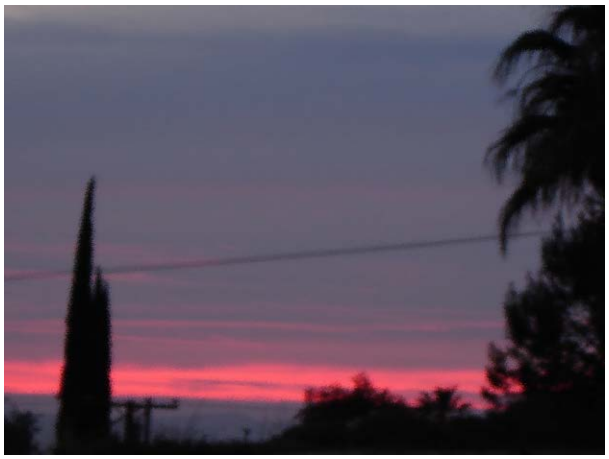
For my December 2006 diary, go here.

Diary - January 2007

John Baez



At the end of December there was a big ice storm in the midwest of the USA. My student Toby Bartels felt the brunt of it: he lives in Nebraska now.

In January it was cold through much of the country, but not here in Riverside. Except for a brief and devastating cold snap starting on the 15th, it was really warm and dry. The pictures above tell the story.

From January 6th to 15th I was in Toronto, where I helped run a workshop on *n*-categories. It was great seeing a lot of my friends! You can see photos from this workshop, and read a description of it.

On the 13th, Bruce Bartlett did an interview of Urs Schreiber and me, focusing on the history of our blog with David Corfield - the *n*-Category Café.

I made it back just before a big snow storm hit Toronto.

For my February 2007 diary, go here.

Eternity is in love with the productions of time. - William Blake

baez@math.removethis.ucr.andthis.edu

home

For my January 2007 diary, go here.

Diary - February 2007

John Baez

February 4, 2007

I didn't get much time to make diary entries last month, and I guess I just wasn't in the mood! Lisa and I enjoyed restoring the house to peak performance upon her return from Shanghai — I kept it reasonably clean in her absence, but I'm not the sort to bake bread, plant lavender and thyme, or shop for a new Belgian waffle maker in her absence! Left to my own devices, I usually choose minimalist efficiency over charm. I'd rather spend all my time exploring the realm of abstract thought patterns: math, physics, music. But a diet solely of this is not what makes me the happiest. A little balance is better.

We're getting married on the 17th of this month. In a way it's no big deal, since we'll have been together 20 years this April — and we'll have the big party not on our wedding but on April 1st, our official anniversary. Anyone can have a wedding; 20th anniversaries are worth a bit more.

But, getting married is turning out to be a pleasant opportunity for doing fun silly things together, especially since we're avoiding most of the stressful hoopla. For example, shopping for rings has awakened my long-neglected alchemical fondness for rare elements. If it weren't so decadent, I would have gotten a ring made of platinum! It's delightfully dense, produced only by supernovae:

Tungsten has its own charms, as does titanium — cheap and light, but not something you see every day. But, after some thought we wound up ordering mokume rings, with a wood-grain pattern of gold and steel laid on a titanium backing. Mokume is a Japanese technique which apparently involves repeated folding of layers of metal, akin to how samurai swords and Damascus steel are made:

- Hiroko Sato Pijanowski and Gene Michael Pijanowski, Wood Grained Metal: Mokume-Gane, Society of

American Silversmiths.

February 7, 2007

The argument about global warming is over. Now the losers are trying to rewrite history.

Today, White House officials began some serious backpedaling. They put out a letter saying that "Beginning in June 2001, President Bush has consistently acknowledged climate change is occurring and humans are contributing to the problem." They also claimed that "Climate change has been a top priority since the president's first year in office."

