaily.com/releases/2010/07/100721133221.htm

3-D Gesture-Based Interaction System Unveiled

The system detects the hands and fingers in real-time. (Credit: Image courtesy of Fraunhofer-Institut fuer Angewandte Informationstechnik (FIT))

ScienceDaily (July 25, 2010) — Touch screens such as those found on the iPhone or iPad are the latest form of technology allowing interaction with smart phones, computers and other devices. However, scientists at Fraunhofer FIT has developed the next generation non-contact gesture and finger recognition system. The novel system detects hand and finger positions in real-time and translates these into appropriate interaction commands. Furthermore, the system does not require special gloves or markers and is capable of supporting multiple users.

Touch screens such as those found on the iPhone or iPad are the latest form of technology allowing interaction with smart phones, computers and other devices. However, scientists at Fraunhofer FIT has developed the next generation non-contact gesture and finger recognition system. The novel system detects hand and finger positions in real-time and translates these into appropriate interaction commands. Furthermore, the system does not require special gloves or markers and is capable of supporting multiple users.

With touch screens becoming increasingly popular, classic interaction techniques such as a mouse and keyboard are becoming less frequently used. One example of a breakthrough is the Apple iPhone which was released in summer 2007. Since then many other devices featuring touch screens and similar characteristics have been successfully launched -- with more advanced devices even supporting multiple users simultaneously, e.g. the Microsoft Surface table becoming available. This is an entire surface which can be used for input. However, this form of interaction is specifically designed for two-dimensional surfaces.

Fraunhofer FIT has developed the next generation of multi-touch environment, one that requires no physical contact and is entirely gesture-based. This system detects multiple fingers and hands at the same time and allows the user to interact with objects on a display. The users move their hands and fingers in the air and the system automatically recognizes and interprets the gestures accordingly.

Cinemagoers will remember the science-fiction thriller Minority Report from 2002 which starred Tom Cruise. In this film Tom Cruise is in a 3-D software arena and is able to interact with numerous programs at unimaginable speed, however the system used special gloves and only three fingers from each hand.

The FIT prototype provides the next generation of gesture-based interaction far in advance of the Minority Report system. The FIT prototype tracks the user's hand in front of a 3-D camera. The 3-D camera uses the time of flight principle, in this approach each pixel is tracked and the length of time it takes light to be filmed travelling to and from the tracked object is determined. This allows for the calculation of the distance between the camera and the tracked object.

"A special image analysis algorithm was developed which filters out the positions of the hands and fingers. This is achieved in real-time through the use of intelligent filtering of the incoming data. The raw data can be viewed as a kind of 3-D mountain landscape, with the peak regions representing the hands or fingers." said Georg Hackenberg, who developed the system as part of his Master's thesis. In addition plausibility criteria are used, these are based around: the size of a hand, finger length and the potential coordinates.

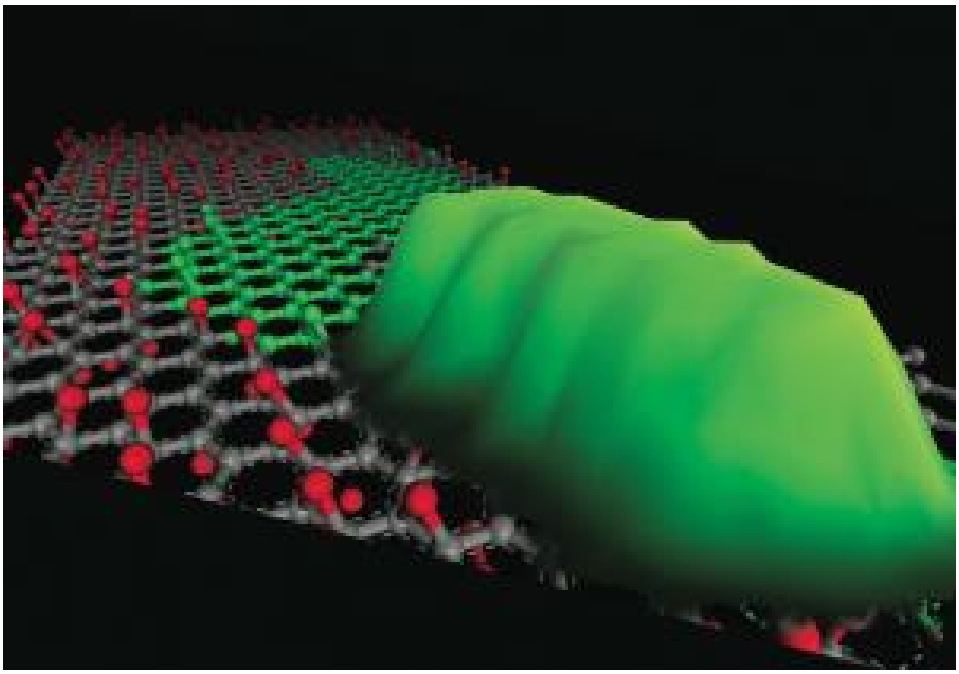
A user study was conducted and found that the system both easy to use and fun. However, work remains to be done on removing elements which confuses the system, for example reflections caused by wristwatches and palms which are positioned orthogonal to the camera.

"With Microsoft announcing Project Natal, it is likely that similar techniques will very soon become standard across the gaming industry. This technology also opens up the potential for new solutions in the range of other application domains, such as the exploration of complex simulation data and for new forms of learning," predicts Prof. Dr. Wolfgang Broll of the Fraunhofer Institute for Applied Information Technology FIT.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Fraunhofer-Institut fuer Angewandte Informationstechnik (FIT).
http://www.sciencedaily.com/releases/2010/07/100721085354.htm

Graphene Oxide Gets Green: Environmentally Friendly Ways to Make It in Bulk, Break It Down



New research from Rice University reveals that Shewanella bacteria convert graphene oxide into environmentally benign graphene. (Credit: Everett Salas/Rice University)

ScienceDaily (July 25, 2010) — "We can make you and we can break you." If Rice University scientists wrote country songs, their ode to graphene oxide would start something like that. But this song wouldn't break anybody's heart.

A new paper from the lab of Rice chemist James Tour demonstrates an environmentally friendly way to make bulk quantities of graphene oxide (GO), an insulating version of single-atom-thick graphene expected to find use in all kinds of material and electronic applications.

A second paper from Tour and Andreas Lüttge, a Rice professor of Earth science and chemistry, shows how GO is broken down by common bacteria that leave behind only harmless, natural graphite.

The one-two punch appears online this week in the journal ACS Nano.

"These are the pillars that make graphene oxide production practical," said Tour, Rice's T.T. and W.F. Chao Chair in Chemistry as well as a professor of mechanical engineering and materials science and of computer science. The GO manufacturing process was developed as part of a research project with M-I SWACO, a Houston-based producer of drilling fluids for the petrochemical industry that hopes to use graphene to improve the productivity of wells. (Read about that here.)

Scientists have been making GO since the 19th century, but the new process eliminates a significant stumbling block to bulk production, Tour said. "People were using potassium chlorate or sodium nitrates that

release toxic gases -- one of which, chlorine dioxide, is explosive," he said. "Manufacturers are always reluctant to go to a large scale with any process that generates explosive intermediates."

Tour and his colleagues used a process similar to the one they employed to unzip multiwalled nanotubes into graphene nanoribbons, as described in a Nature paper last year. They process flakes of graphite -- pencil lead -- with potassium permanganate, sulfuric acid and phosphoric acid, all common, inexpensive chemicals.

"Many companies have started to make graphene and graphene oxide, and I think they're going to be very hard pressed to come up with a cheaper procedure that's this efficient and as safe and environmentally friendly," Tour said.

The researchers suggested the water-soluble product could find use in polymers, ceramics and metals, as thin films for electronics, as drug-delivery devices and for hydrogen storage, as well as for oil and gas recovery.

Though GO is a natural insulator, it could be chemically reduced to a conductor or semiconductor, though not without defects, Tour said.

With so many potential paths into the environment, the fate of GO nanomaterials concerned Tour, who sought the advice of Rice colleague Lüttge.

Lüttge and Everett Salas, a postdoctoral researcher in his lab and primary author of the second paper, had already been studying the effects of bacteria on carbon, so it was simple to shift their attention to GO. They found bacteria from the genus Shewanella easily convert GO to harmless graphene. The graphene then stacks itself into graphite.

"That's a big plus for green nano, because these ubiquitous bacteria are quickly converting GO into an environmentally benign mineral," Tour said.

Essentially, Salas said, Shewanella have figured out how to "breathe" solid metal oxides. "These bacteria have turned themselves inside out. When we breathe oxygen, the reactions happen inside our cells. These microbes have taken those components and put them on the outside of their cells."

It is this capability that allows them to reduce GO to graphene. "It's a mechanism we don't understand completely because we didn't know it was possible until a few months ago," he said of the process as it relates to GO.

The best news of all, Lüttge said, is that these metal-reducing bacteria "are found pretty much everywhere, so there will be no need to 'inoculate' the environment with them," he said. "These bacteria have been isolated from every imaginable environment -- lakes, the sea floor, river mud, the open ocean, oil brines and even uranium mines."

He said the microbes also turn iron, chromium, uranium and arsenic compounds into "mostly benign" minerals. "Because of this, they're playing a major role in efforts to develop bacteria-based bioremediation technologies."

Lüttge expects the discovery will lead to other practical technologies. His lab is investigating the interaction between bacteria and graphite electrodes to develop microbe-powered fuel cells, in collaboration with the Air Force Office of Scientific Research and its Multidisciplinary University Research Initiative (MURI).

Co-authors of the first paper, "Improved Synthesis of Graphene Oxide," include postdoctoral research associates Dmitry Kosynkin, Jacob Berlin and Alexander Sinitskii; senior research scientist Lawrence Alemany; graduate students Daniela Marcano, Zhengzong Sun and Wei Lu and visiting research student Alexander Slesarev, all of Rice.

Salas, Tour, Lüttge and Sun are co-authors of the second paper, "Reduction of Graphene Oxide via Bacterial Respiration."

Funding for the projects came from the Alliance for NanoHealth, M-I SWACO, the Air Force Research Laboratory through the University Technology Corporation, the Department of Energy's Office of Energy Efficiency and Renewable Energy within the Hydrogen Sorption Center of Excellence, the Office of Naval Research MURI program on graphene, the Air Force Office of Scientific Research and the Federal Aviation Administration.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Rice University.

Journal References:

1. Marcano et al. Improved Synthesis of Graphene Oxide. ACS Nano, 2010; 100722093119062 DOI: 10.1021/nn1006368
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http://www.sciencedaily.com/releases/2010/07/100722181319.htm

Nanowick at Heart of New System to Cool 'Power Electronics'

This is a test facility for nanowicks. (Credit: Purdue University School of Mechanical Engineering)

ScienceDaily (July 25, 2010) — Researchers have shown that an advanced cooling technology being developed for high-power electronics in military and automotive systems is capable of handling roughly 10 times the heat generated by conventional computer chips.

The miniature, lightweight device uses tiny copper spheres and carbon nanotubes to passively wick a coolant toward hot electronics, said Suresh V. Garimella, the R. Eugene and Susie E. Goodson Distinguished Professor of Mechanical Engineering at Purdue University.

This wicking technology represents the heart of a new ultrathin "thermal ground plane," a flat, hollow plate containing water.

Similar "heat pipes" have been in use for more than two decades and are found in laptop computers. However, they are limited to cooling about 50 watts per square centimeter, which is good enough for standard computer chips but not for "power electronics" in military weapons systems and hybrid and electric vehicles, Garimella said.

The research team from Purdue, Thermacore Inc. and Georgia Tech Research Institute is led by Raytheon Co., creating the compact cooling technology in work funded by the Defense Advanced Research Projects Agency, or DARPA.

The team is working to create heat pipes about one-fifth the thickness of commercial heat pipes and covering a larger area than the conventional devices, allowing them to provide far greater heat dissipation.

New findings indicate the wicking system that makes the technology possible absorbs more than 550 watts per square centimeter, or about 10 times the heat generated by conventional chips. This is more than enough cooling capacity for the power-electronics applications, Garimella said.

The findings are detailed in a research paper appearing online this month in the International Journal of Heat and Mass Transfer and will be published in the journal's September issue. The paper was written by

mechanical engineering doctoral student Justin Weibel, Garimella and Mark North, an engineer with Thermacore, a producer of commercial heat pipes located in Lancaster, Pa.

"We know the wicking part of the system is working well, so we now need to make sure the rest of the system works," North said.

The new type of cooling system can be used to prevent overheating of devices called insulated gate bipolar transistors, high-power switching transistors used in hybrid and electric vehicles. The chips are required to drive electric motors, switching large amounts of power from the battery pack to electrical coils needed to accelerate a vehicle from zero to 60 mph in 10 seconds or less.

Potential military applications include advanced systems such as radar, lasers and electronics in aircraft and vehicles. The chips used in the automotive and military applications generate 300 watts per square centimeter or more.

Researchers are studying the cooling system using a novel test facility developed by Weibel that mimics conditions inside a real heat pipe.

"The wick needs to be a good transporter of liquid but also a very good conductor of heat," Weibel said. "So the research focuses largely on determining how the thickness of the wick and size of copper particles affect the conduction of heat."

Computational models for the project were created by Garimella in collaboration with Jayathi Y. Murthy, a Purdue professor of mechanical engineering, and doctoral student Ram Ranjan. The carbon nanotubes were produced and studied at the university's Birck Nanotechnology Center in work led by mechanical engineering professor Timothy Fisher.

"We have validated the models against experiments, and we are conducting further experiments to more fully explore the results of simulations," Garimella said.

Inside the cooling system, water circulates as it is heated, boils and turns into a vapor in a component called the evaporator. The water then turns back to a liquid in another part of the heat pipe called the condenser.

The wick eliminates the need for a pump because it draws away fluid from the condenser side and transports it to the evaporator side of the flat device, Garimella said.

Allowing a liquid to boil dramatically increases how much heat can be removed compared to simply heating a liquid to temperatures below its boiling point. Understanding precisely how fluid boils in tiny pores and channels is helping the engineers improve such cooling systems.

The wicking part of the heat pipe is created by sintering, or fusing together tiny copper spheres with heat. Liquid is drawn sponge-like through spaces, or pores, between the copper particles by a phenomenon called capillary wicking. The smaller the pores, the greater the drawing power of the material, Garimella said.

Such sintered materials are used in commercial heat pipes, but the researchers are improving them by creating smaller pores and also by adding the carbon nanotubes.

"For high drawing power, you need small pores," Garimella said. "The problem is that if you make the pores very fine and densely spaced, the liquid faces a lot of frictional resistance and doesn't want to flow. So the permeability of the wick is also important."

The researchers are creating smaller pores by "nanostructuring" the material with carbon nanotubes, which have a diameter of about 50 nanometers, or billionths of a meter. However, carbon nanotubes are naturally hydrophobic, hindering their wicking ability, so they were coated with copper using a device called an electron beam evaporator.

"We have made great progress in understanding and designing the wick structures for this application and measuring their performance," said Garimella. He said that once ongoing efforts at packaging the new wicks into heat pipe systems that serve as the thermal ground plane are complete, devices based on the research could be in commercial use within a few years.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Purdue University. The original article was written by Emil Venere.

Journal Reference:

1. Justin A. Weibel, Suresh V. Garimella, Mark T. North. Characterization of evaporation and boiling from sintered powder wicks fed by capillary action. International Journal of Heat and Mass Transfer, 2010; 53 (19-20): 4204 DOI: 10.1016/j.ijheatmasstransfer.2010.05.043

http://www.sciencedaily.com/releases/2010/07/100722153634.htm

Nanoparticles in English Ivy May Hold the Key to Making Sunscreen Safer and More Effective

English ivy. Researchers see possibilities for tiny particles secreted from ivy rootlets to be used in many breakthrough applications in items such as military technologies, medical adhesives and drug delivery, and, most recently, sun-block. (Credit: iStockphoto/Kimberly McBride)

ScienceDaily (July 25, 2010) — When Mingjun Zhang was watching his son play in the yard, he was hit with a burning question: "What makes the ivy in his backyard cling to the fence so tightly?"

That simple question has led to a pioneering discovery that the tiny particles secreted from ivy rootlets can be used in many breakthrough applications in items such as military technologies, medical adhesives and drug delivery, and, most recently, sun-block.

Zhang, an associate professor of biomedical engineering at the University of Tennessee, Knoxville, along with his research team and collaborators, has found that ivy nanoparticles may protect skin from UV radiation at least four times better than the metal-based sunblocks found on store shelves today.

"The discovery of ivy nanoparticles' application to sunscreen was triggered by a real need. While hearing a talk at a conference about toxicity concerns in the use of metal-based nanoparticles in sunscreen, I was wondering, 'Why not try naturally occurring organic nanoparticles?'" Zhang said.

Zhang speculated the greenery's hidden power lay within a yellowish material secreted by the ivy for surface climbing. He placed this material onto a silicon wafer and examined it under an atomic force microscope and was surprised by what they found -- lots of nanoparticles, tiny particles 1,000 times thinner than the diameter

of a human hair. The properties of these tiny bits create the ability for the vine leaves to hold almost 2 million more times than its weight. It also has the ability to soak up and disperse light which is integral to sunscreens.

"Nanoparticles exhibit unique physical and chemical properties due to large surface-to-volume ratio which allows them to absorb and scatter light," Zhang said. "Titanium dioxide and zinc oxide are currently used for sunscreen for the same reason, but the ivy nanoparticles are more uniform than the metal-based nanoparticles, and have unique material properties, which may help to enhance the absorption and scattering of light, and serve better as a sun-blocker."

The team's study indicates that ivy nanoparticles can improve the extinction of ultraviolet light at least four times better than its metal counterparts. Furthermore, the metal-based sunscreens used today can pose health hazards. Zhang notes some studies have shown that the small-scale metal oxides in sunscreen can wind up in organs such as the liver or brain.

Ivy nanoparticles, on the other hand, exhibit better biocompatibility with humans and the environment. The team's studies indicate that the ivy nanoparticles were less toxic to mammalian cells, have a limited potential to penetrate through human skin, and are easily biodegradable.

"In general, it is not a good idea to have more metal-based nanoparticles for cosmetic applications. They are a significant concern for the environment. Naturally occurring nanoparticles originated from plants seem to be a better choice, especially since they have been demonstrated to be less toxic and easily biodegradable," Zhang said.

Sunscreens made with ivy nanoparticles may not need to be reapplied after swimming. That's because the plant's nanoparticles are a bit more adhesive so sunscreens made with them may not wash off as easily as traditional sunscreens. And while sunscreens made with metal-based nanoparticles give the skin a white tinge, sunscreens made with ivy nanoparticles are virtually invisible when applied to the skin.

Zhang worked with assistant professor Zhili Zhang, graduate student Lijin Xia, and post-doctoral research associates Scott Lenaghan and Quanshui Li in the Department of Mechanical, Aerospace and Biomedical Engineering.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by University of Tennessee at Knoxville, via EurekAlert!, a service of AAAS.
http://www.sciencedaily.com/releases/2010/07/100719162955.htm

'Super Socks' Help Stem Pollution Runoff

ARS scientists and their collaborators found a way to improve the ability of compost filled mesh tubes called filter socks to remove silt, heavy metals, fertilizers and petroleum products from storm water runoff by adding flocculation agents. (Credit: Photo courtesy of Filtrexx International)

ScienceDaily (July 25, 2010) — Agricultural Research Service (ARS) scientists and their collaborators have improved on an existing method for removing contaminants from storm water runoff. These findings could provide surface waters additional protection against runoff containing pollutants from point sources such as construction sites, storm waters and other urban landscapes.

"Filter socks" containing compost tucked into mesh tubes are used to capture some of the silt, heavy metals, fertilizers and petroleum products washed from compacted surface areas into nearby streams and rivers.A group of scientists from the ARS Animal and Natural Resources Institute in Beltsville, Md., teamed with researchers from Filtrexx International, which manufactures the socks, to see if adding flocculation agents to the socks improved their performance. The ARS team included agronomist Eton Codling, microbiologist Dan Shelton and soil scientists Yakov Pachepsky and Ali Sadeghi. Their Filtrexx International partners were Britt Faucette and Fatima Cardoso-Gendreau.Wastewater treatment plants use flocculation agents to help sediments and pollutants form clumps large enough to be filtered out of the water, even when the substances are in a dissolved state. The team added flocculation agents to compost socks and then ran laboratory tests to see how well the socks trapped sediment, coliforms, nitrates, E. coli bacteria, heavy metals and petroleum products in runoff after simulated "rain events."

The scientists found that compost socks alone removed the majority of clay and silt particles that contribute to suspended solids in surface waters. The socks also removed 17 percent of ammonium nitrogen, 75 percent of E. coli bacteria, and from 37 percent to 72 percent of the heavy metals. In addition, runoff levels of diesel fuel dropped 99 percent, levels of motor oil dropped 84 percent, and gasoline levels dropped 43 percent.

However, socks with flocculation agents removed even more of the pollutants from runoff, including 27 percent of the ammonium nitrogen, 99 percent of E. coli bacteria, 99 percent of the motor oil, 54 percent of the gasoline and from 47 percent to 74 percent of the heavy metals.

Results from this research were published in the Journal of Environmental Quality.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by USDA/Agricultural Research Service. The original article was written by Ann Perry.
http://www.sciencedaily.com/releases/2010/07/100723112801.htm

Robot Ranger Sets Untethered 'Walking' Record at 14.3 Miles

The robot Ranger, which set an untethered walking record in Barton Hall. (Credit: Image courtesy of Cornell University)

ScienceDaily (July 23, 2010) — The loneliness of the long-distance robot: A Cornell University robot named Ranger walked 14.3 miles in about 11 hours, setting an unofficial world record at Cornell's Barton Hall early on July 6. A human -- armed with nothing more than a standard remote control for toys -- steered the untethered robot.

Ranger navigated 108.5 times around the indoor track in Cornell's Barton Hall -- about 212 meters per lap, and made about 70,000 steps before it had a stop and recharge.

The 14.3-mile record beats the former world record set by Boston Dynamics' BigDog, which had claimed the record at 12.8 miles.

A group of engineering students, led by Andy Ruina, Cornell professor of theoretical and applied mechanics, announced the robotic record at the Dynamic Walking 2010 meeting on July 9, in Cambridge, Mass. Ruina leads the Biorobotics and Locomotion Laboratory at Cornell. The National Science Foundation funds this research.

Previously, students in Ruina's lab set a record for an untethered walking robot in April 2008, when Ranger strode about 5.6 miles around the Barton Hall. Boston Dynamics' BigDog subsequently beat that record.

One goal for robotic research is to show off the machine's energy efficiency. Unlike other walking robots that use motors to control every movement, the Ranger appears more relaxed and in a way emulates human walking, using gravity and momentum to help swing its legs forward.

Standing still, the robot looks a bit like a tall sawhorse and its gait suggests a human on crutches, alternately swinging forward two outside legs and then two inside ones. There are no knees, but its feet can flip up -- and out of the way, while it swings its legs -- so that the robot can finish its step.

Ruina says that this record not only advances robotics, but helps undergraduate students learn about the mechanics of walking. The information could be applied to rehabilitation, prosthetics for humans and improving athletic performance.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Cornell University.
http://www.sciencedaily.com/releases/2010/07/100722143905.htm

Supercomputer Reproduces a Cyclone's Birth, May Boost Forecasting

The Moderate Resolution Imaging Spectroradiometer on NASA's Terra satellite captured Cyclone Nargis in early May 2008. At its most intense point, the category 4 storm, later simulated by Shen's model, boasted winds of 130 miles an hour before coming ashore in Myanmar on May 2. (Credit: NASA)

ScienceDaily (July 23, 2010) — As a teen in his native Taiwan, Bo-wen Shen observed helplessly as typhoon after typhoon pummeled the small island country. Without advanced forecasting systems, the storms left a trail of human loss and property destruction in their wake. Determined to find ways to stem the devastation, Shen chose a career studying tropical weather and atmospheric science.

Now a NASA-funded research scientist at the University of Maryland-College Park, Shen has employed NASA's Pleiades supercomputer and atmospheric data to simulate tropical cyclone Nargis, which devastated Myanmar in 2008. The result is the first model to replicate the formation of the tropical cyclone five days in advance.

To save lives from the high winds, flooding, and storm surges of tropical cyclones (also known as hurricanes and typhoons), forecasters need to give as much advance warning as possible and the greatest degree of accuracy about when and where a storm will occur. In Shen's retrospective simulation, he was able to anticipate the storm five days in advance of its birth, a critical forewarning in a region where the meteorology and monitoring of cyclones is hampered by a lack of data.

At the heart of Shen's work is an advanced computer model that could improve our understanding of the predictability of tropical cyclones. The research team uses the model to run millions of numbers -- atmospheric conditions like wind speed, temperature, and moisture -- through a series of equations. This results in digital data of the cyclone's location and atmospheric conditions that are plotted on geographical maps.

Scientists study the maps and data from the model and compare them against real observations of a past storm (like Nargis) to evaluate the model's accuracy. The more the model reflects the actual storm results, the greater confidence researchers have that a particular model can be used to paint a picture of what the future might look like.

"To do hurricane forecasting, what's really needed is a model that can represent the initial weather conditions -- air movements and temperatures, and precipitation -- and simulate how they evolve and interact globally and locally to set a cyclone in motion," said Shen, whose study appeared online last week in the Journal of Geophysical Research -Atmospheres.

"We know what's happening across very large areas. So, we need really good, high-resolution simulations with the ability to detail conditions across the smallest possible areas. We've marked several forecasting milestones since 2004, and we can now compute a storm's fine-scale details to 10 times the level of detail than we could with traditional climate models."

The cyclone's birth prediction is possible because the supercomputer at NASA's Ames Research Center in Moffett Field, Calif., can process atmospheric data for global and regional conditions, as well as the fine-scale measurements like those around the eye of a storm. NASA built the Pleiades supercomputer in 2008, incrementally boosting its processing "brain power" since to the capacity of 81,920 desktop CPUs. The upgrades laid the groundwork for Shen and others to gradually improve simulations of varying aspects of a storm -- from simulations of the path, then intensity, and now the actual genesis of a storm.

The improved simulations can translate into greater accuracy and less guesswork in assessing when a storm is forming.

"There is a tendency to over-warn beyond the actual impact area of a storm, leading people to lose confidence in the warning system and to ignore warnings that can save their lives," said study co-author Robert Atlas, director of the National Oceanic and Atmospheric Administration's (NOAA) Atlantic Oceanographic and Meteorological Laboratory in Miami, Fla., and former chief meteorologist at NASA's Goddard Space Flight Center in Greenbelt, Md.

"Although we've seen tremendous forecasting advances in the past 10 years -- with potential to improve predictions of a cyclone's path and intensity -- they're still not good enough for all of the life-and-death decisions that forecasters have to make. Tropical cyclones have killed nearly two million people in the last 200 years, so this remaining 'cone of uncertainty' in our predictions is unacceptable."

As promising as the new model may be, Atlas cautions that "Shen's model worked for one cyclone, but it doesn't mean it'll work in real-time for future storms. The research model Shen and predecessors at NASA have developed sets the stage for NOAA's researchers to hone and test the new capability with their own models."

Shen's use of real data from Nargis -- one of the 10 deadliest cyclones on record -- with the new global model also yields insights into the dynamics of weather conditions over time and across different areas that generate such storms.

"In the last few years, high-resolution global modeling has evolved our understanding of the physics behind storms and its interaction with atmospheric conditions more rapidly than in the past several decades combined," explained Shen, who presented the study last month before peers at the American Geophysical Union's Western Pacific Geophysics Meeting in Taipei, Taiwan. "We can 'see' a storm's physical processes with this advanced global model -- like both the release of heat associated with rainfall and changes in environmental atmospheric flow, which was very difficult until now."

Story Source:

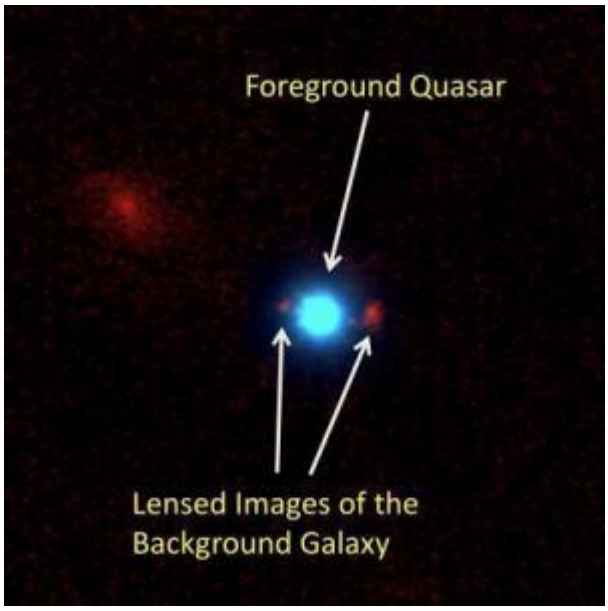
The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by NASA/Goddard Space Flight Center. The original article was written by Gretchen Cook-Anderson.

Journal Reference:

1. B.W. Shen, W. K. Tao, W. K. Lau, and R. Atlas. Predicting tropical cyclogenesis with a global mesoscale model: Hierarchical multiscale interactions during the formation of tropical cyclone Nargis (2008). Journal of Geophysical Research, 2010; 115 (d14): D14102 DOI: 10.1029/2009JD013140

http://www.sciencedaily.com/releases/2010/07/100721121701.htm

Astronomers Discover an Unusual Cosmic Lens



These images of the first-ever foreground quasar (blue) lensing a background galaxy (red) were taken with the Keck II telescope using laser guide-star adaptive optics. (Credit: Courbin, Meylan, Djorgovski, et al., EPFL/Caltech/WMKO.)

ScienceDaily (July 16, 2010) — Astronomers at the California Institute of Technology (Caltech) and Ecole Polytechnique Fédérale de Lausanne (EPFL) in Switzerland have discovered the first known case of a distant galaxy being magnified by a quasar acting as a gravitational lens. The discovery, based in part on observations done at the W. M. Keck Observatory on Hawaii's Mauna Kea, is being published July 16 in the journal Astronomy & Astrophysics.

Quasars, which are extraordinary luminous objects in the distant universe, are thought to be powered by supermassive black holes in the cores of galaxies. A single quasar could be a thousand times brighter than an entire galaxy of a hundred billion stars, which makes studies of their host galaxies exceedingly difficult. The significance of the discovery, the researchers say, is that it provides a novel way to understand these host galaxies.

"It is a bit like staring into bright car headlights and trying to discern the color of their rims," says Frédéric Courbin of EPFL, the lead author on the paper. Using gravitational lensing, he says, "we now can measure the masses of these quasar host galaxies and overcome this difficulty."

According to Einstein's general theory of relativity, if a large mass (such as a big galaxy or a cluster of galaxies) is placed along the line of sight to a distant galaxy, the part of the light that comes from the galaxy will split. Because of this, an observer on Earth will see two or more close images of the now-magnified background galaxy.

The first such gravitational lens was discovered in 1979, and produced an image of a distant quasar that was magnified and split by a foreground galaxy. Hundreds of cases of gravitationally lensed quasars are now

known. But, until the current work, the reverse process -- a background galaxy being lensed by the massive host galaxy of a foreground quasar -- had never been detected.

Using gravitational lensing to measure the masses of distant galaxies independent of their brightness was suggested in 1936 by Caltech astrophysicist Fritz Zwicky, and the technique has been used effectively for this purpose in recent years. Until now, it had never been applied to measure the masses of quasar hosts themselves.

To find the cosmic lens, the astronomers searched a large database of quasar spectra obtained by the Sloan Digital Sky Survey (SDSS) to select candidates for "reverse" quasar-galaxy gravitational lensing. Follow-up observations of the best candidate -- quasar SDSS J0013+1523, located about 1.6 billion light years away -- using the W. M. Keck Observatory's 10-meter telescope, confirmed that the quasar was indeed magnifying a distant galaxy, located about 7.5 billion light years away.

"We were delighted to see that this idea actually works," says Georges Meylan, a professor of physics and leader of the EPFL team. "This discovery demonstrates the continued utility of gravitational lensing as an astrophysical tool."

"Quasars are valuable probes of galaxy formation and evolution," says Professor of Astronomy S. George Djorgovski, leader of the Caltech team. Furthermore, he adds, "discoveries of more such systems will help us understand better the relationship between quasars and the galaxies which contain them, and their coevolution."

Story Source:

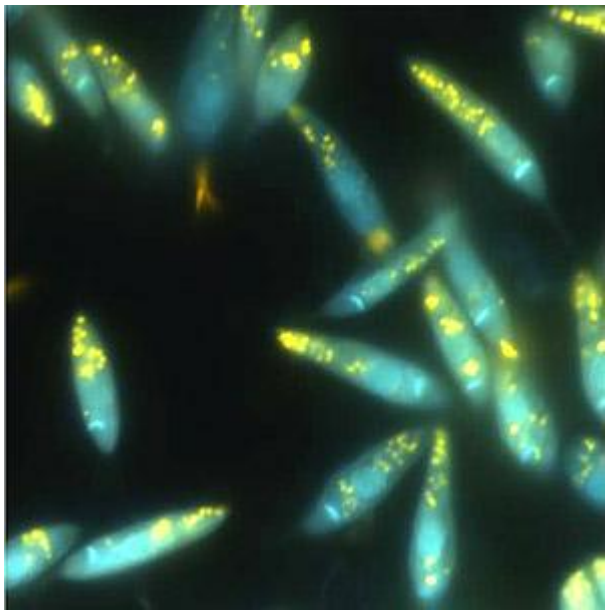
The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by California Institute of Technology.

Journal Reference:

1. Courbin et al. First case of strong gravitational lensing by a QSO: SDSS J0013 1523 at z = 0.120. Astronomy and Astrophysics, 2010; 516L12 DOI: 10.1051/0004-6361/201014376

http://www.sciencedaily.com/releases/2010/07/100716085631.htm

Cancer Drugs May Help Stop Major Parasite



Scientists at Washington University School of Medicine in St. Louis recently showed that when a key protein was genetically disabled, the parasite Leishmania couldn't start infections in cell cultures and animals. Parasites in this picture have been stained so that compounds known as polyphosphates appear yellow. The structures where the parasite normally stores these compounds are misshapen and empty in mutant parasites that lack the TOR kinase 3 protein. (Credit: Washington University School of Medicine in St. Louis)

ScienceDaily (July 16, 2010) — A parasite estimated to afflict as many as 12 million people worldwide relies on a family of genes that should make it vulnerable to compounds developed to treat cancer and other disorders, researchers at Washington University School of Medicine in St. Louis have found.

Scientists searched the genome of the parasite Leishmania to determine that it has three kinds of TOR kinases, proteins that are linked to cell growth and cancer and have been longstanding targets for drug development. When they removed the proteins individually, they found that all three were critical either to the parasite's ability to survive or its ability to cause infections.

"If we can hit any of these proteins with a drug that will inhibit them, we should be able to strike a significant blow against Leishmania," says senior author Stephen Beverley, PhD, the Marvin A. Brennecke Professor and head of Molecular Microbiology. "Given the numerous inhibitors already available, I think there's a pretty good chance that we'll be able to identify a compound that specifically inhibits one of Leishmania's TOR kinases."

The finding appears online in The Proceedings of the National Academy of Sciences.

Infection with the Leishmania parasite, or leishmaniasis, is mainly spread by sand fly bites and is a major public health problem in Asia, Africa, the Middle East and other parts of the developing world. Symptoms include large skin lesions, fever, swelling of the spleen and liver, and, in more serious forms of the disease, disfigurement. The most severe form of leishmaniasis, a condition sometimes called black fever, is fatal if left

untreated and is estimated to kill more humans than any other parasite except Plasmodium falciparum, the malaria parasite.

Mammals have only one TOR kinase protein, and drug developers have targeted it to block immune system rejection of transplanted organs, to treat certain forms of cancer and, more recently, to prevent some age-related illnesses.

When Beverley's lab separately deleted each of the first two TOR kinases from Leishmania's genome, the parasite could not survive. Deleting the third TOR kinase led to a parasite that survived the initial stage of its lifecycle, which normally occurs in sand flies. But the modified parasite died when it tried to infect animals or cell cultures.

Closer study of how loss of TOR kinase 3 affected Leishmania revealed that structures inside the parasite known as acidocalcisomes were defective. They were unusual in size and shape and did not carry their usual cargo, high-energy molecules known as polyphosphates.

The study provides the first proof that acidocalcisomes are essential for infection. The properties of the parasite with mutated TOR kinase 3 confirmed prior research that suggested the acidocalcisome may help cells regulate the flow of fluids across the cell membrane or cope with stress and loss of access to the sugar glucose.

"Entry into the host is one of the most stressful times in a parasite's lifecycle," says first author Luciana Madeira da Silva, PhD, a former postdoctoral researcher. "Having fewer ways to cope with stress at that point could be a real problem for Leishmania."

Beverley has begun working with another group that repurposes human TOR kinase inhibitors, adapting them for other uses. They plan to see if existing drugs might disable or kill the Leishmania parasite by inhibiting one of its three TOR kinases.

Funding from the National Institutes of Health and the Washington University Infectious Diseases Scholar Program supported this research.

Story Source:

The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by Washington University School of Medicine.

Journal Reference:

1. Madeira da Silva et al. Expansion of the target of rapamycin (TOR) kinase family and function in Leishmania shows that TOR3 is required for acidocalcisome biogenesis and animal infectivity. Proceedings of the National Academy of Sciences, 2010; 107 (26): 11965 DOI: 10.1073/pnas.1004599107

http://www.sciencedaily.com/releases/2010/07/100716125839.htm

Fungi's Genetic Sabotage in Wheat Discovered

A team of scientists from seven research organizations lead by ARS plant geneticist Justin Faris has found that a single gene in wheat makes it vulnerable to two major diseases of the grain: tan spot and leaf blotch. (Credit: Stephen Ausmus)

ScienceDaily (July 16, 2010) — Using molecular techniques, Agricultural Research Service (ARS) and collaborating scientists have shown how the subversion of a single gene in wheat by two fungal foes triggers a kind of celular suicide in the grain crop's leaves.

Fortunately, the team has also developed DNA molecular markers that can be used to rapidly screen commercial cultivars for the gene, Tsn1, so it can be eliminated by selective breeding. This, in turn, would deprive the fungi of their primary means of killing off leaf tissue to feed and grow, explains Justin Faris, a plant geneticist with the ARS Cereal Crops Research Unit in Fargo, N.D.

The fungi -- Pyrenophora tritici-repentis (also known as tan spot) and Stagonospora nodorum (leaf blotch) -- are often partners in crime, occurring in the same crop fields and producing the same toxin, ToxA, to induce a Tsn1-controlled response in wheat called programmed cell death (PCD). Normally, PCD protects plants by

confining invading pathogens in dead cells. However, the strategy doesn't work against the ToxA fungi because they're "necrotrophs," pathogens that feed on dead tissue.

To better understand this genetic trickery, Faris led a team of scientists from seven different research organizations in isolating, sequencing and cloning the DNA sequence for Tsn1 from cultivated wheat and its wild relatives. Based on their analysis, the researchers concluded that modern-day wheat inherited Tsn1 from goatgrass. They figure this happened after a goatgrass gene for the enzyme protein kinase fused with another gene, NB-LRR, which probably conferred resistance to biotrophs, pathogens that feed on living tissue.

Interestingly, Tsn1 is controlled by wheat's circadian clock, and only initiates PCD in response to ToxA during daylight hours. At night, Tsn1 shuts down and "ignores" ToxA, suggesting the toxin may indirectly interfere with the plant's photosynthesis.

The team, which includes researchers from North Dakota State University-Fargo and the Australian Centre for Necrotrophic Fungal Pathogens-Murdoch among others, is reporting its findings in the Proceedings of the National Academy of Sciences.

Story Source:

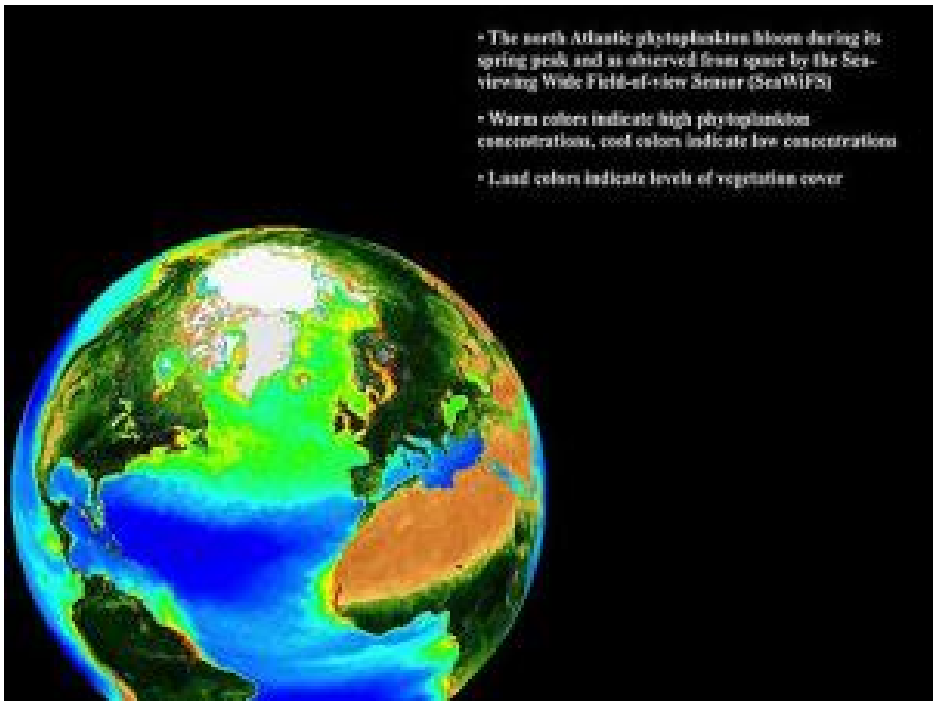
The above story is reprinted (with editorial adaptations by ScienceDaily staff) from materials provided by USDA/Agricultural Research Service. The original article was written by Jan Suszkiw.

Journal Reference:

1. Justin D. Faris, Zengcui Zhang, Huangjun Lu, Shunwen Lu, Leela Reddy, Sylvie Cloutier, John P. Fellers, Steven W. Meinhardt, Jack B. Rasmussen, Steven S. Xu, Richard P. Oliver, Kristin J. Simons, and Timothy L. Friesen. A unique wheat disease resistance-like gene governs effector-triggered susceptibility to necrotrophic pathogens. Proceedings of the National Academy of Sciences, 2010; DOI: 10.1073/pnas.1004090107

http://www.sciencedaily.com/releases/2010/07/100713101414.htm

Old Theory of Phytoplankton Growth Overturned, Raise Concerns for Ocean Productivity



A north Atlantic Ocean view of the spring phytoplankton bloom, as seen from a satellite image. (Credit: Image courtesy of Oregon State University)

ScienceDaily (July 16, 2010) — A new study concludes that an old, fundamental and widely accepted theory of how and why phytoplankton bloom in the oceans is incorrect.

The findings challenge more than 50 years of conventional wisdom about the growth of phytoplankton, which are the ultimate basis for almost all ocean life and major fisheries. And they also raise concerns that global warming, rather than stimulating ocean productivity, may actually curtail it in some places.

This analysis was published in the journal *Ecology* by Michael Behrenfeld, a professor of botany at Oregon State University, and one of the world's leading experts in the use of remote sensing technology to examine ocean productivity. The study was supported by NASA.

The new research concludes that a theory first developed in 1953 called the "critical depth hypothesis" offers an incomplete and inaccurate explanation for summer phytoplankton blooms that have been observed since the 1800s in the North Atlantic Ocean. These blooms provide the basis for one of the world's most productive fisheries.

"The old theory made common sense and seemed to explain what people were seeing," Behrenfeld said.

"It was based on the best science and data that were available at the time, most of which was obtained during the calmer seasons of late spring and early summer," he said. "But now we have satellite remote sensing

technology that provides us with a much more comprehensive view of the oceans on literally a daily basis. And those data strongly contradict the critical depth hypothesis."

That hypothesis, commonly found in oceanographic textbooks, stated that phytoplankton bloom in temperate oceans in the spring because of improving light conditions -- longer and brighter days -- and warming of the surface layer. Warm water is less dense than cold water, so springtime warming creates a surface layer that essentially "floats" on top of the cold water below, slows wind-driven mixing and holds the phytoplankton in the sunlit upper layer more of the time, letting them grow faster.

There's a problem: a nine-year analysis of satellite records of chlorophyll and carbon data indicate that this long-held hypothesis is not true. The rate of phytoplankton accumulation actually begins to surge during the middle of winter, the coldest, darkest time of year.

The fundamental flaw of the previous theory, Behrenfeld said, is that it didn't adequately account for seasonal changes in the activity of the zooplankton -- very tiny marine animals -- in particular their feeding rate on the phytoplankton.

"To understand phytoplankton abundance, we've been paying way too much attention to phytoplankton growth and way too little attention to loss rates, particularly consumption by zooplankton," Behrenfeld said. "When zooplankton are abundant and can find food, they eat phytoplankton almost as fast as it grows."

The new theory that Behrenfeld has developed, called the "dilution-recoupling hypothesis," suggests that the spring bloom depends on processes occurring earlier in the fall and winter. As winter storms become more frequent and intense, the biologically-rich surface layer mixes with cold, almost clear and lifeless water from deeper levels. This dilutes the concentration of phytoplankton and zooplankton, making it more difficult for the zooplankton to find the phytoplankton and eat them -- so more phytoplankton survive and populations begin to increase during the dark, cold days of winter.

In the spring, storms subside and the phytoplankton and zooplankton are no longer regularly diluted. Zooplankton find their prey more easily as the concentration of phytoplankton rises. So even though the phytoplankton get more light and their growth rate increases, the voracious feeding of the zooplankton keeps them largely in-check, and the overall rise in phytoplankton occurs at roughly the same rate from winter to late spring. Eventually in mid-summer, the phytoplankton run out of nutrients and the now abundant zooplankton easily overtake them, and the bloom ends with a rapid crash.

"What the satellite data appear to be telling us is that the physical mixing of water has as much or more to do with the success of the bloom as does the rate of phytoplankton photosynthesis," Behrenfeld said. "Big blooms appear to require deeper wintertime mixing."

That's a concern, he said, because with further global warming, many ocean regions are expected to become warmer and more stratified. In places where this process is operating -- which includes the North Atlantic, western North Pacific, and Southern Ocean around Antarctica -- that could lead to lower phytoplankton growth and less overall ocean productivity, less life in the oceans. These forces also affect carbon balances in the oceans, and an accurate understanding of them is needed for use in global climate models.

Worth noting, Behrenfeld said, is that some of these regions with large seasonal phytoplankton blooms are among the world's most dynamic fisheries.

The critical depth hypothesis would suggest that a warmer climate would increase ocean productivity. Behrenfeld's new hypothesis suggests the opposite.

Behrenfeld said that oceans are very complex, water mixing and currents can be affected by various forces, and more research and observation will be needed to fully understand potential future impacts. However, some oceanographers will need to go back to the drawing board.

"With the satellite record of net population growth rates in the North Atlantic, we can now dismiss the critical depth hypothesis as a valid explanation for bloom initiation," he wrote in the report.

Story Source:

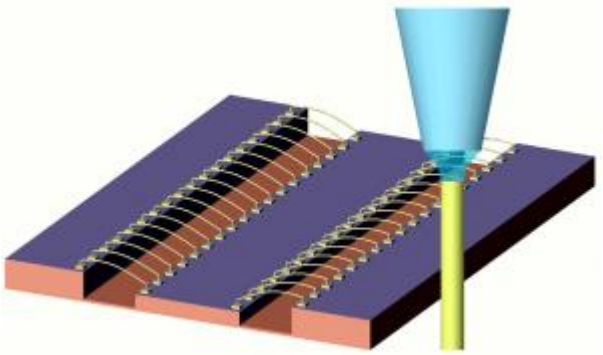
The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **Oregon State University**.

Journal Reference:

1. Behrenfeld et al. **Abandoning Sverdrup's Critical Depth Hypothesis on phytoplankton blooms**. *Ecology*, 2010; 91 (4): 977 DOI: 10.1890/09-1207.1

http://www.sciencedaily.com/releases/2010/07/100716140917.htm

Small Wires Make Big Connections for Microelectronics



Illinois researchers can make tiny wire bonds to connect integrated chips using a direct-write technique. A micropipette nozzle is like a tiny fountain pen writes the wire bonds in 3-D space with metal instead of ink. (Credit: Image courtesy of Min-Feng Yu)

ScienceDaily (July 16, 2010) — University of Illinois engineers have developed a novel direct-writing method for manufacturing metal interconnects that could shrink integrated circuits and expand microelectronics.

Integrated chips are made by wiring multiple transistors and electronic components together to perform complex functions. The connections between chips and circuit boards traditionally are made from pre-fabricated metal wires that connect to a designated bonding pad on a chip.

"Integrated functions require many wire connections. It's tedious and time-consuming to make and increases cost," said Min-Feng Yu, a professor of mechanical science and engineering at Illinois.

In addition, the bonding pad for traditional wire bonds takes up a substantial area of space. As technology has moved toward smaller electronics, shrinking wiring has been a substantial obstacle. Many microelectronic devices are much smaller than the required 50-by-50 micron square bonding site, prohibiting integrated functions on the very small scale.

"There's no existing cost-effective technology that would allow you to wire-bond microstructures," said Yu, "so let's get rid of those wires, and instead, why not directly produce them on-site between the connection points?"

Yu and graduate student Jie Hu developed a direct-write technique that produces tiny pure metal wires much smaller in diameter than traditional wires and requiring two orders of magnitude less bonding area. In a paper appearing in the July 16 edition of Science, they demonstrate as many as 20 of their new wires bonded to a single standard bonding site.

"This technique means the pads can be much smaller than what's needed for traditional wire-bonding technology," Yu said. This reduction in area could allow manufacturers to produce more chips per wafer of semiconductor material. It could also enable more complex integrated functions in microelectronics.

The pair have demonstrated their technique with both copper and platinum wires, and plan to explore the technique with other metals.

Yu likens their technique to writing with a fountain pen. "People's mindset is that you draw a line on a surface, but what we're doing is writing to 3-D space," he said.

The duo loaded a micropipette -- a device that dispenses tiny amounts of liquid -- with a copper electrolyte solution. When the pipette comes into close contact with the surface, a liquid bridge forms between the pipette tip and the bonding pad. The researchers then apply an electric current, which causes the copper in the solution to deposit as solid metal. As the tip moves through space, copper continues to deposit from the solution in the pipette, like ink from a pen, creating a wire. The challenge for Yu and Hu was calculating the correct speed to move the pipette tip to maintain the liquid bridge between the nozzle and the growing wire.

"It's liquid, so it can easily be shaped," Yu said. "As long as you maintain your speed within a certain range, you will always be able to produce uniform, high-quality wires."

They also had to figure out how to "write" the wires laterally for chip-to-chip bonding. Typical micropipette nozzles are flat at the end, but too much tilting breaks the liquid contact. The Illinois duo found that a notched nozzle, with a 90-degree cut in the side, allowed lateral movement, meaning that the wires can arc from one bonding site to another, even if the chips are stacked or tiered.

The process is automated, so Yu hopes to develop arrays of micropipettes to produce wire bonds in bulk for more efficient manufacturing.

"An advantage is that you can do this in parallel," he said. "Instead of one nozzle, suppose you have 10, 20 or 100 working simultaneously. In one step, you can make tens or hundreds of bonds, and that is cost-saving."

In addition to wire bonds, the technique could produce a myriad of metal microstructures for various applications.

"The ability to fabricate metallic structures in 3-D can open up many other opportunities," Yu said. "It has lots of desirable properties aside from the electrical ones. You can imagine the structures that take advantage of the different properties of metal."

Story Source:

The above story is reprinted (with editorial adaptations by Science*Daily* staff) from materials provided by **University of Illinois at Urbana-Champaign**.

http://www.sciencedaily.com/releases/2010/07/100715172012.htm

You Can't Hide Your Lyin' Eyes

ScienceDaily (July 14, 2010) — Shifty eyes long have been thought to signify a person's problem telling the truth. Now a group of University of Utah researchers are taking that old adage to a new level.

Educational psychologists John Kircher, Doug Hacker, Anne Cook, Dan Woltz and David Raskin are using eye-tracking technology to pioneer a promising alternative to the polygraph for lie detection. The researchers' efforts to commercialize their new technology reached a milestone recently when the University of Utah licensed the technology to Credibility Assessment Technologies (CAT).

CAT is based in Park City, Utah, and managed by venture capitalists Donald Sanborn and Gerald Sanders, who are the president and chairman, respectively.

"The eye-tracking method for detecting lies has great potential," Sanders says. "It's a matter of national security that our government agencies have the best and most advanced methods for detecting truth from fiction, and we believe we are addressing that need by licensing the extraordinary research done at the University of Utah."

Tracking eye movement to detect lies became possible in recent years because of substantial improvements in technology. The Utah researchers say they are the first to develop and assess the software and methods for applying these tests effectively.

Using eye movement to detect lies contrasts with polygraph testing. Instead of measuring a person's emotional reaction to lying, eye-tracking technology measures the person's cognitive reaction. To do so, the researchers record a number of measurements while a subject is answering a series of true-and-false questions on a computer. The measurements include pupil dilation, response time, reading and rereading time, and errors.

The researchers determined that lying requires more work than telling the truth, so they look for indications that the subject is working hard. For example, a person who is being dishonest may have dilated pupils and take longer to read and answer the questions. These reactions are often minute and require sophisticated measurement and statistical modeling to determine their significance.

"We have gotten great results from our experiments," says Kircher. "They are as good as or better than the polygraph, and we are still in the early stages of this innovative new method to determine if someone is trying to deceive you."

Besides measuring a different type of response, eye-tracking methods for detecting lies has several other benefits over the polygraph. Eye tracking promises to cost substantially less, require one-fifth of the time currently needed for examinations, require no attachment to the subject being tested, be available in any language and be administered by technicians rather than qualified polygraph examiners.

Research into this method began five years ago, when faculty members started discussing the concept casually. They secured seed funding and the university's Department of Educational Psychology hired new faculty with relevant skills. Each member of the research team fills an important function, but few ever dreamed they would be working on lie-detection technology.

The researchers still have more development work to do, but they hope the recent licensing will help them attract the additional funding necessary and interest from potential customers. Numerous government agencies, such as the U.S. Department of Defense, Department of Homeland Security, Customs and Border Protection, and Department of Energy use polygraphs regularly to screen employees and applicants for sensitive positions, and these agencies always are looking for more effective ways to detect lies.

"It's exciting," Cook says, "that our testing method is going to be taken from a basic research program to commercial use."

Story Source:

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

http://www.sciencedaily.com/releases/2010/07/100713213050.htm

All abroad! How to be a globe-trotting PhD

- 17 February 2010 by **Gozde Zorlu**
- Magazine issue 2748

FANCY trekking through the Malaysian rainforest? Sailing over an ancient volcano? Spending months on ice in Antarctica? Then you may want to consider an exotic location like one of these for your PhD. There is much to be gained from carrying out your research in another country, not least the fact that the experience should mean you'll stand out from the crowd when applying for your first job.

Just don't make the mistake of thinking you'll be in for an extended holiday. You'll need to be highly focused, motivated and have the skills and experience to manage your research. You'll often find yourself alone, and your supervisor won't be down the corridor to help out if things go wrong. Careful planning and preparation are the key to success. *New Scientist* has spoken to students who have lived through the experience, to find out how you can get the most from your time abroad.