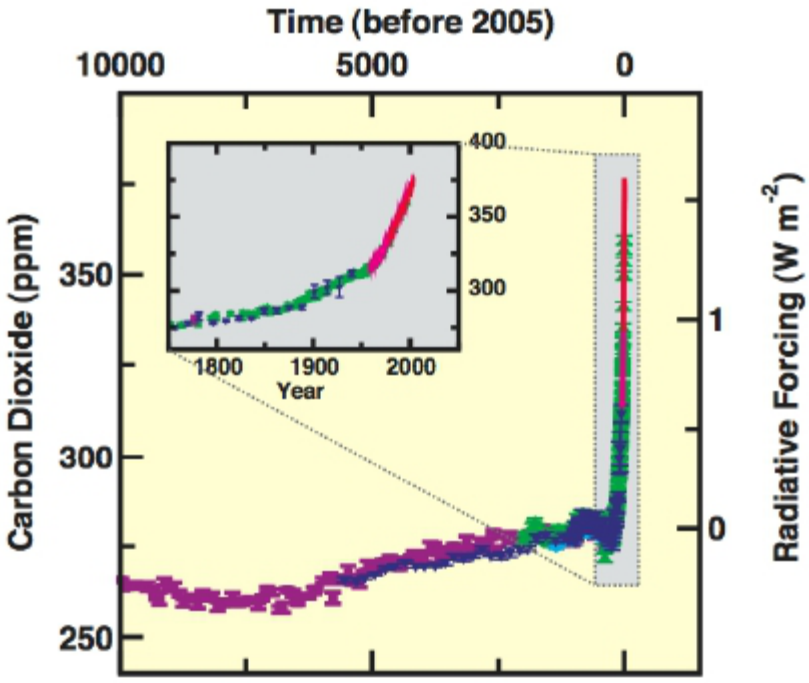
A week ago, White House spokesman Tony Snow said, "Perhaps folks have not taken notice of the fact that this is an administration that's been keenly committed both to environmentalism and conservationism from the start." He added: "The long national slumber may be approaching an end."

Hilarious — but good news in its own way. We can't expect any real action on the environment from the Bush administration. They'll continue to drag their heels as best they can. But at least they've realized it's hopeless to publicly deny the reality of human-induced climate change. Now the best excuse for inaction is claiming that the situation is hopeless.

Perhaps this report was the nail in the "climate skeptics'" coffin:

- UN Intergovernmental Panel on Climate Change, *Climate Change 2007: The Physical Science Basis — Summary for Policymakers*.

Here's the problem in a nutshell:



The consequences? See these temperature projections for the years to come. The lowest one is where, due to some miracle, CO_2 emissions are held constant starting now:

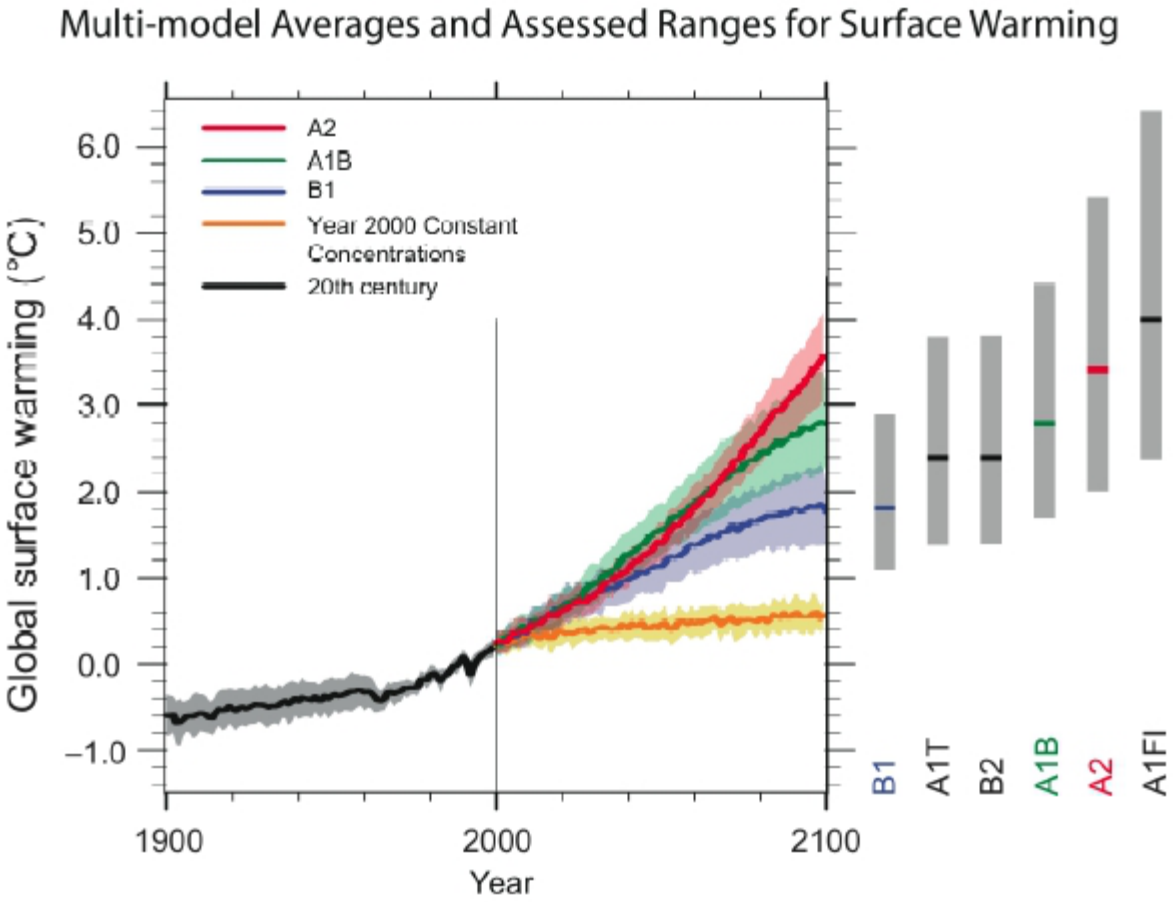
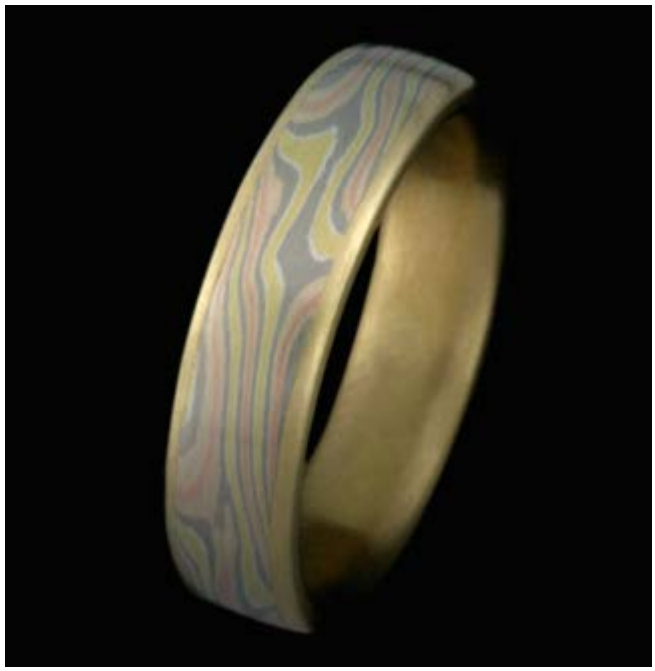