A leap of faith

The unfamiliar culture and climate - not to mention possible language barriers - can be difficult to cope with, and on top of that you'll have to deal with the stress of collecting research data in an unfamiliar environment. If, despite the difficulties, the thought of studying abroad appeals, the most important questions you'll have to ask yourself are why you want to go and what you expect to get out of your time away.

"Whether you're in a rainforest in Borneo or a genetics lab in London, you've got to be passionate about your PhD, not just because you want to travel but because you want to work on that particular project," says Rosie Trevelyan, director of the Tropical Biology Association, an organisation that works in partnership with African institutions to build expertise in biodiversity conservation.

So what are the benefits? After spending three years as an undergraduate student stuck in the library and the lab, you might find that you want to broaden your horizons both personally and professionally. By taking advantage of the different research facilities in a foreign country, you'll develop an understanding of how science operates globally. Being abroad also opens up opportunities to form an international network of contacts for future research collaborations and careers, and the possibility of learning a new language.

If you survive a spell working independently in a foreign environment, it should inspire confidence that you can cope with any challenges thrown up in future. "Employers are likely to view your experience abroad favourably, as you'll show adaptability and flexibility, and an understanding and empathy for a different culture," says Jennifer Milford, international projects officer at the University of Birmingham.

The best way to discover whether you are suited to research abroad is to try it out for yourself. "Doing a master's degree is a common way to get a taste of an area and see if it's for you," says Ben Phalan, a postdoc at the University of Cambridge, who spent months on end in Ghana, surveying wildlife for his PhD in conservation biology.

If a master's doesn't appeal, there are plenty of other opportunities to help you test the waters. Organisations such as Global Vision International and Real Gap offer expeditions and fieldwork experience that lasts from a few weeks to many months. Trips like this can be expensive, though, and may not be in the specific field you're looking for. As an alternative, you could look for paid employment as a research assistant, or voluntary work; either of these could give you more choice to study within your preferred area of research.

"Volunteering is the best way to find out if you enjoy researching abroad, even if it's just for a few weeks," says Aisyah Faruk, who collects her PhD data straight from the Malaysian rainforest, where she researches the effects of encroaching palm oil plantations on frog species. "I know a lot of students who found that fieldwork was not their cup of tea and were relieved to discover this while volunteering, rather than in the middle of their PhD."

Faruk's first experience of doing research abroad was volunteering for Operation Wallacea, an organisation that runs expeditions for biologists in some of the most remote parts of the world. Undergraduate students can volunteer as field assistants on conservation projects, working with experienced researchers. Faruk travelled to Indonesia. "It was the most difficult two weeks of my life, but after that I was sure I wanted to pursue a research career," she says. She returned for six weeks to collect data on frog spawn sites for her undergraduate thesis. "I was supervised for about a week, then I was left to fend for myself, with a local guide for help. It was the best time of my life. I could work at my own pace, I got really good data, and I developed a long-lasting relationship with the people at the village I was working with and even learned how to speak some Indonesian."

While Faruk started her PhD straight after her undergraduate degree, Phalan waited five years before embarking on his. "I wouldn't recommend rushing into a PhD," he says. "You have to develop lots of new skills to do a PhD, and the more you already have under your belt, the more likely it is that you'll have a successful project - and, perhaps more importantly, that you'll be able to enjoy it."

After his undergraduate degree, Phalan worked as a research assistant for the British Antarctic Survey (BAS) for two years on a remote sub-Antarctic island. "The reactions of my friends to the news I had got this job were polarised," he recalls. "People either thought 'You're bonkers' or 'I'm so jealous'."

The reactions of my friends were polarised. People either thought 'You're bonkers' or 'I'm so jealous'

Phalan also went on a month-long course in Uganda with the Tropical Biology Association, and spent time in Cyprus assisting a PhD student with her fieldwork. He recommends getting in touch with PhD students who may need help with data collection, as a way to experience first-hand the life of a postgraduate abroad. "Designing a scientific field study well is crucial to its success and value, and having seen quite a few gave me useful insights into what to do and what not to do," he says.

Location, location

Long before you get out your passport and buy your plane ticket, you need to be doing some serious thinking about planning your PhD. It can take a long time to get things rolling, Faruk warns. "Make sure you plan everything before you board that plane."

Adrian McCallum agrees. He is currently in Antarctica testing the strength of snow as a building material, and says that having a realistic timetable is essential. "It will take time to find opportunities, speak to people and prepare suitable applications for university acceptance and funding. You'll need to ask lots of questions."

And then, of course, you need to choose where to go. Phalan picked Ghana because its flat landscape suited his project. McCallum's research is best carried out in Antarctica, not only because of the plentiful supply of snow, but also because the results of his research have immediate value to the construction of a new BAS research base.

You'll also need to ask yourself if your project requires the support and guidance of other researchers abroad. Stephen Simpson, a postdoc at the University of Bristol, works with PhD students on projects close to his own research interests. He often goes out to tropical countries with his students to identify locations for research into marine biology. This way, students benefit from the guidance of an expert.

Another crucial question to consider is how you are going to fund your project. "A university will not accept your application unless you can display sufficient funding: its importance should not be underestimated," says McCallum. "Do your homework, and find out how much your PhD is going to cost and what grants and scholarships are available both at home and in the country where you intend to study."

Finding the right supervisor is also vital. "It can make the difference between having a PhD project that is enjoyable and one that is a living hell," says Phalan. He suggests you take your time picking a PhD supervisor and to approach several potential supervisors before committing to a project.

Finding the right supervisor can make the difference between having a PhD that's enjoyable or living hell

All of this experience and preparation can go a long way to ensure your stay abroad runs smoothly. But you also need to be flexible, and able to make decisions quickly if things don't go according to plan. "In my experience, plans rarely go the way they should out in the field," says Faruk. "But it's easier to make a back-up plan than to try and make up an entire plan from scratch."

Phalan experienced first-hand the sort of tumultuous incident that can accompany working abroad, when he ran into some unexpected difficulties after a group of villagers began wondering what he was up to. "The farmers did not believe that I was a student surveying wildlife," he explains. "Part of the problem was that I had come to the village with an agricultural extension officer from the adjacent area. In retrospect, it would have been better to find the local extension officer who was known to the village."
There were other problems too. "There was a long-running feud between two factions in the village, which I was unaware of at first," Phalan says. "I was welcomed by one side but this automatically meant that the other side mistrusted me." The moral of the story? Arm yourself with as much information as possible before you set out.
If you're not keen on spending your entire PhD abroad, there is still plenty of scope for travel. International conferences, for example, help you to keep up to date with cutting-edge research, and provide an ideal place to make contacts. "There are lots of opportunities for getting involved with external research projects," says Kate Littler, a PhD student from University College London (see "Adventures at sea"). "The best way to find out more about them is to talk to friends and colleagues and scour the internet for leads."
Many universities take part in global networking schemes such as Universitas 21 and the World Universities Network, which encourage partnerships between institutions, promote networking, and develop research collaborations. Check to see if your university maintains links with overseas institutions that you could use to get involved with short-term research projects.
But if that Malaysian rainforest still sounds appealing, get some experience, explore your funding options, and make some contacts. Then you can consider whether there will be any time for a spot of sunbathing.

Case Study Adventures at Sea

SAILING above a volcano covering an area as big as California, working 12-hour days, with the nearest land 1500 kilometres away - these were just a few elements of the seagoing experience that allowed Kate Littler to witness first-class geoscience in action.
Littler, a PhD student from University College London, was lucky enough to experience life on board the JOIDES Resolution, a retired oil exploration vessel now used as a research ship by the Integrated Ocean Drilling Program (IODP), an international partnership of research institutions that focuses on exploring Earth's structure and history through ocean drilling.
Littler was aboard the JOIDES Resolution for two months as a shipboard sedimentologist, analysing and interpreting the layers of marine sedimentary rock that cover the Shatsky rise, a volcano deep below the Pacific Ocean. Although her findings are not directly related to her PhD, work, she hopes to use them in her first postdoctoral job. "My PhD project doesn't involve much fieldwork, so it's been great to be involved in such an adventurous project outside of my normal research."
Littler's extra-curricular trip got a sympathetic reception from the Natural Environment Research Council, the body sponsoring her PhD and her supervisors. "They appreciated that this would be an important step in my career as well as a great experience for me personally," she says.
Working with 30 scientists from all over the world as part of a big multinational research effort helps to build up a great CV, Littler adds. "I learned a lot about teamwork on board the ship. Most employers ask whether you can work effectively with others, so I'm sure it will be a good experience to refer to in interviews."
Littler recommends that any students with the relevant skills and good sea legs apply for future expeditions. The IODP is currently on the lookout for geophysicists, petrologists, geologists and microbiologists to join the team. "It's a lot of hard work when you're out there, but you get an amazing opportunity to work with a great bunch of people at the cutting edge of the geosciences."

Talking Point: Green travel

BALANCING the need to travel while minimising your carbon footprint can present a challenge for scientists whose research takes them to far-flung parts of the world.
Improved methods of communication mean scientists can collaborate with colleagues back home, without continually having to travel back to base. Online conferences, for example, offer an easy way for researchers separated by thousands of miles to discuss their work.

Some travel may be inevitable, though. "It's a bitter irony that western conservation scientists who are working on providing the information needed to protect tropical forests have a much greater personal carbon footprint than almost anyone they will meet abroad," says Ben Phalan, a postdoc at the University of Cambridge.

But for a conservation biologist like Phalan, many of the greatest and most important challenges are in the tropics, in locations that can only be reached by air. To offset his footprint, he calculates all of his travel emissions and makes a donation to projects working to restore tropical forests. "Offsetting still comes a poor second to avoiding emissions in the first place, so I am doing my best to avoid flying where possible," he says.

"Scientists need to think really carefully about how to minimise their emissions," he adds. "I don't think this should deter people from working in tropical countries, but we need to stop thinking of flights as a cheap commodity."

Ask yourself if you could gain as much information through online conferences and electronic communication. If you do need to travel, consider which method of transport would be the greenest.

Offsetting isn't the only carbon-saving option. Organising a car pooling system among your colleagues, planning fund-raising activities and increasing your online collaborations can all help to reduce your research team's overall carbon emissions, and help you to justify your adventures abroad while keeping your conscience clean.

Before you go

For anyone itching to travel while studying for a PhD, here are our top tips

Use social networking sites to make contact with people in your research field.

Speak to scientists who already work abroad in the area that interests you. Keep up to date with their research and where they are planning to travel to in the future.

Join organisations related to your area of research. They will often publish information about travel opportunities and funding.

Go to as many conferences as you can. The people you meet could be your future collaborators, travel partners and employers.

Leave yourself plenty of time to organise trips abroad. Some travel arrangements can take a year to plan.

If you get knocked back, be certain to ask why, so you can make the necessary changes next time round.

Gozde Zorlu is a freelance writer based in London

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Postgraduate dilemmas

- 16 December 2009 by **Catherine de Lange**
- Magazine issue 2739.

DECIDING whether or not to become a postgraduate can be a daunting prospect. Even if you are sure you want to press ahead, the chances are you'll have a list of unanswered questions about the best approach. That's why *New Scientist* has asked those in the know to talk frankly about what postgraduate life is really like and how to make the most of it. They found out the hard way, so you don't have to.

How do I choose the right project?

One thing all postgrads agree on is that you need to be passionate about your research topic if you're ever going to finish it. Starting off with fire in your belly will give you the best chance of seeing your work through. "During your PhD you will fall in and out of love with your project many times, so it is important to choose something that fascinates you and that you will want to persevere with," says Katherine Reekie, who is in the fourth year of her PhD in genetics at the University of Leicester.

Think, too, about the mode of research, advises Rachel Walker, a second-year PhD student at the University of Cambridge. "You should consider whether the project will require mostly fieldwork or lab work and whether you are happy with this." It is also useful for your project to have some similar aspects to those of other students working in your research group, she says, so that you can help each other out when you get stuck.

Funding availability might influence the exact area you choose to focus on. "Often there will be projects available with funding, waiting for a student to take them up. This was true in my case," says Jonathan du Bois, a PhD graduate from the University of Bristol. If you already have a specific project in mind, shop around for a department or supervisor that is interested in taking you on for that topic. Keep an open mind and spread your search as far as you can to find a university that fits your requirements.

Watch out for projects that are linked to commercial ventures requiring students to sign a contract that limit their ability to publish, or narrowly define the scope of their research. "I know of one horror story where a student obtained funding linked to a project to develop a medical device," says Tristan Farrow, a fourth-year PhD student from the University of Cambridge. "Before he knew it, his hands were tied and he found himself working more on product development than science. His project took seven years and funding was a constant worry."

Finally, don't think too far ahead; the whole point of research is that you can never be quite sure where it will lead. According to Farrow, defining your research topic down to the smallest detail is like putting the cart before the horse. "PhD projects always evolve and final theses rarely cover the exact topics you thought you signed up for. You should have a clear aim but it's fine not to know exactly how you're going to get there," he says. "That's not to say you should be cavalier about your choice of research topic, but there's nothing to be gained by being too prescriptive."

Don't think too far ahead; the whole point of research is that you can never be quite sure where it will lead

Will I get a job at the end of this?

"The market is worse than it has been for a considerable number of years, so you are not guaranteed a job," warns Stephen Kennedy, from the pharmaceutical giant AstraZeneca, where up to 70 per cent of staff have a PhD. "But having a postgraduate qualification will help you give examples of your strengths and attributes in an interview," he says. You'll also have good transferable skills that you can take away from science and apply to a totally different area, such as business.

Lorna Crombie, director of Durham-based science recruitment agency CK Science, agrees that postgrad study can prepare you for employment - as long as you know how to showcase your new skills in an interview. "You need to be able to go in and tell them what you got out of the course," she says. Focus on abilities like project management or working independently - skills that require discipline.

Kennedy believes it's this toolkit of skills that gives postgraduates the edge. "They tend to be more proactive, and have the ability to work autonomously and decisively," he says. "They tend to have a better understanding of the working world than a graduate." Overall, he says, postgraduates are "more likely to hit the ground running", which makes a big impact in the pharmaceutical industry because the sooner new employees are doing their jobs well, the sooner patients receive the benefits.

Can I turn my PhD into a business?

Ever been tempted to use a smartphone to lend a helping hand in the pub quiz? If so, then chances are you'll still be stuck when it comes to the picture round. Now, Mark Cummins, a final-year PhD student working on computer vision at the University of Oxford has found the solution. For the last year, he's been developing a new company called Plinkart - which has created a visual search engine application for smartphones. "You take a picture of an object with your phone, we recognise the object in the picture and return the relevant information," explains Cummins. For example, you can take a photo of a painting and the Plinkart app will find the relevant Wikipedia article.

Because scientists tend to be good at finding solutions to problems it means that, like Cummins, they often come up with ideas that could work well in a business setting. But does that mean it's easy to turn your science into a business?

"Scientific training is intellectually rigorous so it is certainly not difficult for scientists to make a switch to business, but a significant shift in mindset is required," says Afua Osei of the Oxford Centre for Entrepreneurship and Innovation - part of the University of Oxford's Saïd Business School. Instead of focusing on pure scientific discovery, they'll have to focus on context, applications, market needs and customer behaviour, she says.

Lecturer Davin Yap co-founded his company, now called Transversal, when he grew fed up with his students at the University of Cambridge emailing him masses of questions. He produced a piece of computer software which allows users to submit questions - in their own words - which the computer will understand and provide an answer to. His clients now include the Royal Mail and BBC iPlayer, but how confident was he that it would succeed at the start?

"Blindly confident," Yap says. "It's essential that you just get on with it. You'll soon recognise what's lacking and find ways to fill the gaps but only if you're 'doing' rather than 'pondering'."

Cummins couldn't agree more. "Intellectually, we were well aware that a high percentage of start-up companies fail but, almost by definition, start-up founders believe that that doesn't apply to their idea." Nonetheless, the risk of failure is still real and "it's a huge commitment of time, effort and personal savings," he says. However, the biggest investment is probably the opportunity cost: "Initiating a start-up means not doing a postdoc or taking a well-paid job. Some people manage to combine a start-up with a postdoc, but it's very difficult, especially because many universities now claim ownership of any intellectual property you develop during your research."

Scientists that want to set up their own business should remember that great scientific discoveries are not necessarily good investment opportunities, says Osei. To find out if your idea works in a business setting, turn to mentoring programmes that offer you the realistic feedback you need. And finally, if you do have a great business idea but networking isn't for you, it doesn't mean you're doomed to fail - you just need to get someone else to front the company. "In order to succeed in business you also have to understand how people work," says Yap. If this isn't a skill that you have, find someone else who does to take your business forward.

What am I really letting myself in for?

"If you are driven to discover more and push your scientific understanding forward, postgraduate study is the way to make your mark," says Kennedy. Not only will you get the chance to immerse yourself in the science you love, but you'll also get to start exploring it on your own terms, far more than you ever could during your undergraduate degree. "I love being amongst individuals working on a wide range of exciting and important projects, and the feeling of sitting at the forefront of current research. I also like the thought that I am contributing to an important area of research and that my work could actually help people," says Reekie. "After three years I still get genuinely excited about my project."

If you are driven to discover more and push your scientific understanding, then postgraduate study is the way to make your mark

If you think it'll be plain sailing, though, it's time for a reality check. Masters degrees cram in masses of work in a short time frame, and a PhD is "quite possibly one of the toughest things you will ever do", Reekie says. What's more, any doubts you have about your drive to carry out the research will show when things go downhill. "The hardest aspects of a PhD are learning to motivate yourself through periods where experiments are not working, results are not showing what you expected and everything seems to be going wrong," she says. "But equally there are moments where you find something exciting, and that is what makes it all worthwhile."

Three Good reasons to do a PhD

1. For a ticket to an exotic location

Some PhDs, especially in the environmental or public health sectors, can take you to exciting locations for extended periods. Just bear in mind that you'll have to be twice as motivated about the research in order to get it done.

2. Because you're worth it

The sense of achievement you get having carried a project through to its conclusion, largely on your own, can be a huge boost to your confidence and sense of self-worth.

3. Because you've tested the water

"Studying for a master's degree before undertaking a PhD will give you a better idea about what studying for a PhD is like, and ease the transition from being an undergraduate to becoming a postgraduate," says Rachel Walker, a second-year PhD student at the University of Cambridge.

Three Bad reasons to do a Masters

1. As a last resort

Postgraduate study shouldn't be a consolation prize because you can't get a job, warns recruitment consultant Lorna Crombie. "Getting extra qualifications is better than not working, but don't just grab something you aren't especially interested in." You'll risk ending up with an MSc that will lead into jobs in that field - jobs that, ultimately, you won't want to do.

2. Because it sounds glamorous

It's easy to be swayed to go for a sexy subject like forensics, warns forensic entomologist Amoret Whitaker. "A lot of universities are running courses with the word forensics in the title but a lot of them are really dumbed-down," she says. "Stick to the hard sciences, the traditional subjects that keep your options a lot wider."

3. To pad out your CV

If you add up the course fees and the cost of living for a year, an MSc is a huge investment. If you can get equally good experience - with an industry placement or internship, for example - it might be worth reconsidering your options.

How do I choose the right supervisor?

"There are only two kinds of bad supervisors: those who let their students drift and those who over-supervise and end up snuffing out their students' creativity. To spot them, find out if past students completed their projects, how long they took and whether current students look like they're enjoying themselves."

Tristan Farrow, fourth-year PhD student at the University of Cambridge

"Think about your working style. It's worth talking this through with your supervisor beforehand and seeing what they expect to contribute and what they expect to get from you."

Jonathan du Bois, PhD graduate from the University of Bristol

"Students should consider the Research Assessment Exercise rating - the research rating of a department or school. Those where the majority of staff are rated four-star or three-star are the ones that carry out internationally competitive research."

Ann Logan, medical science professor at the University of Birmingham

"Look at the papers your potential supervisor has written to give you an idea about the research they do and the journals they publish in."
Rachel Walker, second-year PhD student at the University of Cambridge
Case Study Should I continue my studies?
If your future rests on a choice between two very different offers, picking one can be sheer agony. Earlier this year Jamie Grant had to choose between a well-paid banking job and the offer of a PhD in physics from the University of Oxford.
What did Grant do? He discovered plan C - a PhD that combined his passion for science and finance. His research looks at the effects of extreme climate events on financial markets and the economy, and is split between Imperial College Business School and the Grantham Institute for Climate Change.
"I was really interested in the workings of the market and also climate science," Grant explains. "This PhD combined both of my interests so I pursued it as hard as I could."
Grant had completed several internships in the banking sector, and came to realise that elements of a PhD aren't that different: "You've got to be an entrepreneur and you've got to network. You have to get your name out there and develop your career," he says.
Grant's case goes to show that looking around for further postgraduate options can throw up the perfect solution to a career dilemma. What's more, the interdisciplinary nature of his studies means that neither door will be closed to him in the future.

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The promise of tomorrow

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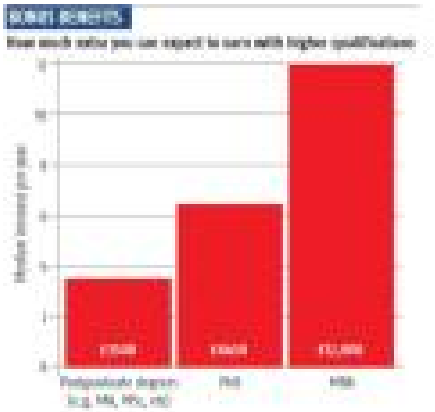


Bonus benefits

EVERYBODY knows that students love to stay up all night, but a recent study by Toshiba shows it's stress rather than parties that is the more likely cause. Ninety per cent of the students surveyed were concerned about their future - worried by their salary potential and the competition for jobs. Going for a higher degree can increase your chances of employment and get you a higher salary, yet many students seem reluctant to take this path. *New Scientist* speaks to the experts to help answer your questions - and perhaps banish those doubts.

Am I ready for a PhD?

"The basic thing you should ask yourself is 'Why do I want to do this?'" says Charlie Ball from the Higher Education Careers Services Unit. "Be honest with yourself," he adds.

Postgraduate study can enhance your life in a variety of ways, so people can have different reasons for going into it; make sure yours are the right ones.

"A PhD is an opportunity to fall in love with a subject," says Tim Edwards, who gained a doctorate in maths from University College London (UCL). But it is a huge commitment, and a decision that shouldn't be taken lightly. "Don't do it just because you can't find a job," says Paul Southern, a research engineer at the Royal Institution in London. "It may be easy at first but the final year might well be one of the most stressful times of your life."

If you're unsure about taking on a PhD, a master's can be a great way to test the water. "A master's is a chance to try an area of knowledge before committing to it for a career, which is very sensible," says Ball. But don't think a master's will guarantee you a PhD place, warns Kathy Barrett, careers advisor at UCL. "It's not necessarily going to help you go further in a research career unless it helps you to change your speciality slightly."

An alternative option is to get work experience. "A summer internship between your penultimate and final year of undergraduate study will give you a firm understanding of what research is really like and what comes after the PhD," says Barrett.

Can I afford it?

Most PhDs are funded by one of the UK's seven research councils, which invest £2.8 billion a year in research. In the sciences, the legwork for funding is usually done in advance by the research group or university department. For the would-be student, timing is everything: to get the well-funded places you need to apply early. Don't wait until you have your undergraduate results to start your search, says Ball. Voice an

interest with your chosen department as soon as possible. If you don't know who to talk to, get advice from your current supervisors. Whatever you do, "do it now", he advises.
Getting funding for a master's can be more difficult. "It's not done in the same way as for an undergraduate degree, where you can get funding from your local council," says Barrett. But you can get a career development award from a bank, which is a loan specifically for a master's degree. This will have to be paid off in the same way as any other bank loan, but has a lower interest rate and might have similar features to a student loan.
Some research councils also have grants for master's courses, and once you get going you may be able to find work related to your studies to help pay the bills. "Most of my funding came from the Engineering and Physical Sciences Research Council," says Edwards, "but I also earned extra money by teaching in the department, marking coursework and tutoring A-level students."
I earned extra money by marking coursework and tutoring students
How do I choose the right project...?
"The important thing is to choose a subject area that interests you," says Edwards. A good supervisor will help you with the specific goals of your PhD, he adds, but don't be afraid to ask what sort of work you might be doing. Find out what methods you will be expected to use and think about the skills you want to develop.
Ask yourself, "Will I be interested in this long enough?" advises Mathew Kallumadil, who is halfway through a PhD in nanotechnology at UCL. "A lot of students have a 'mid-PhD crisis' where they start losing interest. That can be a real fear."

...and the right supervisor?

"Get the gossip and some first-hand experience," says Barrett. Whether you'll get on with any particular individual is bound to be a personal thing. "So find out as much as you can about the way they supervise people, then go and meet them to see whether or not you get on with them."
You should also think about the way your potential mentor works and whether that suits you. If they are world renowned, they might not be around for much hand-holding - so if you are the kind of person who needs plenty of support, that relationship is unlikely to work out. Barrett also suggests looking up the people who have trodden the same path before you. Have they gone on to great things?
"Remember that you are choosing someone with whom you will probably spend a lot of time over the next few years," says Edwards. "I chose a supervisor I knew well from my undergraduate days and who I saw as a great teacher with infectious enthusiasm. I knew I could count on his support and inspiration. Your relationship with your supervisor can be crucial to your happiness.
"Whatever motivates you - teacher, boss, champion, inspiration or galvanising competitor - finding the right fit is more important than it might seem from the undergraduate experience."
And don't forget, a well-connected supervisor might be your ticket to some fantastic places. "My supervisor really enjoyed travelling," says Southern, "so I made some good contacts with people at universities across the world and went to international conferences, which really broadened my horizons."

How do I get work experience?

The simplest way is to go to your university department and ask if you can help out during the holidays. "Students forget that universities don't close outside term time. They're really busy and would be glad of a hand," says Ball. A lot of universities now have spin-off companies, so it's worth enquiring there, too.
Even working in a bar can be valuable experience, says Ball, although it is best to find work related to your degree. "When you apply for a job, the more you can show that you have done things that lead up to it - whether that be visiting relevant organisations or getting some work experience - the more convincing you are as an applicant," says Barrett.

Industry or academia?

"We constantly view academia and industry as two separate cultures with a huge gulf in between," says Geoff Scott, head of strategic development at BT Innovation. "To be innovative you have to know the context of real problems for real customers - it's difficult to see this context when you're only in academia."

Collaborative Awards in Science and Engineering (CASE) studentships are one way to bridge this gap. "These tend to be projects run between industry and academia, where science students work on a collaborative project," says Barrett. Jointly funded by the major research councils, they involve a wide range of private, public and voluntary-sector organisations.

But be warned: they are extremely competitive, says Angela Flannery, director of R&D science policy at AstraZeneca, which runs a number of CASE studentships each year. "Studentships provide valuable experience that can greatly improve the career prospects of students. The stipends are also more generous than other studentships," she says.

One way to increase your chance of success is to make sure you stand out from the crowd, says Matthew Bailey, who coordinates PhD programmes at the University of Edinburgh funded by the British Heart Foundation. "We don't automatically select those students with the best academic record; an unusual CV can provide a hook to catch the attention of the selection panel."

A studentship also provides invaluable support from your sponsor. "Normally a student will work at AstraZeneca for between six and 18 months in total," says Flannery. "Students get the opportunity to use state-of-the-art equipment, up-to-date instrumentation and IT support. They will be exposed to different parts of the pharmaceutical business and are shown how their work relates to market opportunities."

The importance of this inside training shouldn't be underestimated, stresses Barrett. "One skill that employers are looking for by the bucketload is business awareness. If students can get that sort of experience, it will help them to bridge the divide between academia and industry."

Can I go abroad?