FIGURE SPM-5. Solid lines are multi-model global averages of surface warming (relative to 1980-99) for the scenarios A2, A1B and B1, shown as continuations of the 20th century simulations. Shading denotes the plus/minus one standard deviation range of individual model annual averages. The orange line is for the experiment where concentrations were held constant at year 2000 values. The gray bars at right indicate the best estimate (solid line within each bar) and the *likely* range assessed for the six SRES marker scenarios. The assessment of the best estimate and *likely* ranges in the gray bars includes the AOGCMs in the left part of the figure, as well as results from a hierarchy of independent models and observational constraints. {Figures 10.4 and 10.29}

February 9, 2007

We picked up our mokume wedding rings. They're nice! I couldn't really photograph them, but they look a bit like this:



February 10, 2007

We spend the day cleaning up the yard, planting herbs (lavender, savory, purple sage, thyme), flowers (California poppies and wildflowers) and ground cover (creeping thyme) while a fellow worked on our broken sprinkler system, and his assistant cleared out dried leaves and accumulated brush.

I spent a while thinking about how I really didn't want to be doing this... mainly because all this work was our attempt to *recover* from a hot summer with a broken sprinkler system and an inattentive house guest, followed by a frosty cold snap in January that killed a lot of the lantana and morning glory.

Planting a garden is an act of optimism.

Clearing away plants that have died from drought or frost is a lesson in the mortality of all things.

After a while I got happy: with four of us working away, things were improving noticeably. I started thinking about the look of a well-run, active household - or even better, a farmhouse. It's not perfectly neat and clean. Stuff may be strewn around. But it's there for a purpose - it doesn't lie around forever, gathering dust. The house hums with interconnected webs of activity. It's like an ecosystem. There are patches that get neglected for a while... but eventually a spring cleaning comes along and whips them into shape.

My mother is a perfectionist who likes the house to be as clean as a museum. As I kid I rebelled against this "esthetic totalitarianism", but I had trouble envisioning the alternatives - all that came to mind were sloppiness and minimalism, and I chose the latter. It took me a while to discover the robust charm of an active house.

February 11, 2007

The cool thing about this photo:

is that it's not!

It's a drawing by Vija Celmins. She does amazing work. She's having a retrospective at the Hammer Museum in Los Angeles from January 28th until April 22nd, and I hope I have the time to go see it.