Over three-quarters of the students surveyed by Toshiba had considered moving abroad to gain experience in R&D, citing better opportunities as their main incentive. A stint abroad can also look good on your CV and broaden the mind, says Ball. "A lot of employers, especially internationals, really prize experience abroad," he says, "but from a personal development angle it can also be hugely enriching."

A lot of employers really prize experience obtained abroad

Some studentships exist specifically for research abroad. The Leverhulme Trust, for instance, supports around 20 students each year for an "extended period of advanced study or research at a centre of learning overseas" and one of these could stuff an extra £20,000 in your money belt.

Individual universities also have their own schemes in place. "At UCL there are funds to help people do part of their PhD abroad: for instance, if they are going to go and learn a new technique," says Barrett.

Of course, there is always the option to study abroad full-time. Some countries - Sweden is one - have great science links and heavily subsidised courses, with the bonus of being taught in English.

Will I get a job at the end of all this?

With unemployment in the UK at its highest for over a decade, are students right to fret over their future? "Doing something for the love of it is a crucial part of study," says Ball, "but that isn't going to put dinner on the table when you finish." The good news is that employment prospects for postgraduates are good, and the salary is likely to be higher than for those without a further degree, he says (see graph). Postgrads also tend to advance in their career more quickly, and are at an advantage further up the ladder, where jobs may require more than a first degree.

Going to as many conferences as you can should improve your employment opportunities, says Southern. "I was in a conference in Japan and one of the people presenting happened to mention that my current boss had a position open," he says. "Networking is something that many science graduates feel uncomfortable doing," Ball acknowledges, but the reality is that it is absolutely crucial. "The more people you know, the more likely you are to hear about a juicy position."

Getting behind the podium is invaluable, too. "The experience of presenting at conferences will give you a huge advantage in overcoming one of the biggest concerns employers have about science graduates - that they have poor communication skills," says Ball.

John McLean, head of marketing and strategy at BT, agrees: "I would be looking for what other ancillary skills students have," he says. "Of great importance is whether applicants have an awareness of how they interact with people."

Newer, more structured PhD courses can arm you with prized skills like these. The four-year "New Route PhD", developed by the UK government, the Higher Education Funding Council for England and the British Council aims to do just this. "What the New Route PhD is about is providing underpinning training," says Judith Smith of the New Route PhD consortium. "It was the first programme to provide generic training skills to students, such as presentation skills, networking and understanding enterprise."

The course provides a much greater depth of knowledge across the field, says Smith, making you more adaptable and, ultimately, more employable.

Can I turn my science into a business?

Liza Brooks is in her second year of an EngD at Cranfield University, and is technical director of the sports company True Snowboards

Liza Brooks is doing the first ever doctorate in advanced snowboard design. Which is why she found getting funded a little difficult. "I wrote to all the snowboard companies and nobody wanted to sponsor me," she says. In desperation Liza posted a message on an online forum. "It was a bit of a joke, really," she confesses. "It said: 'Does anyone want to sponsor me?'" The response was unexpected. "Two chaps got in touch and said, 'Why don't you start your own company?' I thought, 'I can't do that - I'm only 22!'"

Two years on and Liza is technical director of True Snowboards, the biggest snowboard company in the UK, which she co-founded with her two forum acquaintances. "They were interested in it because no one had ever published peer-reviewed research about snowboards before," she says. The company is not only based on Liza's past research, it also funds more of it, along with some help from the Engineering and Physical Sciences Research Council.

To set up a business, you need a new way to tackle an existing problem, Liza says. Her first project was to design a snowboard that doesn't melt on a dry slope. Now she is developing software to predict how boards behave when made from different materials, so that fewer prototypes need to be produced.

Despite the fairy-tale start, it has not been an easy ride. To succeed, you need determination, motivation and a passion for the subject you're pursuing, she says. You also need a good business head: Liza got hers by studying for half an MBA during her course.

True Snowboards now sponsors some of the country's top athletes, and one of Liza's goals is for a True Snowboards rider to win a medal in the 2010 Winter Olympics. "I'd also like to be a millionaire by then and get my doctorate," she adds. "As long as I achieve one out of the three I'll be happy."

What else should I know?

"A PhD is an opportunity to do something you like for a long period of time. You can choose your own subject and your own research, but be careful to pick something you really do like."

Rodolfo Allendes Osorio, New Route PhD graduate from the University of Leeds

"Discuss work with your colleagues and work together as it makes things much easier. We studied for the final exams in a group of four, discussing the questions - I learned a lot from that."

Ana Ines Ileyassoff, MSc graduate from the London School of Hygiene and Tropical Medicine

"Bear in mind the quality of the institute - things like reputation and publication record are important, and may have a bearing on how much money your research group can pull."

Russell McLaughlin, second-year PhD student at Trinity College Dublin

"A good balance is really important. Doing something completely different like taking up music or a sport is a great way to relax and focus."

Mathew Kallumadil, second-year PhD student at University College London

http://www.newscientist.com/article/mg20026873.900-the-promise-of-tomorrow.html

Science entrepreneurs need better business skills

- 22 February 2008 by **Julia Pierce**
- Magazine issue 2644.

IT IS early evening in the dragons' den. The first entrepreneur slowly climbs the stairs, lays out his prototype and delivers his pitch. Though the product is faultless, his market is wrong. The dragons quickly round on him: "Great idea, but your sales projections and pricing are way off-mark." They agree to help - but at a price. In minutes, his potential profits are slashed.

As anyone who has seen *Dragons' Den* on TV knows, such a scenario is hardly unusual, but it serves to demonstrate that the ability to innovate is by no means a guarantee of wealth and success. However, for scientists with bright ideas, bridging the gap between scribbled drawings and a real-life product - without the help of reality television - could be getting easier.

The secret lies in the growth of science-specific MBAs. They not only allow budding entrepreneurs to reap huge benefits from translating science into commercial products, but also provide scientists with credible business skills, allowing them to emerge as a valuable commodity in academia and industry.

The National Physical Laboratory (NPL) is keen to attract such people. "There is still a need for a core of pure scientific research, but we must also be commercially astute to make sure that the public and the country get value for money," explains Ian Licence, human resources director.

Innovation manager David Mulligan studied for an MBA at Henley Management College while working at the NPL. "I wanted my science skills to be more commercial," he explains. "As you progress as a scientist, you need to be able to manage money and attract research." Currently on secondment to the South-East England Development Agency, Mulligan believes his business skills have put him ahead of the game. "Now I can see how my work fits into the bigger picture."

Learn the language

Scientists such as Mulligan are in short supply, making them highly employable. "At the moment, there is a lack of technology translators in the UK - people who can speak both the languages of science and business," says Fiona Reid, director of the Oxford Science Enterprise Centre at the University of Oxford's Saïd Business School. "There is a clash of values between the science and business worlds," she explains. "In business, you often need to make educated guesses. This is hard for scientists, who are used to making evidence-based predictions."

"It's a different world," agrees Bart Knols, MBA Student of the Year 2007, who now runs his own healthcare consultancy (see "Science skills are not enough"). "Management deals in grey, whereas everything in science is black and white. It is an uncomfortable place for a scientist to be and you need the skills to deal with this." Justin Fry, CEO and founder of computer display company Seamless Display, learned such skills during an MBA at Saïd Business School in 2002. "To translate science into a commercial product you need to be well prepared," he says. "An MBA means you won't have a blank look on your face when people talk about balance sheets and venture finance."

After building up experience in computer programming, Fry applied to the University of Oxford with the intention of targeting a fellow scientist and commercialising his ideas. Through the MBA programme, he discovered Bernard Stark - a research fellow from the department of engineering - who was investigating the

possibility of a wraparound computer display. Within two years of founding their start-up company, Fry and Stark numbered BAE Systems and the Canadian Department of Defence Research among their customers. "As a scientist with business knowledge you are a lot more powerful and far more realistic," Fry says.

As scientists' careers progress, even those who don't want to go it alone can find they are thrust into a position where business skills are essential. "If you look at the FTSE-200 companies, more and more businesses such as BP, Shell or Cadbury Schweppes are appointing scientists to board level," says David Gann, head of innovation and entrepreneurship at Tanaka Business School, part of Imperial College London.

"People working in industry flagged up the problem of scientists rising through the ranks then suddenly needing skills they did not have," says Stephen Little, head of the Centre for Innovation, Knowledge and Development at the Open University Business School. As a result, academic institutions are increasingly offering business courses with content specifically directed at graduates with a scientific background. However, with 117 business schools to choose from in the UK, deciding where to apply can be daunting. "You need to look at the emphasis of each course by examining the modules on offer," advises Jeanette Purcell, chief executive of the Association of MBAs. "Visiting institutions is a good idea. Many will encourage you to sit in on lectures and meet students to get a feel for the course."

Tanaka Business School recently achieved a top 10 best-in-entrepreneurship placing in the *Financial Times* annual survey of global MBA courses, and its students benefit from strong scientific links with industry. During the course, students must build a business plan for a piece of intellectual property drawn from Imperial College's science resources.

18% average salary increase after MBA graduation

Entry to such high-ranking courses is competitive. "We are looking for people with a spark of interest in the future," says Purcell. "We want people interested in big ideas, such as how to engineer a new energy system." To be accepted on an MBA course you will need a high score in the GMAT, a standardised entrance examination that most business schools use to assess applicants' qualifications, says Purcell. "Alternatively, if your GMAT score is not as high as you might wish, good work experience and testimonials from employers may persuade schools to take you on."

Bart Knols chose the Open University's MBA course as it was accredited by the Association of MBAs, the European Foundation for Management Development and the Association to Advance Collegiate Schools of Business. "Their course is one of only a few that are triple-accredited by the three major groups," he says. "I knew that [whatever I chose] had to be of high quality as I would be investing a lot of time in it."
But a word of warning: "The methodology for an MBA is completely different to that of a BSc or PhD," says Susana Pinheiro, who completed her MBA at Saïd Business School after spending 10 years working on ways to prevent HIV epidemics. "My natural inclination was to work like a scientist, trying to read around every subject on the course, but it wasn't necessary." Pinheiro had to learn all over again how to study, in order to develop her venture to expand health infrastructure in Africa. "An MBA is very challenging and hard work, but it's also very rewarding."

Science skills are not enough
MBA Student of the Year 2007, Bart Knols, believes science skills won't deliver a healthier world by themselves...

Despite pioneering a method of controlling mosquitoes using a fungus, which has led to projects in Ghana, Kenya, Tanzania and South Africa and received over £1 million in research funds, Bart Knols says it is his new-found business and management skills that have been essential to his success.

Knols developed an interest in insect-borne disease at the age of 19, after travelling to Africa to study sleeping sickness in a Maasai community. Having completed a PhD in medical entomology, he became director of a Kenyan research station, with responsibility for around 100 people. There he became aware that his science skills could only take him so far. "I suddenly realised I had next to no understanding of management and how to lead and motivate people," he says. After attending a management course headed by an tutor from the Open University, Knols realised that its distance-learning MBA would allow him to continue his work while gaining vital business skills. "I was literally able to study in an internet café in the middle of the Sahara," he says.

He attributes his current position on the executive board of UBS's Optimus Foundation in Switzerland - managing 50 child-health projects worldwide - to his MBA. "They were looking for a person who was able to identify and evaluate valuable biomedical research but also communicate with bankers."

Knols publishes a weekly news bulletin, *MalariaWorld*, and recently launched his own consultancy firm. "This would have been unthinkable without an MBA," he says. "Every day now I enhance my scientific work with my business skills."

Julia Pierce is a London-based freelance writer

http://www.newscientist.com/article/mg19726442.400-science-entrepreneurs-need-better-business-skills.html

Artificial life forms evolve basic intelligence

- 04 August 2010 by **Catherine Brahic**

Magazine issue 2772

Artificial life from a digital sea (Image: Gusto Images/SPL)

FOR generations, the Avidians have been cloning themselves quietly in a box. They're not perfect, but most of their mutations go unnoticed. Then something remarkable happens. One steps forward, and that changes everything. Tens of thousands of generations down the line, some of its descendents will evolve memory.
Avidians are not microbes, or sci-fi alien life forms. They are the digital offspring of Charles Ofria and colleagues at Michigan State University (MSU) in East Lansing. They "live" in a computer world called Avida, and replicate using strings of coded computer instructions instead of DNA. But in many ways they are similar to real life: they compete with each other for resources, replicate, mutate, and evolve. They - or things like them - might eventually evolve to become artificially intelligent life forms.
Similar to microbes, Avidians take up very little space, have short generation times, and can evolve new traits to out-compete their rivals. Unlike microbes, their evolution can be stopped at any time, reversed, repeated, and the precise sequence of mutations that led to the new trait can be dissected. "They're wonderful evolutionary pets," says Ben Kerr, a biologist at the University of Washington in Seattle.
Avidians' evolution can be stopped, reversed and repeated. They make great evolutionary pets
They could become so much more. At the 12th annual international conference on artificial life in Odense, Denmark, this month, philosopher and computer scientist Robert Pennock of MSU will present the findings of experiments in which Avidians were made to evolve memory.
"The big question is: how did we get here? Our intelligence didn't evolve all at once," says Pennock. "You need certain ingredients. Memory is one."
Experiments in Avida nearly always start with the simplest possible organisms, ones that can only clone themselves. To make them evolve, the experimenters release them into a competitive environment where the prize is an amount of "food" - aka processing time - which allows organisms to produce more clones.
In early memory experiments, Laura Grabowski, now at the University of Texas-Pan American, Edinburg, set up a food gradient in a computer environment made of a grid of cells. First-generation Avidians were placed at the low end of the gradient, in a cell that had minimal food. Straight ahead of them, however, lay a cell that had more.
The Avidians replicated themselves for nearly 100 generations, "living" and "dying" in the cell. Then one evolved a computer instruction to move forward. When it landed in an energy-richer cell, it reproduced more

rapidly. Many thousands of generations later, some of its descendents were seen following the food gradient to its source, where concentrations were highest (*Artificial Life 2009*, p 92).

Even then the Avidians did not home in on the source. They stumbled their way along the gradient in zigzags, sensing the food and eventually reaching the source. They had evolved to ability to compare food in its current and past locations. "Doing this requires some rudimentary intelligence," says Pennock. "You have to be able to assess your situation, realise you're not going in the right direction, reorient, and then reassess."

Next, Grabowski sent a fresh batch of non-evolved Avidians on a treasure hunt. This time, cells contained a numerical code, which indicated in what direction the organisms should turn to find more food. But there was an additional twist to the task. Some cells contained the instruction "repeat what you did last time". The Avidians once more evolved into forms that could interpret and execute the instruction. "The environment sets up selective pressures so organisms are forced to come up with some kind of memory use - which is in fact what they do," says Grabowski.

This is not unlike evolution in living creatures, and the findings of the MSU computer scientists have attracted interest from biologists. "Laura's work suggests that the evolution of an ability to solve simple navigational problems depends on first evolving a simple short-term memory - and this in digital organisms that still don't exhibit something you would call learning," says Fred Dyer, an MSU zoologist who advised Grabowski. Dyer says this sort of insight would be all but impossible to obtain by studying biological systems.

But studies on complex behaviours in digital organisms don't just shed light on the evolution of organic life. They could be used to generate intelligent artificial life.

"In the past, the approach has been to start with high-level intelligence and reproduce that in a computer," says Grabowski. "This is the opposite. We're showing how complex traits like memory can be built from the bottom up, from things that are really very simple." To demonstrate this, Grabowski has evolved Avidians that move towards a light source. Her colleagues then translated the evolved "genome" into code that could control a Roomba robot. It worked: the Roomba was attracted to glowing light bulbs.

Starting simple is also what Jeff Clune, another member of the MSU dynasty, is interested in. In particular, he is focused on producing artificial brains that move robots. Clune works with a system called HyperNEAT, which uses principles of developmental biology to grow a large number of digital neurons from a small number of instructions.

In nature, the location of a cell in an embryo often determines its function - whether it will become a heart cell or a neuron for instance. Similarly, in HyperNEAT, the location of each artificial neuron - given by coordinates - is plugged into a matrix of equations and the result defines what the cell's role will be.

This, says Clune, means that you can build complex brains from a relatively small number of computerised instructions, or "genes". In contrast, traditional neural networks have worked on a one-to-one principle: each cell in the network is encoded by a single instruction which is not re-used.

You can build complex brains from a small number of computerised instructions or genes

It also means you can evolve brains that share structural properties with real brains. For instance, Clune has found that unlike old-school neural networks, brains evolved with HyperNEAT tend to be symmetrical and ordered - like real brains. His analysis of the networks shows this comes from having evolved symmetry and pattern-generating instructions right at the start of the series of instructions.

To test whether such brains actually perform better, Clune drops them into a virtual robot, which then has to perform a task like running across a flat surface. If the robot performs well, he selects that brain and evolves it further. As with Avidians, evolution involves copying the brain's "genes", and introducing random errors in the process to produce brains with slightly modified connections or instructions.

Clune's results, presented at the Genetic and Evolutionary Computation Conference in Portland, Oregon, last month, show that symmetrical, organised artificial brains tend to perform better at tasks like running than do non-HyperNEAT brains.

"Brains that have been evolved with HyperNEAT have millions of connections, yet still perform a task well, and that number could be pushed higher yet," he says. "This is a sea change for the field. Being able to evolve

functional brains at this scale allows us to begin pushing the capabilities of artificial neural networks up, and opens up a path to evolving artificial brains that rival their natural counterparts."
"That is a lofty long-term goal, of course," he adds, "but this technology allows us to start marching towards it."

A history of life in silicon

Before Avida and before its predecessor Tierra there was Core Wars. Popular in the 1980s, the game pitted computer programmers against each other. The principle was simple: players would write computer programs that shut each other down and the last one standing would win.
In the late 1980s, ecologist Thomas Ray, who is now at the University of Oklahoma in Norman, got wind of Core Wars and saw its potential for studying evolution. He built Tierra, a computerised world populated by self-replicating programs that could make errors as they reproduced.
When the cloned programs filled the memory space available to them, they began overwriting existing copies. Then things changed. The original program was 80 lines long, but after some time Ray saw a 79-line program appear, then a 78-line one. Gradually, to fit more copies in, the programs trimmed their own code, one line at a time. Then one emerged that was 45 lines long. It had eliminated its copy instruction, and replaced it with a shorter piece of code that allowed it to hijack the copying code of a longer program. Digital evolvers had arrived, and a virus was born.
Avida is Tierra's rightful successor. Its environment can be made far more complex, it allows for more flexibility and more analysis, and - crucially - its organisms can't use each other's code. That makes them more life-like than the inhabitants of Tierra.

http://www.newscientist.com/article/mg20727723.700-artificial-life-forms-evolve-basic-intelligence.html?full=true&print=true

Ageing irises could confound biometric checks

- 04 August 2010 by **Duncan Graham-Rowe**
- Magazine issue 2771

And who are you? (Image: Ian Waldie/Getty)

A BIOMETRIC trait is not just unique, it is also for life. That is one of the claims often made for biometric-based security systems like iris recognition. Now it appears that iris scans can produce subtly different patterns over time, so the older the image of a person's iris stored on a computer, the more likely that the system will fail to match it to a new scan of their iris.

The older the stored image of someone's iris, the more likely the system will fail to match it to a new scan

Iris recognition systems work by scanning a person's eye to create a digital representation or "template" of the texture of the iris. Confirming someone's identity then becomes a matter of matching a new scan of their iris against templates in a library.

The systems are designed to cope with the fact that the scanning process is slightly variable, so two scans of the same eye will be slightly different. The degree of difference between any two scans is described by a parameter called the Hamming distance, which is small if the scans are of the same eye. As the Hamming distance increases, so too does the probability that the scans are of different irises.

Now Kevin Bowyer at the University of Notre Dame in Indiana and colleagues say they have evidence that the Hamming distance increases over time for scans of the same eye. They initially compared pairs of scans of 26 irises taken two months apart with scans made four years apart.

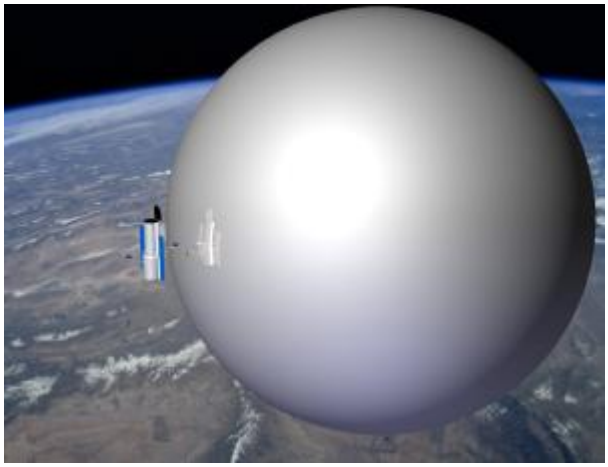
The team measured an increase of 0.018 per cent over the period. This translates directly into an increase in the false rejection rate: the rate at which an iris scan is not matched with its template. A system with a false rejection rate of 1 in 100, say, using scans made two months apart would produce 1.75 false rejections in 100 scans after four years, says Bowyer. That could be problematic in places such as India, which is considering storing iris scans in chips used in its national identity cards.

Bowyer presented the initial findings at the Identity in the Information Society workshop in London last year. He has just submitted the results of further work, including analysis of more irises, for publication.

http://www.newscientist.com/article/mg20727715.700-ageing-irises-could-confound-biometric-checks.html?full=true&print=true

Giant balloons could clear out space junk

- Updated 19:19 04 August 2010 by **David Shiga**



A giant balloon could drag satellites and space telescopes into Earth's atmosphere at the end of their lives (Illustrated image: Global Aerospace Corporation/NASA)

Enlarge image

Helium balloons are known for pulling things up, but they could be a great way to drag defunct satellites down to Earth, a team of engineers says.

Dead satellites pose a hazard to other orbiting spacecraft. In 2009, one of them wandered into the path of a still-functioning satellite, destroying both craft and spawning thousands of pieces of new space junk.

One way to prevent such collisions is to have satellites fire their own engines at the end of their useful lives in order to push themselves into Earth's atmosphere, where they would be incinerated. But this requires launching them with extra fuel, adding mass that drives up the cost of launch.

Balloons would be a cheaper way to solve the problem, says a team of engineers. Kristin Gates of the Global Aerospace Corporation in Altadena, California, presented the idea on Tuesday at the Astrodynamics Specialist conference in Toronto, Canada.

Speedy death

Any new satellite could be launched with a folded-up balloon stowed on board. Once the satellite reached the end of its useful life, the balloon would fill with helium or another gas, creating extra drag as the balloon collided with Earth's tenuous outer atmosphere.

A balloon 37 metres across would take just one year to drag a 1200-kilogram satellite from an initial orbit of 830 kilometres to an altitude low enough to burn up in the atmosphere, the Global Aerospace team calculates. Without the balloon, this would take centuries.

The balloon and the equipment needed to inflate it would add just 36 kilograms of mass to the satellite, less than the amount of fuel that would be needed to de-orbit it without the balloon, the team says.

Low-hanging fruit

Brian Weeden of the Secure World Foundation in Washington DC, which promotes the peaceful use of space, says the concept sounds feasible. But he says it would not work for all satellites – geostationary satellites orbit 36,000 km above Earth, where there is too little gas to provide the necessary drag.

Global Aerospace president Kerry Nock admits that the balloon concept would only work below 1500 km or so but notes that this includes a particularly congested region between 750 and 900 km, where the 2009 satellite collision occurred.

A downside of the approach is that the balloon would make the satellite a larger target while inflated, temporarily increasing the risk of a collision with another satellite. But Weeden says the increase would be "pretty minimal".

"The slightly increased risk of making it larger for a short period of time is more than offset by eliminating the risk of that object staying on orbit for decades or longer," he says.

The space debris problem will get worse unless action is taken to combat it, Nock says. "It's a growing problem and it's not going away."

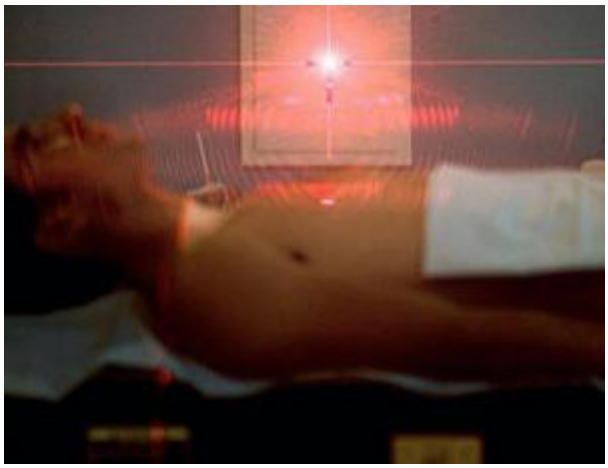
The company is now looking for funding to do a flight demonstration of their concept, called GOLD (Gossamer Orbit Lowering Device).

http://www.newscientist.com/article/dn19262-giant-balloons-could-clear-out-space-junk.html

Who's afraid of radiation?

- 03 August 2010 by **Wade Allison**

Magazine issue 2771.



High doses do little harm under controlled circumstances (Image: Age Fotostock/SuperStock)

Our attitude to ionising radiation is irrational, and easing safety limits would do far more good than harm, says ***Wade Allison***

THE word "radiation" frightens people, and little wonder. Ever since the cold war, the prevailing view has been that ionising radiation can do real harm to us without being seen or felt - and should be avoided at all costs. In fact radiation is much less harmful than we feared. Given the availability of carbon-free nuclear power, this makes a sea change in our view of radiation rather urgent.

Fear of radiation grew alongside descriptions of what might happen in the event of a nuclear war. In earlier decades there was genuine scientific uncertainty about radiation's long-term health effects, and scientists were unable to be reassuring. So, driven by universal popular concern, tight regulation was imposed to minimise public exposure.

Since 1950, public dose limits have been tightened by a factor of 150. Currently, the internationally recommended limit is 1 millisievert per year above the natural background level of about 2.5 millisieverts per year. For comparison, a typical CT scan might give you a dose of 5 millisieverts and a simple dental or limb-fracture X-ray 1/100th of that.

Much has been learned over the past half century from clinical medicine, radiobiology and accidents like Chernobyl. There is no doubt that a very high single dose is fatal, as the fate of the initial 237 firefighters at Chernobyl illustrates. Within a few weeks, 28 died, and 27 of those had received doses in excess of 4 sieverts. However, many people receive much higher doses than this, albeit under very different circumstances. When a cancer patient is treated with radiation in a radiotherapy clinic, the tumour dies after absorbing a dose of more than 40 sieverts. During the treatment, healthy tissue and organs near the tumour get an incidental dose of some 20 sieverts, which is 20,000 times the recommended annual limit and at least five times the dose that proved fatal at Chernobyl.

How can tissue survive this friendly fire? A radiation dose is the same in principle, whether received in a hospital or elsewhere. But the critical point is that the therapeutic dose is spread over four to six weeks, giving cells time to repair the damage. Each day the healthy cells receive about 1 sievert, and just manage to repair themselves. The tumour cells receive a higher dose, and just fail to do so.