- Public Broadcasting System, Vija Celmins: biography, documentary film.
- UCLA Hammer Museum, Vija Celmins: a drawings retrospective.

February 12, 2007

I've been made a member of the Foundational Questions Institute. This is an organization that seeks:

> To catalyze, support, and disseminate research on questions at the foundations of physics and cosmology, particularly new frontiers and innovative ideas integral to a deep understanding of reality but unlikely to be supported by conventional funding sources.

Since I think fundamental physics is stuck, this seems like a good thing to me.

Vernor Vinge is talking at the Long Now Foundation on Thursday February 15th. Stewart Brand writes:

> Science fiction writer Vernor Vinge invented the concept that dominates thinking about technology these days. He called it "the Singularity" — the idea that technology (computer tech, biotech, nanotech) is now accelerating so exponentially that it will lead to a massive, irreversible, and profoundly unpredictable transformation of humanity by mid-century.
>
> This Thursday evening Vinge will challenge his own idea for the first time: "I have some plausible, non-singularity scenarios that get us into a human-scale world with long time horizons. I'll describe the near-term peculiarities I see for such scenarios and then discuss what such a world might be like across ten or twenty thousand years. Finally, I'd like to talk about dangers and defenses related to these scenarios."

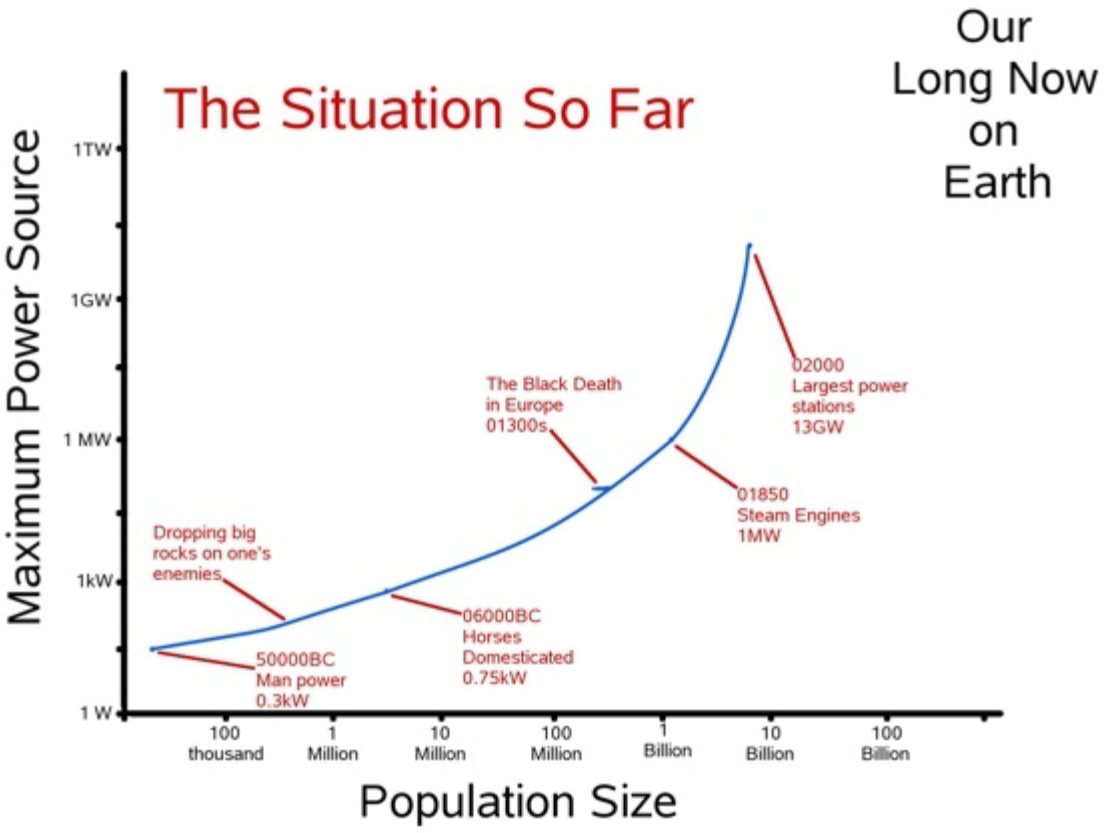
February 15, 2007

I've talked about Vinge's Singularity scenario a number of times in this diary — for example, on October 2nd, December 5th, and December 6th last year. Today Vinge gave a talk on this topic:

- Vernor Vinge, What if the Singularity does NOT happen, talk at the Long Now Foundation.