So much for acute effects, but what about longer-term ones? Very rarely, the damage is misrepaired, and the resulting error may eventually lead to cancer. To find out how often this happens, we need to compare the lifelong health data of a large number of people, some of whom have received a significant radiation dose and some who have not.
The nuclear bombs dropped on the Japanese cities of Hiroshima and Nagasaki in August 1945 provide us with the data we need. About 66 per cent of the original inhabitants of the two cities survived to 1950, since when their individual health records have been extensively studied.
By 2000, 7.9 per cent of them had died of cancer, compared with 7.5 per cent expected from rates found in similar Japanese cities over the same period (*Radiation Research*, vol 162, p 377). This shows that the extra risk caused by radiation is very small compared with the background cancer risk, and less than the 0.6 per cent chance of an American citizen dying in a road traffic accident in 50 years.
Not surprisingly, those who received higher doses developed more cancers. But those subjected to doses less than 0.1 sievert showed no significant increase in solid cancers or leukaemias. Nor did they suffer an increase in the incidence of deformities, heart disease or pregnancy abnormalities. So there is a practical threshold of 0.1 sievert for any measurable effect due to a single acute dose.
Given what we now know, from radiotherapy to the legacy of the attacks on Hiroshima and Nagasaki, it is clear that radiation safety limits are far too conservative. Evidently, our bodies have learned through evolution to repair or eliminate damaged cells, with a low failure rate. I suggest the upper limit might be reset at a lifetime total of 5 sieverts, at no more than 0.1 sievert per month. That would be a fraction of a radiotherapy dose, spread over a lifetime.
Given what we now know from Hiroshima and Nagasaki it is clear the safety limits are too low
Such a revision would relax current regulations by a factor of 1000. This may seem excessively radical to some, especially those in the safety industry who have spent 60 years trying to reassure the public by regulating against all avoidable sources of radiation - which, after all, is what society asked them to do.
But common sense says that extra precautions are most needed when we know least, and in a reasoned approach to any new technology we should start with a cautious limit which may be relaxed later, as instrumentation improves and our appreciation of it grows. The regulation of ionising radiation has resolutely gone in the opposite direction, driven by fear.
Changing the limits would bring practical benefits. Radiation safety is a major contributor to the cost of nuclear power, so any relaxation should lead to big cost reductions. Given that we urgently need to develop carbon-free energy sources, that is hugely beneficial.
It should also lead to a more sensible attitude to nuclear waste. If treated properly, the quantities are small, it become harmless after a few centuries, and it may be buried at moderate cost. In any event, the effect of radioactive waste is a small matter compared with the global influence of carbon dioxide and leaked hydrocarbons. We should re-examine the environmental risks of radiation with the same radical attitude that is required for our own health.
Wade Allison is a nuclear and medical physicist at the University of Oxford and the author of Radiation and Reason (YPD Books). He has no ties to the nuclear industry

http://www.newscientist.com/article/mg20727715.800-whos-afraid-of-radiation.html?full=true&print=true
Cheap lasers could capture electrons in motion

- 15:34 03 August 2010 by **Kate McAlpine**

A handful of physics labs have access to the ultimate camera flash: one that produces bursts of light so short – each less than 100 attoseconds (an attosecond is 10^{-18} seconds) – that it can be used to capture freeze-frames of electrons orbiting an atom.

But the technology requires ultra-fast custom-built lasers, so attosecond physics remains the preserve of the biggest and best-funded institutions. That may soon change, however, as a new scheme could produce 60-attosecond pulses with commercial lasers.

Attosecond pulses are not generated directly from a laser, but by using longer laser pulses to excite electrons in a cloud of noble-gas atoms. These atoms respond by releasing bursts of radiation at extreme ultraviolet wavelengths, each under 100 attoseconds long. To work, the laser pulses must be no longer than 11 femtoseconds (a femtosecond is 10^{-15} seconds) – but the shortest pulses commercial lasers can manage are 25 femtoseconds long.

The new scheme, proposed by Songsong Tang and Xianfeng Chen of the Shanghai Jiao Tong University, China, uses a commercial laser capable of generating 30-femtosecond pulses of red light to trigger the extreme ultraviolet pulses.

Electronic flotsam

The laser is plane-polarised: in other words, the combined electric and magnetic field oscillates back and forth in a plane along the direction of travel. This means the fields can be thought of as rising and falling like the surface waves on the ocean.

When a polarised laser pulse is trained on a jet of helium gas, it sweeps some electrons away from the atoms before bringing them back again – like flotsam rising and falling on the ocean waves.

But the electrons do not always immediately fall back again: some may get caught up in subsequent waves and so hang around for longer periods before returning to the atom. Since the electrons release bursts of light only when they recombine with the atom, the result is a ragbag of X-ray pulses which are, on average, 300 attoseconds long.

Single hit

For a clearer picture of electron behaviour, the atom needs to be hit once with a short pulse of light – not riddled with a barrage of pulses. A second laser, with pulses 64 femtoseconds long and in the near-infrared region of the spectrum, can both shorten the pulses and isolate them.

The trick is in the polarisation. The second pulse is also plane-polarised, but its plane of polarisation is angled at 45 degrees to that of the first pulse. Both pulses travel along the same path towards the helium atoms, but rather than form a pulse that is X-shaped when viewed end-on, the two polarised pulses interfere to create a combined field with a complicated polarisation pattern.

Because one wavelength is longer than the other, the combined polarisation is constantly evolving. For brief periods, each lasting 1.3 femtoseconds, it passes through an effectively plane state, appearing I-shaped when viewed end-on.

It is only during these brief periods of plane polarisation that the helium atom's electrons are swept away from the atom. Because these brief periods are isolated from one another, the electrons quickly return to the atom. The result is that only short, 60-attosecond pulses emerge.

"The proposed scheme is new and feasible," says Ruxin Li of the Chinese Academy of Sciences in Shanghai, suggesting that a commercial titanium-sapphire laser could provide both the driving and control beams with the help of a beam splitter and amplifier.

Journal reference: *Physical Review A*, DOI: 10.1103/PhysRevA.82.013827

http://www.newscientist.com/article/dn19255-cheap-lasers-could-capture-electrons-in-motion.html?full=true&print=true

'Anti-laser' traps all incoming light

- 02 August 2010 by **Jeff Hecht**
- Magazine issue 2772. **Subscribe and save**

Call it the anti-laser. Instead of amplifying light, it would soak it up completely, leaving utter darkness.
A laser shines by producing a cascade of photons that bounce around inside a light-amplifying material before exiting from one end. A team at Yale University wondered what would happen if they could reverse the process, making the material absorb rather than emit a laser beam.
Most lasers emit from one end, but it's also possible to make lasers emit two identical beams in opposite directions. This requires having identical, partly transparent layers at both ends of a slab of a light-emitting material such as gallium arsenide.
The researchers calculated that if a light-absorbing material like silicon were used instead, then at certain wavelengths, two identical laser beams shone directly at each other would completely cancel themselves out inside the material.
A paper-thin slice of silicon would normally absorb about 20 per cent of the incoming light, but the team showed that in this set-up it would cancel nearly all of the light at 945 nanometres, in the near infrared (*Physical Review Letters*, vol 105, p 053901).
So far the effect exists only on paper, but team member Douglas Stone says "ongoing experiments are extremely promising, and I have total confidence it can be realised". The energy from the cancelled beams is converted into heat, but if it could somehow be turned into current, the effect could allow pulses in fibre-optic cables to be converted with high efficiency into electrical signals.

http://www.newscientist.com/article/mg20727720.101-antilaser-traps-all-incoming-light.html?full=true&print=true

Plug-free electric cars' hidden cost

- 14:08 02 August 2010 by **Helen Knight**

Wires not required (Image: ICHIRO/Getty)

It's bad enough forgetting to recharge your mobile phone overnight – the inconvenience is likely to be far worse if you fail to plug in your electric car. Now an array of technologies are being developed to ensure that absent-minded drivers don't run out of power on the road, but the come with a downside: they risk negating a key environmental benefit of going electric.

One potential method to ensure electric cars remain topped up involves a wireless system that charges your car without any thought or effort on the driver's part.

At the Plug-In 2010 conference in San Jose, California, last week Evatran of Wytheville, Virginia, launched a plug-free car charger. To use the device, drivers will simply pull into their garage or charging station and park over a base unit fitted to the floor, and the system will do the rest, says Rebecca Hough, Evatran's director of marketing.

Park and charge

Electric vehicles starting to go on sale over the next few years "will have intelligent control systems that allow the vehicle to request charge when it's ready", Hough says. "As long as the vehicle requests charge from our system, our system will automatically begin charging."

The plug-free system is based on induction charging – the technology commonly used to power electric toothbrushes. A coil in the base unit creates an electromagnetic field that interacts with a coil attached to the car, which converts it back into an electric current.

The company recognises that the device will require more power from the grid than plug-in recharging systems. It will be about 90 per cent efficient, says Hough.

This may be a price worth paying for the greater convenience offered by wireless charging, which Hough says should encourage more drivers to buy electric vehicles. "We believe that our system will eliminate a barrier to electric vehicle adoption and increase the adoption of electrified transportation," she says.

Other companies developing inductive charging systems include WiTricity, a spin-out of the Massachusetts Institute of Technology, while Nissan last year announced that it was looking into wireless charging for its

electric vehicles. Earlier this year researchers at KAIST (the Korea Advanced Institute of Science and Technology) in Daejeon, South Korea, demonstrated their Online Electric Vehicle (Olev), which is powered by an electromagnetic field generated by strips buried in the road.

Wasted energy

Not everyone is convinced that the convenience of wireless charging systems is sufficient compensation for their reduced efficiency. The power lost by these systems in transferring energy could be enough to make electric vehicles and plug-in hybrid electric vehicles less environmentally friendly than conventional cars, says Michael Kintner-Meyer at the Energy and Environment Directorate at the Pacific Northwest National Laboratory in Richland, Washington.

If you take into account the energy used to produce the electricity, and compare it with a well-to-wheel analysis of the most efficient diesel-engine cars available today, the difference is already fairly small, says Kintner-Meyer. "It's on the tipping point. It depends how green your electricity is," he says.

Even a 10 per cent loss in overall efficiency could make electric cars the less environmentally attractive option. "When you compare a highly efficient diesel engine car with an electric car, that 10 per cent may tip the needle," Kintner-Meyer says.

http://www.newscientist.com/article/dn19246-green-machine-plugfree-electric-cars-hidden-cost.html?full=true&print=true

Google, Twitter and Facebook build the semantic web

- 02 August 2010 by **Jim Giles**
- Magazine issue 2771.

Chicago, the city not the show (Image: KeystoneUSA-ZUMA/Rex Features)

A TRULY meaningful way of interacting with the web may finally be here, and it is called the semantic web. The idea was proposed over a decade ago by Tim Berners-Lee, among others. Now a triumvirate of internet heavyweights - Google, Twitter and Facebook - are making it real.

The defining characteristic of the semantic web is that information should be stored in a machine-readable format. Crucially, that would allow computers to handle information in ways we would find more useful, because they would be processing the concepts within documents rather than just the documents themselves. Imagine bookmarking a story about Barack Obama: your computer will store the URL, but it has no way of knowing whether the content relates to politics or, say, cookery. If, however, each web page were to be tagged with information about its content, we can ask the web questions and expect sensible answers.

It is a wildly attractive idea but there have been few practical examples. That's about to change.

Google's acquisition this month of Metaweb, a San Francisco-based semantic search company is a step in the right direction. Metaweb owns Freebase, which is an open-source database. Why would Google want Freebase? Partly because it contains information on more than 12 million web "entities", from people to scientific theories. But mostly because of the way in which Freebase accumulates its knowledge - it is almost as if a person were doing it, making links between pieces of information in a way that makes sense to them. Freebase entries, culled from sources such as Wikipedia, are tagged so that computers can understand what each is about and link them together. Freebase lists, for example, that one entry for "Chicago" is about a city and another describes the hit musical. Entries are also linked to other relevant entries, such as other towns or shows.

Freebase's tags and links will help Google develop smarter searches. For example, you may be able to request a list of "colleges on the US west coast with tuition fees under $30,000", or "actors over 40 who have won at least one Oscar". So Jack Menzel, Google's director of product management, wrote in a blog post.

With smart searches, you can ask for a list of colleges on the US west coast with fees under $30,000

Google isn't alone. Recently details emerged of Twitter's "annotations", a system that allows tweets to be tagged with information that will not appear in the message but can be read by computers. A tweet about a film, for example, might let you link straight to a movie trailer or the Amazon page for its DVD. A test version may be launched this summer.

Meanwhile, Facebook's changes to its Open Graph protocol also have a semantic element. The protocol allows web developers whose sites are devoted to specific topics, such as a restaurant, to add tags and a "like" button to their site. The tags tell Facebook's servers what the page is about - perhaps including the restaurant location - and when one of its users clicks the button, a link is established between that site and their Facebook profile.

The moves by Facebook and Twitter could change the very nature of how we interact with the web. Software writers will be able to build applications that search for bars and restaurants your Facebook friends have enjoyed, or movies and books your Twitter contacts say were over-hyped. Facebook's involvement should help overcome one of the biggest hurdles faced by the semantic web - persuading website owners to tag their content (see "Solving the chicken-and-egg problem").

Joshua Shinavier, a PhD student at Rensselaer Polytechnic Institute in Troy, New York, has developed an application that runs searches of tweets using the location data they contain.

Shinavier's software, which he plans to release next week, uses the website Geonames to convert the latitude and longitude information in the tags into place names. It then looks up those places in DBpedia, a version of Wikipedia built along similar lines to Freebase. The combination of DBpedia and Geonames will make it possible to search for all tweets made from specific types of places, such as college towns or coastal regions.

While users may find that the semantic web can help them get to grips with some complex questions, its main attraction may be for advertisers. "The whole play is about advertising," says Alex Iskold of Adaptive Blue, a New York-based start-up that focuses on semantic technologies. "Better data will mean better ads."

So advertisers may seize on the capabilities promised by tools like Shinavier's to probe consumer tastes in specific regions. Facebook's semantic tags will also appeal to advertisers, who can use them to explore the connections between users and interests.

Berners-Lee's vision may finally be here, but it comes with something he did not ask for - adverts finely tailored to our likes and dislikes. And those of our friends.

Solving the chicken-and-egg problem

You could argue that the semantic web is a classic example of the chicken-and-egg problem. The only way to create a web that's intuitive for users and where the pages are comprehensible to computers, too, is for web pages to be tagged. But without tags on web pages, there is no incentive to build applications that can use them. And without the apps in place there is no reason to tag websites.

Facebook is working on it: websites that include the social networking site's "like" button and appropriate tags now get links from Facebook pages. So powerful is Facebook that many other sites are expected to provide the appropriate tags. In much the same way that web developers have tweaked sites to improve their Google ranking, playing along with Facebook should improve their visibility.

"This is why we're all so excited," says Alex Iskold of Adaptive Blue, a New York-based start-up that focuses on semantic technologies. "The incentive problem has been solved."

Facebook's like button doesn't solve the incentive problem completely, though. If you can find a way to attach tags to users' blogs and tweets you have a much richer source of data.

One of Adaptive Blue's products, an entertainment recommendation system called GetGlue, may help. Instead of forcing users to generate tweet tags manually, websites can use GetGlue to automatically produce tags based on URLs contained in tweets. If a message contains a link to movie bible IMDb's page for *Inception*, for example, GetGlue will tag the message appropriately.

http://www.newscientist.com/article/mg20727715.400-google-twitter-and-facebook-build-the-semantic-web.html

Green light for first embryonic stem cell treatment

- 13:12 03 August 2010 by **Andy Coghlan**

It has taken more than five years of graft, but at long last approval has been given for the first clinical trial using human embryonic stem cells (hESCs). These cells can develop into all tissues of the body.
Geron Corporation of Menlo Park, California, received the green light from the US Food and Drug Administration this week to use cells derived from hESCs to treat people with acute spinal cord injuries. Ten people will receive injections into the injury site of hESC-derived oligodendrocyte progenitor cells, which stimulate the growth of new and severed nerves and recoat damaged nerves with myelin. The hope is that the injections will help people recover function lost through injury, as seen in rodent studies in 2005.
Geron first received permission to proceed in January last year, only for the FDA to withdraw it in August following studies showing that some animals developed benign cysts around the injection sites. Further animal studies led to the FDA's change of heart.
Chris Mason, a professor of regenerative medicine at University College London, says that the approval is excellent news and "well overdue".
"We just don't know how hESC therapies will behave in humans unless we actually administer them to patients in the course of a properly conducted clinical trial," says Mason. "When we look back in 25 years, putting the first embryonic stem cells into humans will prove as momentous as man's first step on the moon."

http://www.newscientist.com/article/dn19254-green-light-for-first-embryonic-stem-cell-treatment.html

Computer supermaterial could stop your shoes smelling

- 01 August 2010
- Magazine issue 2771.

Graphene might help (Image: Howard Huang/Getty)

GRAPHENE has been heralded as the new supermaterial of our time. It possesses incredible strength and elasticity, while its exceptionally high conductivity and use in flexible semiconductors could soup up computing. If all that weren't enough, there's another way that the atom-thick layers of carbon might improve your life: stopping your shoes from smelling.

Sheets of graphene oxide are highly effective at killing bacteria, say Chunhai Fan, Qing Huang and colleagues at the Chinese Academy of Sciences in Shanghai. The team sprayed sheets of the material with an aerosol rich in *Escherichia coli*, and then placed the sheets in an incubator and examined them under a microscope. "We observed that *E.coli* cells were destroyed when they interacted with the graphene oxide," says Fan, providing the first evidence that graphene oxide kills bacteria.

The mechanism is not fully understood, he says. Nevertheless, if the material's bactericidal properties extend beyond *E. coli*, it could find its way into a host of new applications, from warding off shoe odour to packaging that will help keep food fresh for longer (*ACS Nano*, DOI: 10.1021/nn101097v).

http://www.newscientist.com/article/mg20727715.300-computer-supermaterial-could-stop-your-shoes-smelling.html

Anti-vaccination website poses public health risk

- 14:02 27 July 2010 by **Wendy Zukerman**

Misleading and inaccurate claims published by an Australian anti-vaccination campaign group pose a risk to public health, a government watchdog has ruled.

The Health Care Complaints Commission (HCCC), the health watchdog for the state of New South Wales, based in Sydney, issued the warning yesterday over information presented on the website of the Australian Vaccination Network (AVN).

The HCCC warning states that the AVN site "quotes selectively from research to suggest vaccination to be dangerous" and "contains information that is incorrect and misleading", such as saying measles is a "non-threatening illness".

On 7 July, the HCCC gave the AVN two weeks to comply with its request to include a warning on the site stating that the claims were not medical advice, and that parents should consult healthcare providers about their children's vaccination options.

The AVN has failed to comply, triggering HCCC's public warning that the website could guide people to making improperly informed vaccination decisions.

Misleading claims

The AVN website states that measles is a "non-threatening illness", despite it having caused an estimated 733,000 deaths worldwide in 2000.

It also claims that "vaccines have never been tested", on the grounds that they do not undergo double-blind crossover placebo trials. In these, those being vaccinated would be switched to receiving placebos and vice versa.

However, the group fails to mention that such crossover trials are impossible for vaccines, because the effects of vaccines would linger in participants after they had been switched to placebos.

The AVN only has around 2000 members. However, because its website has a high Google ranking it is an influential source of information on vaccination in Australia.

"The scientific community challenges anti-vaccination groups by publishing good science in academic journals, but that doesn't reach the public," says Ken McLeod of the pressure group Stop the Australian Vaccination Network.

McLeod, who filed the complaint to the HCCC, says he is now planning to seek a court order to force the AVN to make the changes requested by the HCCC.

http://www.newscientist.com/article/dn19228-antivaccination-website-poses-public-health-risk.html

Rethinking Einstein: The end of space-time

- 04 August 2010 by **Anil Ananthaswamy**
- Magazine issue 2772.

Physicists struggling to reconcile gravity with quantum mechanics have hailed a theory – inspired by pencil lead – that could make it all very simple

IT WAS a speech that changed the way we think of space and time. The year was 1908, and the German mathematician Hermann Minowski had been trying to make sense of Albert Einstein's hot new idea - what we now know as special relativity - describing how things shrink as they move faster and time becomes distorted. "Henceforth space by itself and time by itself are doomed to fade into the mere shadows," Minowski proclaimed, "and only a union of the two will preserve an independent reality."

And so space-time - the malleable fabric whose geometry can be changed by the gravity of stars, planets and matter - was born. It is a concept that has served us well, but if physicist Petr Horava is right, it may be no more than a mirage. Horava, who is at the University of California, Berkeley, wants to rip this fabric apart and set time and space free from one another in order to come up with a unified theory that reconciles the disparate worlds of quantum mechanics and gravity - one the most pressing challenges to modern physics.

Since Horava published his work in January 2009, it has received an astonishing amount of attention. Already, more than 250 papers have been written about it. Some researchers have started using it to explain away the twin cosmological mysteries of dark matter and dark energy. Others are finding that black holes might not behave as we thought. If Horava's idea is right, it could forever change our conception of space and time and lead us to a "theory of everything", applicable to all matter and the forces that act on it.

If Petr Horava's idea is right, it could change our conception of space and time forever

For decades now, physicists have been stymied in their efforts to reconcile Einstein's general theory of relativity, which describes gravity, and quantum mechanics, which describes particles and forces (except gravity) on the smallest scales. The stumbling block lies with their conflicting views of space and time. As seen by quantum theory, space and time are a static backdrop against which particles move. In Einstein's

theories, by contrast, not only are space and time inextricably linked, but the resulting space-time is moulded by the bodies within it.

Part of the motivation behind the quest to marry relativity and quantum theory - to produce a theory of quantum gravity - is an aesthetic desire to unite all the forces of nature. But there is much more to it than that. We also need such a theory to understand what happened immediately after the big bang or what's going on near black holes, where the gravitational fields are immense.

One area where the conflict between quantum theory and relativity comes to the fore is in the gravitational constant, G, the quantity that describes the strength of gravity. On large scales - at the scale of the solar system or of the universe itself - the equations of general relativity yield a value of G that tallies with observed behaviour. But when you zoom in to very small distances, general relativity cannot ignore quantum fluctuations of space-time. Take them into account and any calculation of G gives ridiculous answers, making predictions impossible.

Emergent symmetry

Something has to give in this tussle between general relativity and quantum mechanics, and the smart money says that it's relativity that will be the loser. So Horava began looking for ways to tweak Einstein's equations. He found inspiration in an unlikely place: the physics of condensed matter, including the material of the moment - pencil lead.

Pull apart the soft, grey graphite and you have a flimsy sheet of carbon atoms just one atom thick, called graphene, whose electrons ping around the surface like balls in a pinball machine. Because they are very small particles, their motion can be described using quantum mechanics; and because they are moving at only a small fraction of the speed of light there is no need to take relativistic effects into account.

But cool this graphene down to near absolute zero and something extraordinary happens: the electrons speed up dramatically. Now relativistic theories are needed to describe them correctly. It was this change that sparked Horava's imagination. One of the central ideas of relativity is that space-time must have a property called Lorentz symmetry: to keep the speed of light constant for all observers, no matter how fast they move, time slows and distances contract to exactly the same degree.

What struck Horava about graphene is that Lorentz symmetry isn't always apparent in it. Could the same thing be true of our universe, he wondered. What we see around us today is a cool cosmos, where space and time appear linked by Lorentz symmetry - a fact that experiments have established to astounding precision. But things were very different in the earliest moments. What if the symmetry that is apparent today is not fundamental to nature, but something that emerged as the universe cooled from the big bang fireball, just as it emerges in graphene when it is cooled?

So Horava did the unthinkable and amended Einstein's equations in a way that removed Lorentz symmetry. To his delight, this led to a set of equations that describe gravity in the same quantum framework as the other fundamental forces of nature: gravity emerges as the attractive force due to quantum particles called gravitons, in much the same way that the electromagnetic force is carried by photons. He also made another serious change to general relativity. Einstein's theory does not have a preferred direction for time, from the past to the future. But the universe as we observe it seems to evolve that way. So Horava gave time a preferred direction (Physical Review D, vol 79, p 084008).

With these modifications in place, he found that quantum field theories could now describe gravity at microscopic scales without producing the nonsensical results that plagued earlier attempts. "All of a sudden, you have new ingredients for modifying the behaviour of gravity at very short distances," Horava says.

"Horava gravity" is, of course, not the first attempt to devise a theory of quantum gravity. Of its many predecessors, the most popular is string theory. But Horava gravity has one particularly appealing feature: unlike string theory, which requires mastery of daunting mathematics, it can be studied using the same mathematical tools that have been developed for the three other fundamental forces of nature. "It is a completely new approach to a very difficult problem," says Oriol Pujolas, a theoretician at the CERN laboratory, near Geneva, Switzerland. "Yet it's a very simple framework we know very well."

This is partly why so many physicists have taken up Horava's theory so avidly. Other theories of quantum gravity, including string theory and loop quantum gravity, are far more difficult for newcomers to embrace.

Other theories of quantum gravity, like string theory, are far more difficult for newcomers to embrace

Pretty mathematics is all very well; the true test is how the theory works out when it is applied to the real world. So how does it fare? Some clues that Horava might be on the right track come from another approach to quantum gravity called causal dynamical triangulation, which stitches space-time together from smaller pieces. Jan Ambjørn of the Niels Bohr Institute in Copenhagen, Denmark, and his colleagues, pioneered the idea. They used computer simulations to analyse the behaviour of space-time and were puzzled by what they found in some of their models: as they zoomed in and out, they found that the contributions from the three dimensions of space and one of time varied in a way they did not fully understand. Zoom out and space and time play equal parts, in line with Lorentz symmetry. But zoom in and time plays a far greater role than space.

Beyond Einstein

Ambjørn thinks this means space and time are contracting differently - as you would expect if Lorentz symmetry is broken as it is in Horava's theory of quantum gravity (arxiv.org/abs/1002.3298). "So, if you call these computer simulations experiments," says Ambjørn, "then Horava's theory and experiment have met - in a way."

But it's not all been plain sailing for Horava's work. The near-unprecedented spotlight that is being focused on it has, not surprisingly, illuminated some cracks. The first appeared in June 2009 - just five months after Horava published his paper. If his theory works, then at low energies it should look like general relativity. However, Pujolas, along with Diego Blas and Sergey Sibiryakov of the Swiss Federal Institute of Technology in Lausanne, showed that wasn't the case in the system they analysed, meaning that Horava's theory would always be at odds with experimental observations (arxiv.org/abs/0906.3046). At first, the theory seemed doomed. Then within months of their initial paper, Pujolas and his colleagues realised that this disparity only appears in special circumstances and that the theory could after all lead to general relativity at low energies (arxiv.org/abs/0909.3525).

That was welcome news to those who have been using Horava gravity to study astrophysical and cosmological mysteries such as black holes, dark matter and dark energy. Take black holes. In general relativity, black holes are a consequence of space and time being part of the same fabric. Black holes warp space-time so much that they suck in everything around them. Nothing can escape a black hole's gravity because nothing can travel faster than the speed of light.

By breaking the symmetry between space and time, Horava's theory alters the physics of black holes - especially microscopic black holes, which may form at the very highest energies. What this means for the formation of these black holes, and whether they are what they seem to be in general relativity "is a very big question", says Pujolas, and one that researchers are now addressing.

By breaking apart space-time, Horava's theory alters the physics of black holes

Horava gravity might also help with the long-standing puzzle of dark matter. The motions of stars and galaxies that astronomers have observed seem to require there to be much more matter in the universe than meets the eye; without it, galaxies and clusters of galaxies should fly apart. But this conclusion arises from equations of motion derived from general relativity. What if these equations are slightly off? Could this explain the observed speeds of the stars and galaxies without dark matter playing a role?

Shinji Mukohyama at the University of Tokyo in Japan decided to find out. When he extracted the equations of motion from Horava's theory, he found that they came with an extra term that is not present in equations derived from general relativity - and that this extra term mimics the effects of dark matter. Depending on its value, you can do away with some dark matter, or even most of it (arxiv.org/abs/0905.3563). "It is possible that some fraction of the dark matter picture of the universe could be coming from corrections to Einstein's equations," Horava says.

Dark energy is a more daunting problem still. It appears that the expansion of the universe has started to speed up in the past few billion years, and to explain it physicists have invoked the inherent energy of the vacuum of space-time. This is dark energy. But there is a big problem. The theories of particle physics predict the strength of dark energy to be about 120 orders of magnitude larger than what is observed, and general relativity cannot explain this enormous discrepancy. Here, too, Horava's theory may come to the rescue. It contains a parameter that can be fine-tuned so that the vacuum energy predicted by particle physics is reduced to the small positive value that is in line with the observed motions of stars and galaxies (arxiv.org/abs/0907.3121).

It will, however, be hard to show whether or not this picture it correct - as Roberto Casadio of the University of Bologna in Italy and colleagues, who did these calculations, admit. That's because, with the parameter in Horava's equations set to the necessary value, their predictions will deviate from those of Einstein's relativity only at energies far, far higher than can be probed in labs today.The universe, of course, will have the final say. Improved observations of supermassive black holes, which contain regions of intense gravity, could reveal the necessary corrections to general relativity. This could pave the way for a theory of quantum gravity, such as Horava's, in much the same way that unexplained measurements of Mercury's orbit showed that Newton's laws were incomplete, opening the door for Einstein.

In the midst of all the buzz, Horava is keeping his cool. Hanging in his office in Berkeley is a 17th-century Dutch map on which California appears as an island off the west coast of America. He takes its lesson to heart. "We have found some new land and it's very exciting. But we are very far from getting all the details right."

Anil Ananthaswamy is a consultant for New Scientist and author of The Edge of Physics: Dispatches from the Frontiers of Cosmology (Duckworth Overlook)

http://www.newscientist.com/article/mg20727721.200-the-end-of-spacetime.html?DCMP=NLC-nletter&nsref=mg20727721.200

How Wikileaks became a whistleblowers' haven

- 16:32 27 July 2010 by **Paul Marks**

The release of 90,000 leaked US intelligence documents about the war in Afghanistan has thrown Wikileaks into the spotlight as never before. But how do you go about putting top secret documents online without getting caught?

What is Wikileaks?

In 2006 a loose association of anti-censorship activists, lawyers and internet experts realised that the combination of the internet and sophisticated new anonymity tools could create a whistleblowers' haven where sensitive documents could be posted without fear of reprisal.

Their idea was that posting leaked documents could become as easy as posting an entry in Wikipedia – hence the name.

Wikileaks isn't a single organisation but a grouping of like-minded activists around the globe but is fronted in the main by Julian Assange, an Australian freedom-of-information advocate and former computer hacker. He and his colleagues – many of whom are lawyers – have taken advice on anonymising technology from experts such as Ben Laurie, pioneer of SSL – the "secure sockets layer" that keeps web transactions secure.

What provides anonymity for the whistleblower?

Despite its anti-authoritarian stance on censorship, Wikileak's main strength comes from a piece of technology developed by the Pentagon. A kind of network called The Onion Router – or Tor – enables users to post documents without fear of being traced.

A Tor network uses around 1000 volunteer servers around the world. To transmit a document, a whistleblower downloads a piece of software called a Tor client and uses it to inject the document into the Tor network. The document then bounces between Tor servers in a random manner, using layers of encryption to obfuscate its source address. Eventually it emerges at the destination – in this case Wikileaks.

To keep a step ahead of companies and governments who might want leaks taken down, Wikileaks is hosted in Sweden, where robust freedom-of-information legislation makes a takedown order unlikely. A similar site in transparency-friendly Iceland is being investigated. In addition, Wikileaks is mirrored at undisclosed locations around the world, so if it's taken down in one location, other sites can take over.

What sort of information has been leaked via Wikileaks?

The 90,000 documents relating to the Afghanistan campaign are just some of the 1.2 million documents posted to the site. Others have included claims of government corruption in Kenya, the design for the Hiroshima atom bomb and the military rule book for the Guantanamo Bay detention camp in Cuba; others still have included the financial accounts for a Masonic lodge and a detailed description of a sorority society's initiation ritual.

A recently released Wikileaks' video, *Collateral Murder*, showed a US army helicopter attack that killed 12 people, including two Reuters journalists, in Baghdad, Iraq, in 2007.

So can you post to Wikileaks without fear of being caught?

In short, no. As Tim Berners-Lee has said: "It is very difficult to make a foolproof anonymiser. Frankly, it's a bit hairy to be in that game."

The US military has arrested Bradley Manning, an intelligence analyst stationed in Iraq, on suspicion of leaking the helicopter footage. At this stage it is not clear whether he is thought to have been involved in leaking other documents. However, his arrest followed a tip-off from a contact, rather than the military tracing the source of Wikileaks posts.

http://www.newscientist.com/article/dn19230-how-wikileaks-became-a-whistleblowers-haven.html?full=true&print=true

Mumbai Restoration Includes Art

By VIKAS BAJAJ

MUMBAI — When terrorists stormed this city nearly two years ago, killing at least 163 people, they also dealt a blow to the Taj Mahal Palace hotel, an architectural landmark that has played a critical role in nurturing and housing Indian art.

During a three-day siege the hotel, a Moorish-Florentine palace that opened in 1903, was ravaged by fires, gunshots and grenade explosions. The roof collapsed, and intricate woodwork was burned away. Paintings by modern Indian masters like Vasudeo S. Gaitonde and Jehangir Sabavala were covered in soot and fungus, which thrived in the humid air after air-conditioners gave out, and sprinklers and fire trucks doused the building with water.

Over the last 21 months a team that has at times swelled to more than 2,000 has gutted and renovated the hotel. A smaller group of five specialists spent 10 months restoring nearly 300 pieces of art, working in the Crystal Ballroom, where guests and staff sought refuge during the attack.

On Thursday their work will be put on display, a few days in advance of the Palace Wing's reopening on Sunday, Indian Independence Day. (Some of the common areas in the palace and a tower wing that was not damaged extensively have been open for more than a year.)

Unlike before the attack, when much of the hotel's notable art was scattered in hallways and guestrooms, the Taj will now showcase its prized possessions in three prominent locations: a banquet hall, a lounge and a sea-facing bar just off the main lobby.

Though in recent years galleries have sprung up across Mumbai and New Delhi, there was a time when the Taj was a central hub for Indian art. Until the early 1990s its Taj Gallery was one of just a handful of places

where admirers and collectors could go to see and buy contemporary art in Mumbai, formerly known as Bombay.

"A lot of the artists that earned reputations for themselves in the '70s and '80s — people like B. Prabha — had a lot of shows there," said Abhay Sardesai, editor of Art India, a Mumbai magazine. "It was an important space."

Other divisions of the Tata Group, which started and still owns the Taj, also contributed significantly to India's modern-art scene by buying works, especially in the 1950s and 1960s, said Gayatri Sinha, an art critic and curator in New Delhi. Most Indian corporations "have been largely indifferent" to art, she said. "In that sense the Tatas really stand out for having made the right investments in art at the right time."

Closed during a renovation nearly 10 years ago, the Taj Gallery never reopened, but in recent years the hotel has devoted more attention to its own collection, which was started by the wife of the hotel's manager in the 1960s. A few years ago it hired an art specialist, Mortimer Chatterjee, to help catalog and preserve the collection.

Several notable works, including a large piece by the abstractionist S. H. Raza, escaped damage because they were in storage, slated for cleaning and restoration, when the hotel was attacked, said Mr. Chatterjee, who, with his wife Tara Lal, runs a gallery, Chatterjee & Lal, down the street from the Taj.

But other pieces that were on display at the time needed significant restoration because fungus and soot particles became embedded in their paint and canvases. One work that proved particularly challenging was a light-blue abstract work by Laxman Pai, embellished with grooves and ridges that had to be cleaned with care, Mr. Chatterjee said.

Priya Khanna, whose New Delhi firm, the Art-Life Restoration Studio, was hired by the Taj to do the work, said some pieces suffered multiple kinds of damage — mold, tears, blanching — slowing down the work. She sent five of her most experienced restorers to live and work at the Taj for 10 months and came herself to Mumbai every 10 days.

"Every process takes time, and after one process we would need to leave the painting for a while," she said.

Taj officials said they had spent $50 million on the restoration of the hotel and its art. In addition to Ms. Khanna's firm, the hotel hired five interior design and two architecture firms to redo rooms and public spaces. A new roof was installed, and the floors were redone on the second and sixth floors, which had the most damage.

Much of the hotel has been overhauled, including its plumbing, wiring and furniture, but Raymond Bickson, the chief executive of the Indian Hotels Company Limited, the Tata unit that owns the Taj, said the company tried to closely replicate period details like railings and moldings — some done by craftsmen from the northwestern state of Rajasthan — because it wanted to preserve the hotel's "Tajness."

"We were able to return the palace to what it was like — with maybe a crisper feel," he said.

Sitting on the harbor across the street from the Gateway of India, a monument commissioned under British rule, the Taj has long been a symbol of Mumbai. Built at a time when many hotels prohibited Indians from

even entering, the Taj was reportedly built by its founder, Jamsetji N. Tata, as a place where Indians would be welcome and could mingle with the British on something like equal terms.

For many its status as an emblem of the city has only grown since the attack, which is often referred to by the day on which it started, "26/11" (Nov. 26, 2008). Much more so than the Oberoi Hotel, a Jewish center and other places targeted by the terrorists, the Taj, with smoke billowing out of its windows and onion-shaped domes, became the enduring image associated with the tragedy.

"After 26/11 the Taj, more than any edifice in the city, has captured the imagination of people in the city and elsewhere," said Mr. Sardesai of Art India, and he added that it had come to "represent the city and the country."

He said he hoped the hotel would embrace this role and again play the part of a patron of the arts by showcasing and buying works from contemporary artists, not just the established masters that make up most of its collection. The hotel has commissioned a new work for its reopening — a large mixed-media piece by Rajesh Pullarwar that has figures resembling the island of Mumbai — but aside from that it has not acquired much new art in recent years.

"It should also allow the city to come in," Mr. Sardesai said of the hotel. "Art is a wonderful vehicle to do that."

http://www.nytimes.com/2010/08/12/arts/design/12taj.html?ref=design

An Art Experiment in Flashy Las Vegas

By CAROL VOGEL

Las Vegas may be known for gambling and gaudiness, but when it comes to art, the exhibitions on view there have been surprisingly highbrow. Over the years its galleries have displayed canvases by Rembrandt and Picasso, Monet and van Gogh.

On Tuesday, however, the four-sided marquee of the new Cosmopolitan casino and resort became a canvas for a scrappier kind of art project. Organized by the Art Production Fund, a nonprofit organization that presents public art, it is the first entry in what is to be a series of public art at the resort, called Pause, that will run through Sept. 30.

"Most of the art in Las Vegas has been blue-chip brand names, but this has a lighter touch," said Yvonne Force Villareal, a founder of the Art Production Fund. "It's meant to be an unexpected respite in the middle of a busy commercial strip."

Located near the Bellagio, the 2,995-room Cosmopolitan is scheduled to open in December. But the marquee is already running with three videos — one by Yoko Ono and two by T. J. Wilcox — that change every 20 minutes.

Mr. Wilcox's works deal with nature: "Filter" is about a young girl who discovers an endangered turtle in her swimming pool, while "Eau de Vie de Poire" documents the artist's own backyard attempt to make pear brandy. Ms. Ono is represented with one of her signature videos in which the phrase "Imagine Peace" flashes across the screen in different languages while John Lennon's "Imagine" plays in the background.

The roster of artists will change every two months. And by the time the Cosmopolitan opens, the Art Production Fund will have installed site-specific projects inside that include murals and videos.

LEARNING FROM NEWBIES

Too much information or not enough? It's a question museum curators grapple with every time they begin writing the wall labels that accompany an exhibition.

"We talk constantly about labels," said Kathy Halbreich, associate director at the Museum of Modern Art. "It's something we give great care to. And inevitably there is that tension between what some of us think the public wants to know and what curators feel is important."

Recently when she and Christophe Cherix, a curator in MoMA's department of prints and illustrated books, began working on "Contemporary Art From the Collection," a giant reinstallation on the second floor that is on view through May 9, they decided to do something the museum has never done before. Beside 50 of the 130 works in the show there is a label that reads, "First Time on View at MoMA."

Explaining that a particular artwork had never been shown in the museum before tells a lot about the history of taste. For example, Ms. Halbreich said that she thought "Untitled (Suite 'Blancs')," a 1973 painting by the Hungarian artist Simon Hantai that had entered the collection in 1982, may not have been interesting to viewers years ago but is particularly relevant today. The colorful abstract painting, in which Mr. Hantai bunched up the canvas, creating an overall abstract pattern, may appeal to younger artists today because many of them are taking a new look at abstraction.

"You can see influences that are prescient about the way artists are working right now," Ms. Halbreich said.

Other works on view for the first time include a portfolio of posters by the Guerrilla Girls, the gorilla-masked feminist radicals. Dating from 1985 to 1989, the posters were acquired by MoMA's library but never shown. They are not in the museum's collection database but are recorded in its archives. Ms. Halbreich said that raised a question: "What is a work of art, and who has the authority to call it that?"

Recent acquisitions are also making a debut, including one that is part of a recent gift from Gilbert Silverman, an honorary trustee, and his wife, Lila. Called "One Year," it is an installation from the early 1970s by George Maciunas, one of the so-called Fluxus artists, an anti-art movement made up of a loose international collective of young writers, musicians and artists in the early 1960s.

"It looks like a huge store window in which are placed all the containers," Ms. Halbreich said, from which the artist ingested for a year, "from sugar to his medication."

"It hasn't been shown because it is a new acquisition," she added, "but it is hard to imagine that MoMA would have thought much of the Silverman collection of Fluxus art 20 years ago. Now it represents a conceptual approach that helps us tell a more ample story."

Ms. Halbreich said the idea first blossomed when she and Mr. Cherix realized how many works in the collection either had not been on view for a long time or had never been exhibited at all.

It became an exercise in "seeing an alternative history," Ms. Halbreich said. "We saw many things of interest to us that deserved to see the light of day. Some of them challenged our own perspective of what is important, especially since once upon a time somebody thought they were."

GUNPOWDER GATHERING

For years now Cai Guo-Qiang's gunpowder drawings have fascinated museum audiences from New York to Taiwan. But the public has rarely had an opportunity to see this Chinese-born artist make one. So when officials at the Museum of Fine Arts, Houston commissioned him to create "Odyssey," one of his largest such drawings, for its new Arts of China gallery, they decided to make the process available to the public.

The completed drawing will cover 42 panels and will line the four walls of the new space, which opens on Oct. 17.

"It will be a contemporary crucible juxtaposed with ancient material," said Peter C. Marzio, director of the museum, referring to the collection of ceramics, bronzes, sculptures and paintings dating from 3000 B.C. that will be showcased in the new space. The gallery is one of five planned components of the Arts of Asia galleries the museum has been opening.

"So many Asian galleries have a hushed quality to them, and I wanted to make them a little more open and lively," Mr. Marzio explained.

For two days — Oct. 5 and 6 — Mr. Cai will be working in a 25,000-square-foot warehouse in Houston, engaging dozens of local volunteers to help. The public will be able to watch as he sprinkles a mixture of gunpowder onto the drawing, which will have been created on handmade hemp affixed to wood panels. He then will light a fuse that snakes along the gunpowder. Like so much traditional Chinese art, it is combination of skill and chance.

Tickets are free, but those who want to view the process must register online at mfah.org, starting Sept. 20.

http://www.nytimes.com/2010/08/06/arts/design/06vogel.html?ref=design

Sharing a National Identity, Emerging Artists Engaging in a Visual Language

By ROBERTA SMITH

Small though it is, Israel has been providing more than its share of artistic talent to the global art circuit, especially where video and performance art are concerned.

Over the past decade Guy Ben-Ner has become known for what might be called home videos, starting with a version of "Moby-Dick" shot in his kitchen, starring himself and his young daughter; Tamy Ben-Tor has startled the art world with scathing depictions of a cast of characters ranging from a pretentious art theorist to an aging Nazi; Mika Rottenberg has created a genre of disorienting video installations centering on women enacting strange tasks; Ohad Meromi, another sculpturally inclined video installationist, has revisited "The Odyssey" and Brecht.

And the redoubtable Omer Fast has alternated between rapid-fire sampling of existing material and elaborately staged works, making some of the most gripping, astutely political videos of the moment.

"Greater New York," the current survey of emerging artists at MoMA P.S. 1 in Long Island City, Queens, has at least three memorable contributions by young Israelis, and the summer show at the Lesley Heller Workspace on the Lower East Side is using those very words as a title, supplemented by a portentous definite article. "The Young Israelis," which closes on Saturday, presents 16 videos and several related photographs by 10 artists, including the three Greater New Yorkers.

Organized by the critic and independent curator Lilly Wei, "The Young Israelis" is not without weak points or generically familiar inclusions. Nonetheless, for the most part it suggests that a certain chemistry often exists between Israel — its history, landscape, politics and cities — and young artists wielding video cameras.

Several of the pieces are standard emergent video work, including Karen Russo's 2005 "Economy of Excess," a micro-video-camera journey through the sewer system of Essex, England. Despite the sense of trippy abstraction resulting from manipulations of color and plunging space, it is overly indebted to a video excursion through the sewers of Zurich from the 1990s by Peter Fischli and David Weiss.

A similar derivativeness plagues Nira Pereg's "And Melancholy," which visits the balconies of the different buildings in Tel Aviv where she has lived. At each site the view is surveyed, and the camera then plunges to the ground, creating the effect — suggested by the title — of a series of suicide jumps.

In "Volcano Demo" and "Sunset Demo/Sonya," Tom Pnini simulates natural events using hand-built mock-ups — a papier-mâché volcano on top of his parents' apartment building in Tel Aviv, a large orange circle attached to an ocean pier — but they don't add much more than an endearing footnote to the history of set-up video. A much better impression is made by Lior Shvil, whose comic "RoughCut" shows him in a symbiotic if sometimes violent relationship with a life-size cloth puppet of a dark-bearded male figure in a keffiyeh.

As for Gilad Ratman, I recommend seeing his recent video of disembodied faces and hands emerging from and sinking into an expanse of gray sludge in "Greater New York," which runs through Oct. 18. His contributions at Heller are earlier and not as convincing, although they provide a baseline of his artistic growth.

Israel as a place of strange vistas and fraught history is intensely present in the work of Oded Hirsch, whose task-oriented videos are among the show's most haunting. Shot on or near the kibbutz where he grew up, and cast with people who live there, both works depict oddly pointless physical feats in spectacularly isolated landscapes. In his "50 Blue" (2009), he pushes a wheelchair holding his paralyzed father in a yellow slicker up muddy paths to a rocky palisade that evokes the battle of Masada. He then takes his father to the edge of the Sea of Galilee, where six more slicker-clad men hoist his father, wheelchair and all, to the top of an old watchtower.

In "Tochka," from this year, a group of men in blue clothes and white caps wheel a large rusty spool across the landscape, ultimately using it to construct a rickety footbridge over a small ravine that could easily be crossed without it. A medieval yet timeless mood prevails; the fragile predicament of Israel is enacted in terms that Bosch or Bruegel would recognize.

Operating in a more contemporary mode, Rona Yefman's "Pippi at Abu-Dis" (2008) shows a latter-day Pippi Longstocking (played by the performance artist Tanja Schlander) futilely but energetically trying to dismantle the towering Abu-Dis wall that divides Israel from the Palestinian territories. In the similarly seemingly improvised "2 Flags," a battle to the death between two fairly hapless gangs — the Hoods and the Stripes — on the streets, rooftops and beaches of Tel Aviv. A result is a loopy mixture of fact and slapstick that brings together ninjas, nerds and several elders, including two who recall evading the Nazis in Poland.

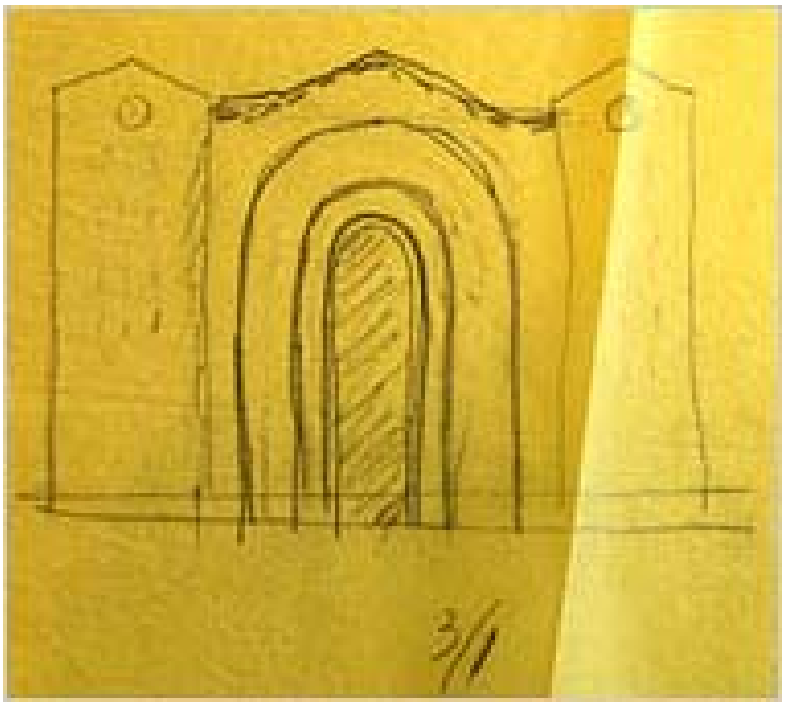
And Deville Cohen backs up his impressive contribution to "Greater New York" with "The Wall," another video mixture of performance, installation and appropriation dominated by large grisaille photocopies, this time of buildings and brick walls. A group of actors — whose faces are covered and whose genders are ambiguous — change outfits, introduce brightly colored objects and interact with their flimsy setting. It is as if some avant-garde troupe of performance artists has been relegated to dressing store windows and is making the best of it. These last three works, expanding on ideas generally at large in the art-world atmosphere, are by artists who just happen to be Israeli.

"The Young Israelis" is on view though Saturday at the Lesley Heller Workspace, 54 Orchard Street, near Grand Street, Lower East Side; (212) 410-6120, lesleyheller.com.

http://www.nytimes.com/2010/08/12/arts/design/12chance.html?ref=design

The Hand of a Master Architect

By ROBIN POGREBIN



A huge and previously unknown trove of archival material from Philip Johnson's architectural practice — including his hand-drawn sketches for towers that helped define postmodern architecture — is to be put up for sale by one of Johnson's former partners, who has had them in storage for years.

The cache contains more than 25,000 design sketches, working drawings, renderings and photographs from the second half of Johnson's architectural career, covering more than 120 projects from 1968 to 1992. While there are collections of his early work at the Museum of Modern Art, the Getty Research Institute and the Avery Architectural & Fine Arts Library at Columbia University, documentation from this later period, in which he became known for his tall buildings, is much rarer. Included in the archive is material on the AT&T Building in Manhattan (now Sony's American headquarters); the Crystal Cathedral in Garden Grove, Calif.; PPG Place in Pittsburgh; Pennzoil Place in Houston; and smaller-scale structures that Johnson built around his celebrated Glass House of 1949 on his property in New Canaan, Conn., now owned by the National Trust for Historic Preservation.

That period was "the pinnacle of Johnson's career" as an architect, said Willis Van Devanter, an appraiser of architectural materials hired to examine the archive by lawyers for the archive's owner, Raj Ahuja. Mr. Van Devanter described the archive as "absolutely essential to the study of modern architecture," given Johnson's stature as "the major influence in world architecture of the latter 20th century."

Still, that stature was arguably based more on his role as a leading advocate for Modernism and subsequent architectural movements — beginning with the International Style show he helped organize at the Museum of

Modern Art in 1932 — than on his own design work. Aside from a few of his almost universally praised projects, Johnson has been regarded by some critics and fellow architects as dilettantish, more slave to fashion than serious practitioner.

He was criticized in particular for focusing on aesthetics at the expense of more fundamental issues of function. But Michael Robinson, an expert on 20th-century documents and another appraiser of the archive, said its drawings would do much to help counter that notion.

Mr. Robinson was especially struck, he said, by the degree to which the drawings concern themselves with the surrounding context.

“Nobody thinks of Johnson as a planner,” Mr. Robinson said. “They think of him as an antiurbanist. He really was concerned with how life interacted with these buildings. You get elaborate plans for walkways, roads, the works.”

Calling the archive “extraordinarily complete,” he added, “You literally see him thinking on paper all the way through to the final drawings necessary to actually build a building.”

The archive also offers insight into aesthetic matters, like the evolution of Johnson’s approach to shaping buildings, said Christy MacLear, who until recently was executive director of the Philip Johnson Glass House. For example, she said, the drawings demonstrated similarities in the massing of several notable but modest buildings on the Glass House property and of the vast Crystal Cathedral that Johnson worked on around the same time.

And there are also working drawings for at least 50 unbuilt projects, including London Bridge City, an office complex on the Thames; four Times Square office towers; and a house for Johnson’s companion, David Whitney. The archive “has a lot of things Johnson thought about but never got off the drawing board,” said Wilbert R. Hasbrouck, who was also consulted on the collection and was an owner of the Prairie Avenue Bookshop in Chicago, which has gone out of business. “This archive is going to open up a whole new field of study about his work, particularly on the unbuilt buildings. It fills out a lot of gaps that we didn’t even know existed.”

Mr. Ahuja, the archive’s owner, was a former design partner of Johnson’s. An Indian-born architect, he joined the firm as a young man in 1971 and ran its Iranian office before becoming a partner with Johnson and John Burgee in 1984. During his tenure Mr. Ahuja developed a strong affinity for Johnson, who left the partnership for a consulting role in 1986 and left the practice entirely five years later.

Mr. Ahuja and Mr. Burgee clashed over Johnson’s level of involvement. “I was more for keeping Johnson in the firm as a consultant and as a designer, and Burgee was more determined to get Philip out,” Mr. Ahuja said in an interview. “I thought, without Philip Johnson, we would not be getting the assignments we were getting. He was the man.” (Speaking by telephone from California, where he has retired, Mr. Burgee said he had not forced Johnson out, adding, “He voluntarily withdrew.”)

Mr. Ahuja, now 69, said he ended up with the archival material in 1995 as part of a Chapter 11 proceeding in which Mr. Burgee sought bankruptcy protection for the firm and for himself. The bankruptcy followed an arbitration between Mr. Ahuja and Mr. Burgee in 1988, when Mr. Ahuja left the firm.

Since then, Mr. Ahuja said, he has kept the archive in a warehouse: "The court awarded me the drawings, which I have safeguarded because they are our legacy." But having paid for its maintenance for years, he added, "it is time to transfer it to respectful hands, and I have my family's security to think of as well."

Mr. Ahuja said that he did not know when or how the rest of the collection would be sold. (It has received two separate appraisals, but lawyers for Mr. Ahuja, James Frankel and Andrew Ross of Arent Fox in Manhattan, declined to disclose the valuations.)

Mr. Burgee played down the importance of the archive. "It's mostly working drawings and drafting drawings," he said. "We purposely didn't keep design sketches because they weren't good enough. Philip was sensitive that he didn't want his hand drawings shown anywhere."

Ms. MacLear said that Johnson was known for weak drawing skills. He had a "high-concept" sketching style, she said.

But Mr. Ahuja said standard office procedure had been to roll and store all drawings, and that there had been no policy of destroying Johnson's.

So far one significant piece of the collection has been sold, in what Mr. Ahuja's lawyers described as a kind of market test: a seven-and-a-half-foot-tall presentation drawing of the AT&T skyscraper's facade at 550 Madison Avenue, which the Victoria and Albert Museum of London acquired at auction for $70,000 in April.

However the rest of the archive is sold, Mr. Ahuja said, he hopes it will be bought en masse by a single institution so that it will be available to scholars and students. The architect Robert A. M. Stern, dean of the Yale School of Architecture, said he was sorry that even the single rendering had been sold separately. Although he has not seen the materials, he said, it was clear to him that "the worst thing would be breaking the archive up."

This article has been revised to reflect the following correction:

Correction: August 12, 2010

An article on Monday about the newly discovered archive from Philip Johnson's architectural practice misstated the name of one of the institutions that houses collections of his early works. It is the Getty Research Institute, not the "Getty Museum." (The J. Paul Getty Museum and the research institute operate as different programs under the J. Paul Getty Trust.)

http://www.nytimes.com/2010/08/09/arts/design/09archive.html

Beyond the Blockbusters at the Met

By HOLLAND COTTER

Wall Street may be fattening up, but New York's art institutions aren't. There's a conspicuous recessionary logic behind the Metropolitan Museum of Art's two marquee spring-summer exhibitions, one devoted to Picasso, the other to American fashion. Both were homegrown, low-overhead productions, pulled entirely from the permanent collection.

The good news is that self-reliance has worked.

Thanks to the Met's oceanic closets and to its long, shrewd effort to shape itself into a popular entertainment hub, the two exhibitions have been hits, the Picasso in particular — even with B-level art — generating a blockbusterish frisson.

And both are closing soon, on Aug. 15, which means — doesn't it? — that we'll be on short exhibition rations till the new season kicks off in September. No. August is prime time, with the Met full of shows that many of us have had neither the time and stamina nor the healthy curiosity to catch earlier. Manageable in scale, cogent in theme, with material often unfamiliar even to experts, they are some of the hidden highlights of the season.

The six I have in mind span geography and time, from Rajput India to Rococo Europe, from 19th-century Micronesia to 1950s Manhattan. For lovers of luxe, there are gold-threaded Chinese robes and Hapsburgian sauce tureens. Romantics can moon over dolorous lovers and the flowers of yesteryear. Music fans can choose between six-foot-long sacred flutes and a souvenir of the world's most famous drummer. Some of

these items are tucked away in remote corners of the museum; others are right in the general flow. Whether you take them in on separate visits or in one immoderate gulp (my preference) is, of course, up to you.

Major Beauty

Why not start with a shot of clear beauty, which is what you get in "The Prismatic Eye: Collages by Anne Ryan, 1948-54," a modest-size show installed in the museum's 20th-century galleries.

Ryan, born in New Jersey in 1889, was a poet and fiction writer who came to art in her 40s. Divorced and the mother of three grown children, she lived alone in Europe for two years before being forced back to America by the Depression. In 1933 she settled in Greenwich Village, opened a restaurant to support herself and befriended some of the painters, then young, who would later rise to fame as Abstract Expressionists.

Discouraged by the bleak prospects of publishing, she studied painting and printmaking and immersed herself in the new art moving through the city's galleries and museums. She was earning a reputation as a printmaker, but in 1948, at 59, she saw some collages by the German artist Kurt Schwitters and discovered her ideal medium.

Like Schwitters's collages, hers initially featured bits of found text. The earliest piece at the Met incorporates a sugar-cube wrapper from Rumpelmayer's restaurant in a swirl of cut paper, cellophane and string. She moved fairly quickly, though, to nonreferential abstraction, using handmade papers she bought and fabrics she accumulated: strips of worn clothing, ribbons and other sewing basket detritus.

At the same time she was constantly experimenting with shapes (square, rectangle, oval), size (usually notebook size but sometimes bigger) and styles (rectilinear, painterly, biomorphic). She had an appetite for punctuating color — rose red, tangerine, gold, pea green — though some of her most radical late collages are composed primarily of "white" materials: undyed or bleached linens and gauzes, different tones and weights of uncolored paper with which she created subtly toned arrangements of ivories, beiges, silvers and ash grays.

By the time Ryan died in 1954, she had made some 400 collages in six years. The Met owns 23; they're all on view (in uniform institutional frames, alas). Together they offer an accurate gauge of the breadth and sophistication of her art. They also demand that orthodox accounts of post-World War II New York abstraction as a monumentalizing, ego-driven enterprise be rethought. Thirty years ago, the artist Scott Burton wrote that Ryan's collages "remind us how self-defeating we are when we make distinctions between 'major' and 'minor' art." They remind us of this still. And more than ever before, Ryan's time is now.

The Silver Touch

If "The Prismatic Eye" serves as a subtle amuse-bouche to a banquet of small summer shows to come, "Vienna Circa 1780: An Imperial Silver Service Rediscovered" emphatically sets the table for the feast. Organized by Wolfram Koeppe, a curator in the department of European sculpture and decorative arts, it centers on a landmark example of silver service production and one with a cliffhanger history.

Extravagant tableware was de rigueur for aristocratic dining in 18th-century Europe. Formal meals comprised dozens of courses requiring fresh dishes with every zig and zag of the menu.

Tableware was a staple of royal bridal doweries. In 1779 the Empress Maria Theresa of Austria commissioned a silver service for her daughter Marie Christine when she married Duke Albert Casimir of Sachsen-Teschen. The set was made by the master goldsmith Ignaz Joseph Würth. It had more than 350 pieces. It was magnificent, and the newlyweds took it with them to their new Brussels home.

For a little while they led a charmed life. Then came the French Revolution. In 1793 they were forced to return to Vienna, where Marie Christine died within a few years. That the silver service stayed intact and in the family was highly unusual, considering how much cast silver was routinely melted down. After World War II, however, the set was sold at auction and disappeared. In 2002 the Met bought two wine coolers from the set and traced other objects to a private collection in Paris. All the known surviving elements — about a third of the original number — have been united for this show.

A silver service is basically a multipart work of cast, functional sculpture; this one happens to be in a French-Viennese version of Neo-Classical style. This means surfaces encrusted with naturalistic forms in high relief — fish, flowers, veggies, mythological figures — surrounded by almost unbroken decorative patterning. If you consider craftsmanship the measure of beauty, what's here will take your breath away. If, on the other hand, to your eyes conspicuous consumption varies little in form and spirit from century to century and always looks a little gross, you'll be less impressed. Though you will have to admit — anyone would — that this intense concentration of imperial bling must have made for some pretty blinding parties.

Happy Birthday

As it happens, there is a party, polished but not blinding, under way in the Chinese Decorative Arts galleries. It takes the form of an exhibition called "Celebration: The Birthday in Chinese Art," for which Joyce Denney, an assistant curator in the department of Asian art, has scoured the permanent collection for all kinds of auspicious objects, dating mostly from the Ming and Qing Dynasties.

In China birthdays are very much many-happy-returns-of-the-day affairs. Yes, you want to make merry, but mainly you want to live long, and nearly everything in the show reflects that sentiment. Peaches, the fruit of immortality, are everywhere, carved on ink tablets and painted on porcelains. In a hanging scroll from the Ming Dynasty (1368-1644), the tippling courtier Dongfang Suo, who stole the peaches of eternal life from the Queen Mother of the West, clutches the fruit and looks off to one side as if he sensed someone sneaking up from behind.

The Chinese character for longevity (shou) is omnipresent as well, most prominently in a billboard-size silk tapestry woven with shimmering gold thread: it's like a fancy version of a birthday balloon bouquet, and very Qing. And there are multitudes of party pictures, most depicting the 80th birthday celebration of Guo Ziyi (A.D. 697-781), a ruthless Tang Dynasty war hero, who — he must have been as surprised as everyone else — was, at the end of his life, promoted to a god of wealth and happiness.

He's the presiding figure in two panoramic scenes of courtly feasting, one carved on a red lacquer screen, the other painted across 12 contiguous hanging scrolls. But nothing evokes a banquet mood more immediately than the sight, in the middle of a gallery, of a plate piled high with peaches, berries and lychee fruits, supplemented by sprigs of flowers. That the still life looks as orchard-fresh as it must have to the Qing birthday boy who first received it centuries ago is no surprise: the perfect fruits and flowers are carved from amber, jade and bone.

An Indian Epic

Something like the same mortal-to-divine dynamic embodied in the person of Guo Ziyi also animates the vivid exhibition called "Epic India: Scenes From the Ramayana," which has been installed in the Indian Painting Gallery, another off-the-path space that routinely holds ambitious collection shows.

The Ramayana, a Sanskrit epic attributed to the poet-sage Valmiki and dated to around 400 B.C., is at once a moral tale, a devotional tract and a proto-Bollywood epic. It stars a pair of comely stars, Prince Rama and his wife, Sita; a powerful villain in the demon-king Ravana; and a picturesque band of secondary characters, chief among them Rama's younger brother Lakshmana and his valorous retainer, the monkey-king Hanuman.

As the story opens, Rama, Sita and Lakshmana have been sent, for complicated reasons, away from the royal court and into exile. And the plot takes a pivotal turn when Ravana manages to kidnap Sita and spirit her away to the island-fortress of Lanka.

Rama and Lakshmana, assisted by Hanuman and the monkey army he commands, go on the attack. After many skirmishes, setbacks, miracles and acts of derring-do, Sita is rescued; Ravana dispatched; and Rama returns to court to be crowned king.

No Indian story has lent itself so readily to illustration, and the 30 superb paintings and textile pieces here cover some ground in terms of mood and style. Giant demons are sliced and diced in a brilliantly colored 17th-century court painting from Malwa. And a painting from Rajasthan of the final battle between the armies of Rama and Ravana depicts war as it is: a ghastly, slippery, reeking puddle of blood and mashed flesh.

That image is an example of the epic as it might be adapted for a violent video game. But there are other Ramayanas. One is a moral allegory, populated by characters representing the perfect husband, the blameless wife, the loyal servant, the just ruler — personified ideals that are, for better and worse, still honored in India. And there is the Ramayana as romantic tale in which lovers pine for each other in separation, and as a devotional poem in which distressed souls long for God.

Grand, courtly images are well represented in the show, which has been expertly thought through by John Guy, curator of South and Southeast Asian art, and Kurt Behrendt, an assistant curator in the Asian department. One of the most commanding is also one of the smallest: a carved ivory relief, probably a home altar, with the central players taking a bow before an adoring audience of monkeys and holy men. And then there's an 18th-century album painting from the Punjab hills showing Rama and Lakshmana sitting together atop a mountain soon after Sita has been abducted. They don't yet know her fate, whether she is alive or dead; they are desolate. The world sits below them, a vast black orb; a silver moon looks as cold as glass. The image is a little poem of loneliness, as plaintive as the sound of a sitar played far away late at night.

Pacific Overtures

Such soul-stirring aural sensations are the very essence of "Sounding the Pacific: Musical Instruments of Oceania," a fascinating survey in the Michael C. Rockefeller Wing. Certain instruments are familiar, though not everything about them is. We know what a ukulele sounds like. We may even know that it originated as a Portuguese mini-guitar. But who knew that the name means "jumping flea"? It is possible to imagine, from sight alone, the booming tones of a loglike Papua New Guinea slit-gong. But what might the sound be of the marvelous-looking sesando, or tube zither, from Timor in Indonesia? Constructed from a central bamboo column fitted within a ballooning, Frank Gehry-ish resonator of bent palm leaves, it looks ethereal enough to drift away on a breeze. I would not have guessed, had a label not told me, that the instrument used to accompany fatalistic songs that depict life as baffling and brief. And what about the music produced by an

instrument that looks like the opposite of the sesando, the "friction drum" from New Ireland? Squat and thick, studded with watchful little shell eyes and carved with three handlelike tongues forming hollows, it is played by a musician rubbing his moistened palm over the surface. The resulting sound is said to resemble the cry of a bird, and to be the voice of the dead, though you can come up with your own associations after listening to an audio sampling, on the exhibition's Web site.

'Ringo Starr's Gold Drum'

There's one more extra-special sound device in the museum this summer. In an effort to draw visitors to the recently renovated and reopened Musical Instruments Galleries, the Met has temporarily introduced a single charismatic item: a gold-plated snare drum belonging to Ringo Starr.

The drum was given to Mr. Starr in 1964 during the Beatles' first United States tour by the American company Ludwig-Musser Drums and Percussion, in gratitude for his using one of their instruments. Last month Mr. Starr, who recently turned 70, was at the Met to tape a public-television broadcast of "Live From the Artists Den: Ringo Starr With Ben Harper and Relentless7," and agreed to let the museum put the drum on view. Despite its aura, the drum looks modest and meek surrounded by cabinets chockablock with bassoons and oboes, cornets and bugles, not to mention the odd oliphant, ocarina and shofar. But near the drum there's a little label with some history and a Beatles photo, and visitors are queuing up to have their pictures taken in what could turn out to be a high-summer blockbuster show, new-Met style.

THE MUSEUM'S SMALL GEMS

CELEBRATION: THE BIRTHDAY IN CHINESE ART, through Nov. 28.

EPIC INDIA: SCENES FROM THE RAMAYANA, through Oct. 3.

THE PRISMATIC EYE: COLLAGES BY ANNE RYAN, 1948-54, through Sept. 6.

SOUNDING THE PACIFIC: MUSICAL INSTRUMENTS OF OCEANIA, through Jan. 23.

RINGO STARR'S GOLD DRUM, through December.

VIENNA CIRCA 1780: AN IMPERIAL SILVER SERVICE REDISCOVERED, through Nov. 7.

MIDSUMMER TREATS

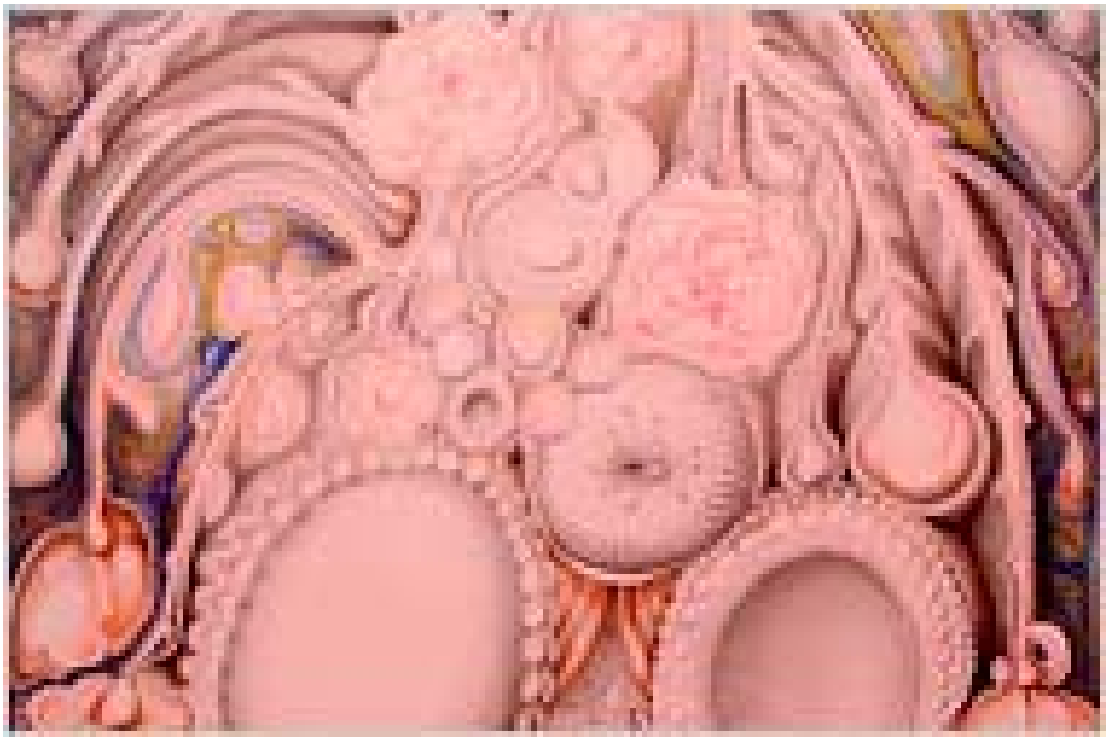
WHAT AND WHERE Small shows at the Metropolitan Museum of Art; (212) 535-7710, metmuseum.org.

IN THE NEIGHBORHOOD For light bites, Alice's Tea Cup, 220 East 81st Street, (212) 734-4832, alicesteacup.com. Central Park Boathouse Lounge: enter at Fifth Avenue and 79th Street, (212) 517-2233, thecentralparkboathouse.com.

http://www.nytimes.com/2010/08/06/arts/design/06met.html

Varieties of Abstraction

By ROBERTA SMITH



Happy birthday, abstract painting! One of the prides and joys of Western modernism is in the vicinity of its first centennial. It's hard to be much more exact, since its invention was a scattered effort extending over years if not decades. Fans of Frantisek Kupka should have celebrated last year; Kandinsky's crowd can uncork the Champagne in 2012. Devotees of Mondrian or Malevich will have to wait a year or two longer.

Of course one can make too much of this anniversary. Beyond the narrow precincts of Western painting and sculpture, abstraction has been a free radical in visual culture for a lot longer than a century, a vital component in ceramics and textiles worldwide, for example, since time immemorial, or in Chinese painting for most of a millennium. Still, within a global history of abstraction, the Western variety has its own substantial chapter, one that is still being written.

Since its inception, abstract painting in the West has given as good as it has gotten. It has spawned styles, schools and opposing camps, not to mention volumes of criticism. It has repeatedly cross-fertilized with representational painting; absorbed found materials and aspects of popular culture; adopted the strategies of postmodern irony and appropriation.

In addition the principles of abstraction have spread to photography and sculpture and beyond — even to the mind-set behind Conceptual Art, with its penchant for systems, categories and repetition that isolate and reorganize, and thereby abstract, aspects of reality. It is worth remembering, when considering the ever-expanding definition of abstract art, that the term refers to the act of abstracting from reality. For whatever

reason, such art — in paint and other mediums — is unusually visible in Manhattan galleries this summer. The shows in question don't always set out to focus on abstraction per se, but that doesn't stop them from providing a lively account of some of its movements.

Miguel Abreu Gallery

The camera — as a tool for creating not so much abstraction but the aura of it — is at the center of "False/Divide: representations of abstraction in a few photographic works," a slightly esoteric but completely intriguing show at Miguel Abreu (36 Orchard Street, Lower East Side). Basically, the works here use different elements of photography to make the world less legible, forcing us to sort through what we're seeing, what we think we're seeing, and what we're thinking.

Liz Deschene's silver-toned photogram is blank, a ghostly modernist monochrome whose main visual incident, in its lower left corner, is a shadow on or crease in the paper; you can't tell which. Eileen Quinlan's silver gelatin print, an angular abstract, seemingly made with light, shadow and perhaps a shard of mirror, is only slightly more substantial. And Zoe Leonard presents two photographs of what appear to be the same tangled bush with berries — one large and in color, the other smaller and black and white — to mind-bending effect. Puzzling out whether they are from the same negative dissolves the images into masses of details.

Sam Lewitt achieves a similar mystery by taking the letters and forms from hot-type printing, photographing them individually, then enlarging and combining the images on a computer. The final assemblagelike composition of perpendicular elements of wood and metal is completely ambiguous in terms of its actual size, weight, function, orientation and vintage, although it resembles one of Irving Penn's elegant, white-ground images.

Moyra Davey's 1990 color photograph "Copperhead #1" features an especially startling enlargement: the head on a Lincoln penny blown up to a height of two feet to resemble a relief. The magnified nicks and dents come across as sculptured texture, introducing the abstracting illusion of an artistic process that never happened.

This piece resonates unexpectedly with Matthew Buckingham's "The Six Grandfathers, Paha Sapa, in the Year 502,002 C.E.," a 2002 work that uses an illuminating timeline and a manipulated W.P.A. photograph to follow the mountain range that includes Mount Rushmore for nearly 70 million years, from its geological past, through its role in American history and into its distant future, when the presidential portraits have worn away like soap, becoming abstract. After reading the timeline detailing the troubled history of this particular stretch of rock, which the Sioux call Paha Sapa, the erosion seems just.

Lisa Cooley Fine Art

At Lisa Cooley (34 Orchard Street, Lower East Side), the equally exceptional "No Barrier Fun" lives up to its nearly nonsensical title (borrowed from a new song by Liars, the ostentatiously dour post-punk band). The show's one photograph — an especially blurry body-print earthwork by Ana Mendieta — provides an uncanny link to the Abreu show (right next door). But otherwise much serious play transpires in mostly abstract paintings, and at every turn we encounter the freedoms (fun) of ignoring or accentuating edges and boundaries (barriers) of all kinds, whether literal, stylistic, bodily or psychic.

Ballast is provided by two older artists: Jo Baer, who reconfigures her signature two-toned Minimalist borders as quasi-legible letters, and Dan Walsh, who is represented by a field of concentric green lines that effectively mines the terrain of Frank Stella's Black Paintings. But most of the work is by refreshingly unfamiliar names.

Using grout, Molly Zuckerman Hartung gives a small green abstract canvas a protective border of tiny stones and bits of glass to poetic effect. Heather Guertin surgically separates stretcher, frame, canvas and image into three separate occasions for painting. Francesca Fuchs makes small, wonderfully wan renditions of even smaller snapshots and drawings, including mats, frames and those frames' shadows, that seem to be fading into the mist, toward abstraction.

In Scott Calhoun's "Emperor Gum," an enormous pale bubble jostles the canvas's edges while ambiguous shapes and forms percolate within its translucent, skinlike expanse. Michael Bauer adds tilelike black-and-white borders to a painterly tangle that evokes the liquidity of Wols and the precision of early Dalí. And Alex Olson's "Weaver" echoes much of all this with admirably relaxed simplicity: thicker white over thinner black on white, finished with some languid scratched lines, looping back and forth.

The show's finishing touch is a continuing work by Peter Coffin in which members of the gallery staff draw circles in colored chalk on the floor around visitors, recording a linear afterimage.

Mitchell-Innes & Nash

Some of the works in "Item" at Mitchell-Innes & Nash (534 West 26th Street, Chelsea) are abstract, others reflect an abstracting state of mind. Organized by Mamie Tinkler, a gallery staff member, it focuses, in the words of the news release, on "lists, arrangements, collections and patterns" — reorganizing reality into things less real.

Mel Bochner's painting "Die" covers a pink surface with synonyms and colloquialisms for the word, in bright cheerful colors. Next to it, Wayne Gonzales's more traditionally abstract painting layers concentric hourglass shapes of white into a hazy reformulation of Op Art. To the other side Roger White's nonrepeating pattern of blue shapes on white suggests a lifetime's accumulation of abstract tchotchkes; next to it, the bottles and vases in a drawing by Giorgio Morandi seem only slightly more specific.

More abstraction of everyday life is seen in Stephen Shore's 1972 photograph of a New York City shop window: a sign in the form of a pointing hand makes the row of five small potted cactuses in front of it look like a chorus line of mittens. Erica Baum reveals the random abstracting powers of the book index — "Nude Figures, Shells, Triumphs" — while reminding us that poetry is but another form of abstraction. Carol Bove makes a paintinglike surface from scores of peacock feathers (eyes only). And the performance artist Michael Smith poses at the center of a group portrait of his students at the University of Texas. It is as if the shapes in Mr. Gonzales's painting have suddenly come into focus.

Anton Kern Gallery

At Anton Kern (532 West 20th Street, Chelsea), Shio Kusaka, a young Los Angeles artist, is making an exciting New York debut with works that deliberately relocate some of abstract art's staples — grids, parallel lines, repeating marks — to ceramics, a medium that has yet to receive its due from modernist art history. Pots, bowls and vases cover the surfaces of two long tables, balancing subtly but insistently between function and nonfunction, sculpture and drawing.

Ms. Kusaka approaches her medium with a Process artist's deliberation, combining and recombining abstract motifs, marking techniques, pale glazes, clay bodies and vessel shapes with a consistent sparseness. Every difference is carefully exploited, as in the contrast, for example, between black clay left plain and matte or glazed shiny black. If the Minimalist painter Agnes Martin had been a potter, she might have made vessels like these. **Around Town**

There is plenty more abstraction around town. In Chelsea, D'Amelio Terras (525 West 22nd Street) is presenting "Spray!" a punchy survey of the use of spray-paint by artists like David Smith, Keltie Ferris, Sterling Ruby and Rosy Keyser, with the star turn being a literally loopy spray painting from 1968 by Dan Christensen. At Tracy Williams Ltd. (521 West 23rd Street), a show called "Daniel Hesidence Curates" presents the work of seven women selected by Mr. Hesidence, a painter, including Kinke Kooi, Carrie Moyer and the newcomer Ji yeon Park. Circles, spheres, ellipses and various orifices abound, but the work is so diverse and strong you don't initially see this formal through line. In a single gesture Mr. Hesidence seems to validate feminist essentialism and kiss it goodbye.

In SoHo you can see more of Ms. Kusaka's ceramics in "Not Extractions, but Abstractions (Part 2)," at Clifton Benevento, a newly opened gallery at 515 Broadway. Jonas Wood contributes meditations on shades of orange in jaunty arrangements of triangles that evoke Christmas trees. Also outstanding are Polly Apfelbaum's small riotously bright floor pieces in polystyrene clay (which can also be seen at D'Amelio Terras).

Back on the Lower East Side "In Here" at Laurel Gitlen (261 Broome Street) begins with another riot: Halsey Rodman's "It's Not Getting Bigger You're Getting Closer," a biomorphic aggregate of aluminum tubing, aluminum foil and wire that sends up 1960s abstract public sculpture from a base painted shades of fluorescent pink and orange. Behind it, three studies silhouette the sculpture on its side against bright colors, in successively bigger versions.

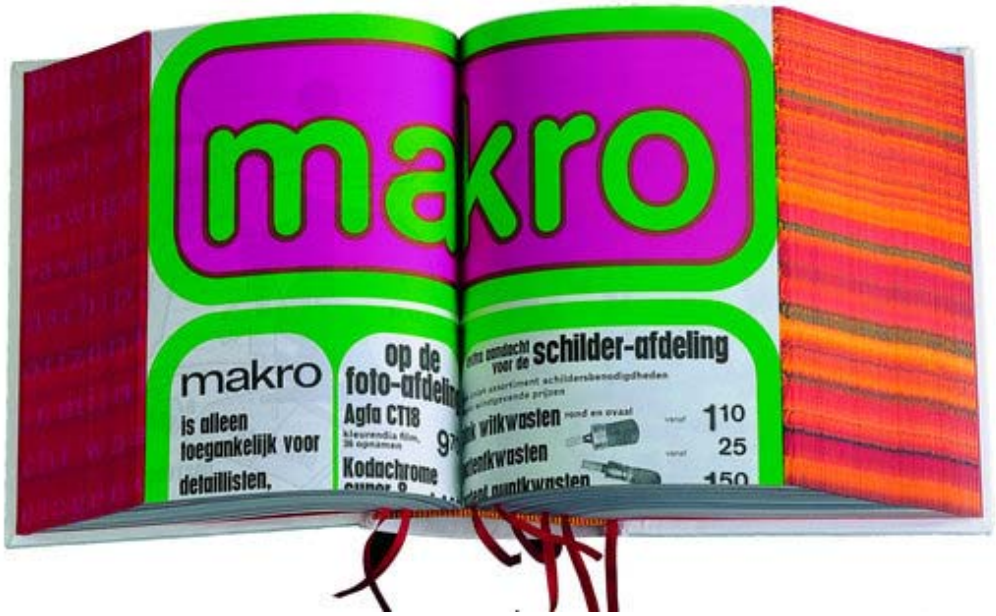
The main focus in "You Were There" at the Rachel Uffner Gallery (47 Orchard Street) is artistic growth. The show juxtaposes one work from 2010 and one from 2005 by each of seven artists of largely abstract inclination. Many developments are for the better. Joe Bradley, for instance, has returned to mucking around aggressively with paint and canvas with terrific results. And Justin Adian has gone from perfectly respectable abstract paintings to bulging painted reliefs that are weirder and more his own.

An energizing place to finish is Markus Linnenbrink's "NOMATTERWHEREYOUGOTHEREYOUARE," a site-specific painting in the tiny storefront gallery Number 35 (39 Essex Street). Mr. Linnenbrink has covered the walls, ceiling and floor with narrow bands of vibrant color that all seem to rush toward a vanishing point in one corner that they never quite reach, at least not in unison. The colors on the floor are often shaded: green to orange, gray to violet. The colors on the walls drip and splatter over one another. It's a great space to stand in and think about abstraction as an infinitely renewal energy source.

http://www.nytimes.com/2010/08/06/arts/design/06abstract.html

A Small Book on a Big Career

By ALICE RAWSTHORN



LONDON — Imagine that you're one of the world's best book designers — some say the best — and you have to design a book about your own work. How would you feel? Excited at having the freedom to do whatever you want? Daunted by that freedom? A bit of both?

What sort of book would you come up with? Whatever you're thinking, I'll bet that it doesn't involve squeezing 704 pages into a "baby" book that's roughly the same size as a small box of matches. Yet that's what the Dutch book designer Irma Boom did with the book she created to accompany an exhibition of her work, "Irma Boom: Biography in Books," which runs until Oct. 3 at the University of Amsterdam Library.

To be precise, she packed those 704 pages into a book that's 2 inches high, 1.5 inches wide and 1 inch thick or, if you prefer metric measurements, 5 centimeters, 4 centimeters and 2.5 centimeters respectively. She bound the result in a bright red cover with the word "Boom" printed on the front in, intentionally, clumsy white letters.

When I first saw "Boom," I presumed that its (lack of) size was a wry commentary on any or all of the following: a) the trend to produce very big, very blingy, often badly designed books; b) the realization that, since the microchip's invention, the size of an object no longer necessarily bears any relation to its power; or c) the threat posed by Apple's iPad, Amazon's Kindle and other electronic readers to the traditional books that Ms. Boom designs so beautifully.

Wrong, wrong and wrong. "A lot of people have asked me about those things, but I didn't think of them," said Ms. Boom, laughing. "The book is small because whenever I make a book, I start by making a tiny one. Usually I make five, six or seven for each book, as filters for my ideas and to help me to see the structure

clearly. I have hundreds of those small books, and am so fond of them. I've always wanted to make one for publication, but no one has ever wanted to do it. And I thought, well, this time, I can."

Size excepted, Ms. Boom, 49, has designed most of her books just as she has wanted. Typically, a book designer works with the text and images selected by the editor and art director, but Ms. Boom prefers to combine all three roles by deciding on the book's structure and choosing the themes and visual material herself. She then obsesses over every element — not just how the book will look, but how it will feel and smell — and invents ingenious ways of achieving the desired effects. One of her books was printed on coffee filter paper. Another was scented to smell of soup. A monograph of the work of the Dutch artist Steven Aalders was made in the exact dimensions of one of his paintings. The page edges of a book on the American textile designer Sheila Hicks were hacked with a circular saw to evoke the fraying edges of her work. The title on the white linen cover of a history of the Dutch company SHV only becomes visible after frequent use. There are 2,136 pages in that book, but no page numbers, to encourage readers to dip in and out.

The page edges were trimmed to depict a field of tulips printed on them when read from left to right, and the words of a Dutch poem from right to left. When Ms. Boom was told that it would take 14 years to make her chosen paper, she invented her own. Her subjects tend to get hooked on her approach. She worked for many years for De Appel, the contemporary art space in Amsterdam, and has had a long collaboration with the Dutch architect Rem Koolhaas for whom she is now designing a book on Metabolism, the Japanese architectural movement. He designed the lettering on the cover of "Boom" as her visual identity.

Another live project is a book on the work of the Dutch product designer Hella Jongerius, which Ms. Boom has organized according to the color of her objects.

"Irma has her own method of working," Ms. Jongerius said. "Sometimes she'll be silent for a few weeks, then she studies intensely, concentrating on every detail. She took my book under her wing and looked at the full picture to make a clear translation of my work, something that's very difficult to do yourself." Back to "Boom," which features images from 226 of the books she has designed since leaving art school in the Dutch city of Enschede in 1985.

They appear in reverse chronological order, starting with the most recent, "Al Manakh Contd.," a collaboration with Mr. Koolhaas, and ending with her first book, a 1986 guide to Dutch museums. Ms. Boom designed it for the government printing office in The Hague, where she worked for five years after graduating, before opening her own studio in Amsterdam. She has included comments on some of the books, which are printed in Plantin, one of her favorite typefaces, which is (just) legible at 5.5 points, roughly half the size of conventional book type. In one comment, she describes the "Sheila Hicks" book as "a kind of manifesto for books." A second dismisses a book on Mecanoo's architecture as "a failure for all involved." Ms. Boom reminisces about how the driver dispatched to take her to Ferrari's headquarters asked her to choose between "fast or slow." Duh! And she recounts how the late American artist Robert Rauschenberg thought her treatment of one of his paintings was "lousy." "Of course, I included my mistakes," she said. "You learn so much from them, and they're always my fault. I could always have said no."

"Boom" isn't among them. The first edition of 3,200 copies has almost sold out and Ms. Boom is now considering whether to print a second edition. "I might make it a bit bigger," she said. "Maybe one centimeter higher for every print run?"

http://www.nytimes.com/2010/08/09/arts/09iht-DESIGN9.html?ref=design

Sketching a Future for Brooklyn Museum

By ROBIN POGREBIN

THOUGH it resides in a prime example of traditional museum architecture — a Beaux-Arts building designed in 1893 by McKim, Mead & White — there is little stale or stodgy about the Brooklyn Museum.

For more than a century the museum has been one of the country's most important cultural institutions, and for more than a decade it has also courted controversy.

And that is by design, part of a considered effort to address the challenges that it, along with many other museums, face: how to appeal to a new generation in a climate of persistent financial pressure and the ambition to grow, to do more, to expand its audience. By some measures it has succeeded. By others, including attendance goals articulated by the museum itself, it has not.

With a stagnant economy magnifying these challenges, The New York Times asked experts with various perspectives, including artists, business executives and museum directors, to take a look at a number of questions that now confront the Brooklyn Museum and others. Is attendance a good measure of museum success? How do institutions build financial support at a time when both donors and the government feel pinched? Should a museum do more to engage its local artists, who, in Brooklyn's case, are an especially vibrant group? And how should the unorthodox approach of the last decade be assessed?

In 1999 the museum created a maelstrom by exhibiting a painting that depicted the Virgin Mary decorated with elephant dung, prompting the mayor, Rudolph W. Giuliani, to threaten to cut city financing. In 2002 it hosted an exhibition featuring props, models, costumes and characters from the "Star Wars" films that struck

some reviewers as particularly lowbrow. And five years ago it added an unapologetically brash, modern glass entrance to the Old World exterior of its building.

More recently it gave away its celebrated costume collection to the Metropolitan Museum of Art and did away with traditional curatorial departments — like Egyptian art, African art and European painting — in favor of "teams" for exhibitions and collections. It included a Louis Vuitton shop in its Takashi Murakami exhibition, including handbags and other items designed by that artist. And it agreed to devote an exhibition this month to the work of whichever unknown artist beats back the challengers on Bravo's reality show "Work of Art."

For many, the museum's often populist efforts have been just the kind of inventive risks necessary to stay accessible to the kind of visitors it has recently shown an ability to attract. The museum's audience, which numbered 340,000 people a year at last count, is now significantly younger and more diverse than it had been, with an average age of 35 and members of minority groups making up 40 percent of its visitors. Others grumble, though, that the institution's approach has undermined its stature, undersold its world-class collections and done little to increase attendance, which museum officials had once hoped would triple. Attendance, in fact, has been flat, even after the museum several years ago introduced First Saturdays — free nights that include music, dancing, food, a cash bar, gallery talks and films — which account for nearly a quarter of its visitors.

Apart from the discussion over its mission and future, the museum, which operates on a $28 million budget, has had many successes in recent years, from educating school children, to mounting critically acclaimed shows and introducing countless visitors to paintings by Gilbert Stuart, landscapes by Bierstadt, the mummy of Demetrios and other works in its permanent collection.

Many of the experts who agreed to assess the museum's efforts were effusive in their support for the institution, whose innovations they embraced. Others suggested changes in its approach.

Many expressed compassion for the challenge faced by the museum's director, Arnold L. Lehman, who confronts these obstacles while working in the shadow of Manhattan and its cultural behemoths like the Metropolitan Museum and the Museum of Modern Art.

Taken together the responses speak to the passionate feelings that continue to be stirred by the Brooklyn Museum. They are not meant to provide a definitive solution or to resolve debate. They are intended to start a conversation.

PHILIPPE DE MONTEBELLO, former director of the Metropolitan Museum of Art

The problem with Brooklyn is that it's competing with the Guggenheim, the Whitney, the Met, MoMA, all the galleries, El Museo del Barrio — you name it. I don't know of any museum so marginalized by its locality and demographic change. The Detroit Institute of Arts and the Cleveland Museum of Art are struggling. But at least those institutions are the one thing in town, so you can still promote them as, "Come and see great works of art."

I'm glad I'm not its director. It's a very difficult job, and I wouldn't rush to blame Arnold Lehman; he's trying his best. But trying to change the nature of the institution so as to accommodate one's conception of popular taste doesn't work.

Part of the turnaround would be to declare, not only rhetorically but also by action, "This is a great museum and an opportunity to see great works of art." The message here is that a major encyclopedic museum, one born like the Met or the Louvre along the values of the Enlightenment, flirts with popularization and the espousal of so-called popular culture at its own risk. Therein lies a paradox. I suspect that, in fact, what most museum visitors crave is some form of uplift, an experience to get them away from the humdrum of daily life in favor of an encounter with something unique, thus unreplicable. They don't just want to step into the museum as they would into a mall, but to experience a real transition from the street to the institution.

I think the current glass entrance defeats that very purpose and the exhilaration felt when a person who wasn't brought up in a mansion is able to walk into a mansion. By taking away the majesty of the entrance, they've taken away the majesty of the experience. I would take it away, if I could.

I would stress the sense of privilege people in the area should feel at being able to see great old master paintings, great American pictures without having to go into Manhattan. Promotion would stress: "You don't have to go to Manhattan to see one of the world's great collections. We have it here in Brooklyn."

When you have a collection of this magnitude — art from most parts of the world, often at a very high level — your responsibility is not just a communal one. Of course you have to emphasize service to the community. But danger always lurks when a museum is regarded first and foremost as an instrument of social engineering. A museum of the stature of Brooklyn should care for and research and publish the collections, which it holds in trust for humanity, and which I have no reason to believe it does not do, but also accompany its collections with programs that are equal to that stature and the obligations that come with it. Great museums are not just for the people who live within 20 miles. You are not the owners. You are the privileged guardians or custodians of the artistic heritage of all mankind.

I cannot believe the community would not rise to the opportunity and joy of seeing great collections displayed properly — as a stated attraction, not an unexpected encounter. I am inclined to be indulgent and indeed to praise Arnold's willingness to experiment and to place the accent on the museum as a Brooklyn institution. The key question is whether Brooklyn really wants something different from everywhere else, something watered down, something slanted more to popular culture than to high culture. Much of this is a matter of style and perception in the message conveyed. The art is there, after all, so perhaps major retooling is to be in the message, not so much the medium. I don't know, and it's easy to talk, isn't it?

KAREN BROOKS HOPKINS, president of the Brooklyn Academy of Music

The museum doesn't deserve a barrage of criticism. Let's face it: When you work in Brooklyn, or anywhere outside of Manhattan, the stakes are simply different. When you have a great show (and I mean great), the place is packed. When you only have a very good show, the place isn't always packed.

Programs like Target First Saturdays are wonderful and help to introduce new audiences to the organization. But when all is said and done, a hit show delivers the goods every time. Is this easy to do? Of course not! The world of art is completely unpredictable, and the cost of presenting a big show can be daunting. Therefore I believe a good programming strategy that won't break the bank is one that focuses on bringing together a combination of new discoveries and blockbusters featuring well-known artists, all within the same season.

After all the talk, however, those of us toiling here in Brooklyn know that you have to earn it every day. Some seasons are just better than others; 365 days a year, no matter what's happening inside, the Metropolitan Museum has thousands of people on its front steps. It's the location, it's the scope of the collection — it's the

Met! But for those organizations outside of the mainstream the world of attendance and financing is a very different place. Although many Brooklyn neighborhoods have had an influx of new residents, the population density and philanthropic capacities of Manhattan remain enormous by comparison. But while our numbers may sometimes be smaller, the demographics are unbeatable: Brooklyn audiences are young, diverse and adventurous, which has enormous positive implications for the future.

I like to think that this struggle to succeed is what pushes us and gives us our edge. It makes working in Brooklyn just a little bit tougher, but, at the end of the day, somehow more rewarding.

WILLIAM POWHIDA, Brooklyn artist

Some of the problems facing the museum may be beyond its control because of the recession and beyond my experience as an artist. What is in its control, and an area I feel strongly about, is its identity, or for a lack of a better term, its "brand." The museum has tarnished its reputation by ceding too much institutional control to outsiders, with Charles Saatchi's "Sensation," the commercial artist Takashi Murakami's boutique and now Bravo's "Work of Art" prize show. These efforts tend to dominate the conversation and de-emphasize the museum's role in otherwise strong, scholarly exhibitions and educational outreach.

I would restore some of the museum's institutional control and relevance by developing a flagship survey show of contemporary art in Brooklyn. The museum has tried that only once in the last decade, with 2004's "Open House," which was unfortunately poorly installed. It was still an important opportunity for the museum to engage one of its greatest assets, artists working in Brooklyn, and insert itself into the conversation about contemporary art that New York obsesses over.

Bushwick and Gowanus both have vibrant artist communities, just to name two, evidenced by the some 300 shows at the recent Bushwick Open Studios. The Brooklyn Museum needs to be part of the debate about contemporary art, not one about commercial tie-ins like "Work of Art." I know there are significant financing and installation challenges posed by surveys, but in the long term it's all about the perception of the museum, one that can be progressive, relevant and home to a world-class permanent collection.

ROCHELLE SLOVIN, director of the Museum of the Moving Image

What's bugging people about the Brooklyn Museum? Is there any good reason not to embrace First Saturdays? If international D.J.'s are O.K. for P.S.1 Contemporary Art Center, and string quartets are judged suitable for late nights at the Metropolitan Museum, then what exactly is the objection to hip-hop and salsa at the Brooklyn Museum? My advice to the Brooklyn Museum: Continue to take excellent care of your treasured collections, hang tough, and pile it on — more great exhibitions, more performances, more joyful noise.

DANIEL SIMMONS JR., chairman of the New York State Council on the Arts

The museum is an incredible institution that continues to be vibrant and innovative. However, it has fallen short in developing a core identity and marketing this effectively. The museum should brand itself as a contemporary-art museum with more shows geared to artists who are defining the global art scene. While this might not garner record attendance, it would produce a stable core audience on which to build. I applaud its public programs, like First Saturdays, but those should be seen as just that, a civic service and not an

attendance and marketing strategy. Revenues should not be the principal driver of programs, and many shows have been perceived to be just that. Not great public relations for a serious institution.

ANN PHILBIN, director of the Hammer Museum in Los Angeles

Attendance is simply one measure in a long list of priorities—some of which are very hard to quantify. For example, how does one measure the impact of showing a young artist for the first time and starting his or her career, or the ramifications of capturing the imaginations of young at-risk school groups?

Furthermore, how is attendance defined? At the Hammer we have begun to understand that our visitor numbers should not be limited to our own box office but might also include the hundreds of thousands of people aroun the world who log on to our Web site, hammer.ucla.edu, to view podcasts of our public programs, or the many thousands currently visiting the Charles Burchfield retrospective at the Whitney Museum of American Art, which the Hammer organized. Are these not all part of a measurable sphere of audience and influence?

MAXWELL L. ANDERSON, director of the Indianapolis Museum of Art

With a national average of 2 percent to 4 percent of art museum revenue coming from admissions, the distracting glitter of crowds is not as material to institutional health as most people assume. Instead of being evaluated for their contributions to research, preservation and education, art museums like the Brooklyn Museum are increasingly expected to be commercial attractions and economic engines.

The museum's future, like that of libraries, universities and other art museums beyond tourist meccas, lies in making a case for government, foundation and individual patronage by being a hotbed of creativity. Not by making a case for the box office.

MICHAEL M. KAISER, president of the Kennedy Center for the Performing Arts

The museum has done more than most arts organizations to build a diverse audience; that may be far more important to its management than increasing attendance steadily each year. In the end it is the mission of the organization that determines how success will be measured.

MARTY MARKOWITZ, Brooklyn borough president

The museum has developed unprecedented audience diversity at a time when so many cultural centers struggle and hire consultants to expand their audiences. It has among the most important permanent collections in the nation and has used its estimable curatorial resources to mount great exhibitions that have traveled to other museums nationwide. Thus, it is both a multicultural gathering place and a tremendous Brooklyn export.

GRAHAM W. J. BEAL, director of the Detroit Institute of Arts

Along with Brooklyn, the Museum of Fine Arts, Boston, and, increasingly, others, the Detroit Institute of Arts has been accused of "dumbing down" and "Disneyfication." I am, from time to time, described as leading the United States' most challenged institution, and it is true that we labor under many adverse conditions. But at least I do not have an art museum that is a world exemplar sitting across the river in Windsor, Ontario. Arnold

is in an invidious position, and has tried to create a very different type of museum on the proverbial shoestring.

BILL IVEY, former chairman of the National Endowment for the Arts

Brooklyn needs to control costs and focus on growing its local audience, perhaps by developing an annual exhibition on a Brooklyn theme. Second, figure out how simultaneously to place the museum's unique collection in front of fine-arts fans everywhere. Mounting strong traditional exhibitions, while serving Brooklyn day to day, means guest curators and touring, touring, touring. Oh, and don't promise to triple attendance anytime soon.

DAVID A. ROSS, former director of the Whitney Museum of American Art

The Brooklyn Museum is far from alone in its attempts to come to grips with a society in which not just change but also the relentless rate of change creates new problems and opportunities daily. Will it make mistakes as it tries one new idea after another? Of course it will. But in the same way that great artists do not fear failure, it continues to push forward, finding new ways of serving its rapidly changing audience. Nothing would be worse than a risk-averse museum, so fully confident that it holds all the answers that it simply bores us to death.

STEPHEN A. SCHWARZMAN, chairman of the Blackstone Group, the private equity firm

To succeed, the museum has to instill the same feeling of pride that New Yorkers feel about other institutions that make this city great, from Central Park to Yankee Stadium. With its collection, among the best in the world, there is no reason why the museum cannot reclaim this role.

WENDA GU, Brooklyn artist

Attendance is the most important and objective measurement of the museum. It is also the only measurement of a museum's success.

LAURIE BECKELMAN, former chairwoman of the New York City Landmarks Preservation Commission

I do not think this is a time to instigate cost-savings measures like cutting hours of operation or public programs. Rather it is a time for trustees to be bold and to contribute at higher levels to ensure that the programs — and the institution — endure. I also believe the museum's future lies in finding ways to get international visual artists to come to Brooklyn.

KIKI SMITH, artist

Attendance is not necessarily a good measure of museum success. The quality of its collection, its administrative vision, the depth of its scholarly programming and its curatorial direction are. The nature of capitalism is dependent on growth, but it is not inherently in a museum's interest to expand.

PETER C. MARZIO, director of the Museum of Fine Arts, Houston

The Brooklyn Museum is pioneering a new path that many older encyclopedic museums will have to follow if they want to survive. It is transforming itself into an ecumenical museum by focusing its collections and programs on the diverse neighborhoods of Brooklyn.

By looking closely at Brooklyn, by exploring the ideals and values of its citizens, the museum is opening a dialogue that is creating a sense of community ownership. Progress is slow and uneven, but this is a new path with few directional signs. To judge the results by attendance is to miss the new trees for the forest.

One example is the free Target First Saturdays event held on July 3. A record 24,000 people entered the museum. The dynamics were incredible. Diverse patrons interacted to create a beautiful portrait of Brooklyn. This is a new paradigm. Critics who denounce this as populism (a word that somewhere along the way has become negative) miss the point. The museum does not have a large endowment or sufficient government financing, nor does it have the cash flow provided by millions of tourists. It cannot ignore the grass roots of its communities because those communities are the base audiences.

Will the museum survive following this path? I will bet that not only will it survive these difficult economic times, but it will also mutate into a new type of museum that will grow beyond anyone's imagination.

RICO GATSON, Brooklyn artist

Some of my most amazing art experiences have been at the museum, both as an exhibiting artist and as a visitor to the spectacular collection of Egyptian art and shows like "Andy Warhol: The Last Decade," "Kiki Smith: Sojourn" and "Basquiat." Brooklyn is host to the world's most vibrant group of artists, and it would make sense for the museum to devote itself to providing a forum for these contemporary artists. High-profile exhibitions like the Whitney Biennial could draw from this pool and stimulate interest, which could energize this fine institution.

http://www.nytimes.com/2010/08/08/arts/design/08museum.html?ref=design

What Does It Mean? Artists Will Explain

By STEVEN McELROY

EVER stand in a museum or gallery looking at a work of art and wonder: "Gee, what were they thinking?" Some artists are willing to answer that question in person, and dozens, including the photographer Tom Steele, the multimedia artist Avital Oz and the painter Roseline Koener, will meet participants in a self-guided tour of artists' studios in the greater Westhampton area next weekend. The tour is being presented for the second year by Family Counseling Services in Westhampton.

"It's great for people to come into these studios and see how the art is created and get to speak to the artist directly," said Candyce Brokaw, a participating artist. "It's what everybody wishes they could do when they go to a museum."

Ms. Brokaw is not only a participant: the tour was her idea, she said in a recent telephone interview. She was inspired by the annual tour run for the past 25 years by the Artists Alliance of East Hampton. "I always felt that our area had a lot of very good artists that needed to share their art with the community as well," Ms. Brokaw said.

With the help of a fellow artist, Pam Capozzola, Ms. Brokaw started the newer tour, which covers the area from East Quogue to East Moriches. Visitors may drop by any or all of 18 locations, including more than a dozen private studios and galleries, like the Full Moon Arts Center, where several artists will be grouped. About 50 artists will participate, and many will be working.

Proceeds from the tour benefit Family Counseling Services, which provides a variety of mental health services with fees on a sliding scale based on income.

The artwork on display — and for sale — will be diverse, Ms. Brokaw said. "We have potters, we have woodworkers, we have photographers, we have traditional oil painters," she said. Her own work, she added, is not exactly traditional. "I'm a visionary artist," she said, "a self-taught, outsider artist."

"My stuff is really out in left field," she added. But next weekend, she may be willing to explain some of it.

Greater Westhampton studio tour, Aug. 14 and 15, 11 a.m. to 4 p.m. Tickets, $35, at familycounselingsvc.org; at Galerie BelAge, (631) 288-5082; and at a reception at Full Moon Arts Center, East Moriches, on Aug. 13, 5 to 7 p.m.

http://www.nytimes.com/2010/08/08/nyregion/08spotli.html?ref=design

After the Internet, There's Always Art

By ALEX WILLIAMS

TIM NYE, the bon vivant, Park Avenue heir and Chelsea gallery owner, has a theory about art openings. "You've got to do something that makes them say 'Wow.' "

By that standard, the festivities for Swell, a three-gallery exhibition on surfing-inspired art that opened last month, lived up to expectations.

This was no typical art opening, in a windowless white box with chablis in plastic cups. Instead, the post-opening party crammed 250 scruffy artists, well-dressed buyers and art world insiders onto a 108-foot wooden Turkish sailing yacht moored on the Hudson River. A live band thundered funk-inflected free jams, while kegs flowed. The artist Norton Wisdom created a "live painting" on a sheet of translucent vellum illuminated by stage lights.

Always near the center of the action, sporting a broad mustache and chin puff, was Mr. Nye. "People are so jaded," he said, shouting over the band while he leaned against the port railing. "You have to make it a happening."

That seems to be his specialty. But Mr. Nye is not your usual scion of a New York real estate fortune, going about town, quietly sprinkling money around art fairs and museum boards. He has always tended to make big professional statements. In the 1990s, he earned millions of his own, as a high-flying dot-com entrepreneur, when the Web was in its unprofitable infancy.

And when it comes to the arts, Mr. Nye is more interested in nurturing an art scene, and creating a space for artists and benefactors to intermingle, than in just amassing a collection. In 1991, he founded the Thread Waxing Space, a contemporary-art gallery and performance site in SoHo that once featured a collaboration between Beck and his grandfather Al Hansen, a noted Fluxus artist.

These days, however, he is focusing his considerable resources on Nyehaus, a gallery he started in 2002 at the venerable National Arts Club, in a Gothic Revival mansion in Gramercy Park where Mr. Nye also maintained a duplex apartment. In addition to showcasing mid-career artists, Mr. Nye incorporated live music. Past performers include Rufus Wainwright and Laurie Anderson.

Mr. Nye left the club last year to be closer to the Chelsea art scene and moved the gallery to a four-story brownstone on West 20th Street, which functions as much as a clubhouse for art friends as a commercial gallery.

Nyehaus events are usually invitation-only, rare for the art world. Many are thematic sit-down dinners for up to 100 guests, including serious collectors. A dinner in May in honor of the late artist John Altoon featured an Armenian feast — a nod to Mr. Altoon's origins — and belly dancers.

"It's much more a whole evening built around art," Mr. Nye, who is now 44, said the other day, sprawled across a sofa in his West Village town house, which he also moved to last year. He wore pink corduroy pants and a T-shirt, taking drags on an American Spirit cigarette amid half-empty wine and cognac bottles from a dinner party the night before.

"I was always interested in showing art in a more domestic environment," he added. "It's more fun to see art in a way you might live with it if you bought it." As he spoke, a Vietnamese pot-bellied pig, Wally, which belongs to his 9-year-old daughter, Moppy, tapped its hooves across the floor, which was "painted" with colored vinyl tape in a rainbow pop-art geometric pattern by the artist Jim Lambie.

Life seems good for Mr. Nye these days, but it's a far cry from his high-tech days, when he seemed poised to become one of Silicon Alley's breakout moguls, a Mark Cuban of the city's very own.

His most promising venture was SonicNet, a pioneering online bulletin board that grew into a kind of one-stop shopping site for all things alt-rock, offering music news, chats with artists, CDs for sale, Internet radio, and even some downloadable music, years before iTunes.

Even then, he never veered far from the arts. Among his many side projects, he leased a former vaudeville house on Houston Street with plans to open it as the Sunshine Theater and stream live shows there over SonicNet. (When his company failed to secure a liquor license, the concert hall became a cineplex, which Mr. Nye maintains a stake in today.)

In 1998, he started Alltrue.com, a Web site that allowed users to freely upload any videos — seven years before YouTube. "I wanted to create Nye-a-com," Mr. Nye said.

He wasn't completely joking. His grandfather, Harold Uris, and great-uncle Percy amassed one of the city's great postwar real estate fortunes, building skyscrapers in the 1950s and '60s. Mr. Nye's own empire, however, never quite came together, in part because many of his ideas were premature.

To be fair, some of his ventures did end up making a fortune — just not for him. In 1997, Mr. Nye and his partners sold SonicNet for $35 million, he said. Not bad, until you consider that two years later, SonicNet was a centerpiece of a deal between a subsequent buyer and MTV Networks that some analysts at the time valued at more than 10 times that amount. The prince of the city's tech geeks looked like the King of Coulda.

Looking back, Mr. Nye said that he spread himself too thin — a lesson he is now trying to apply to his gallery. Until recently, for example, he curated each show as a one-off, reflecting his enthusiasm of the day, rather than cultivating a stable of artists.

During the last year, he has narrowed his curatorial focus to a collection of California minimalists and assemblage artists from the 1960s, including Larry Bell, Ed Moses and Billy Al Bengston, who coalesced around the legendary Ferus Gallery in Los Angeles.

The Ferus artists already have their place in art history, the subject of a recent documentary, "The Cool School," and were featured in a 2006 retrospective at the Pompidou Center in Paris. But the scene was largely ignored by East Coast critics and collectors in its heyday, Mr. Nye said, so he is working to advance their reputation by collecting their work, organizing shows and spreading the word among his well-heeled and plugged-in circle of friends.

That also means more boozy, laughter-filled dinner parties. He started renting a small complex of cottages on Electric Avenue in Los Angeles , which he travels to twice a month, and invites artists affiliated with Ferus, now in their 70s, to socialize in his garden. "It became a whole project to rebuild a community and relaunch a movement," he said.

Yes, the stakes are lower than they were in the tech world. "It's not a billion-dollar idea, like SonicNet," he said. But so is the pressure.

Mr. Nye, after all, missed out on multimillions in his tech career, thanks largely to bad timing. But in the art world, he said, you "create your own timing."

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