Here's Stewart Brand's summary:

> Vinge began by declaring that he still believes that a Singularity event in the next few decades is the most likely outcome — meaning that self-accelerating technologies will speed up to the point of so profound a transformation that the other side of it is unknowable. And this transformation will be driven by Artifical Intelligences (AIs) that, once they become self-educating and self-empowering, soar beyond human capacity with shocking suddeness.
>
> He added that he is not convinced by the fears of some that the AIs would exterminate humanity. He thinks they would be wise enough to keep us around as a fallback and backup — intelligences that can actually function without massive connectivity! (Later in the Q&A I asked him about the dangerous period when AI's are smart enough to exterminate us but not yet wise enough to keep us around. How long would that period be? "About four hours," said Vinge.)
>
> Since a Singularity makes long-term thinking impractical, Vinge was faced with the problem of how to say anything useful in a Seminar About Long-term Thinking, so he came up with a plausible set of scenarios that would be Singularity-free. He noted that they all require that we achieve no faster-than-light space travel.
>
> The overall non-Singularity condition he called "The Age of Failed Dreams." The main driver is that software simply continues failing to keep pace with hardware improvements. One after another, enormous billion-dollar software projects simply do not run, as has already happened at the FBI, air traffic control, IRS, and many others. Some large automation projects fail catastrophically, with planes running into each. So hardware development eventually lags, and materials research lags, and no strong AI develops.
>
> To differentiate visually his three sub-scenarios, Vinge showed a graph ranging over the last 50,000 and next 50,000 years, with power (in maximum discrete sources) plotted against human population, on a log-log scale. Thus the curve begins at the lower left with human power of 0.3 kilowatts and under a hundred thousand population, curves up through steam engines with one megawatt of power and a billion population, up further to present plants generating 13 gigawatts.



His first scenario was a bleak one called "A Return to MADness." Driven by increasing environmental stress (that a Singularity might have cured), nations return to nuclear confrontation and policies of "Mutually Assured Destruction." One "bad afternoon," it all plays out, humanity blasts itself back to the Stone Age and then gradually dwindles to extinction.

His next scenario was a best-case alternative named "The Golden Age," where population stabilizes around 3 billion, and there is a peaceful ascent into "the long, good time." Humanity catches on that the magic ingredient is education, and engages the full plasticity of the human psyche, empowered by hope, information, and communication. A widespread enlightened populism predominates, with the kind of tolerance and wise self-interest we see embodied already in Wikipedia.

One policy imperative of this scenario would be a demand for research on "prolongevity" — "Young old people are good for the future of humanity." Far from deadening progress, long-lived youthful old people would have a personal stake in the future reaching out for centuries, and would have personal perspective reaching back for centuries.

The final scenario, which Vinge thought the most probable, he called "The Wheel of Time." Catastrophes and recoveries of various amplitudes follow one another. Enduring heroes would be archaeologists and "software dumpster divers" who could recover lost tools and techniques.

What should we do about the vulnerabilities in these non-Singularity scenarios? Vinge's main concern is that we are running only one, perilously narrow experiment on Earth. "The best hope for long-term survival is self-sufficient off-Earth settlements." We need a real space program focussed on bringing down the cost of getting mass into space, instead of "the gold-plated sham" of present-day NASA.

There is a common critique that there is no suitable place for humans elsewhere in the Solar System, and the stars are too far. "In the long now," Vinge observed, "the stars are not too far."

Stewart Brand

February 16, 2007

Tomorrrow is the big day — Lisa and I are getting married! It should be lots of fun. We're having a small ceremony with a few good friends, and then going out to dinner. The best part is that, having been a couple for almost 20 years, and having lived and worked in Riverside together for almost 10, we're not at all nervous about it all.

For lots of people, getting married feels more like this:

In case you're wondering, the fool in this movie is using a wingsuit.

On a wholly different note, here's an interesting free book on sustainable development:

- Lester R. Brown, *Plan B 2.0: Rescuing a Planet Under Stress and a Civilization in Trouble*, Earth Policy Institute, 2006.

February 17, 2007

Lisa Raphals and I got married today!

In a small ceremony in our back yard, our friend the anthropologist Al Fix served as solemnizer, as shown here. Also attending were his wife Betsy, my aunt Marilyn Goudzwaard, and our friend Lothar von Falkenhausen. Our other relatives were unable to attend. But that's okay: the big party will take place later this year, on our 20th anniversary of being together — April Fool's Day!

After the ceremony we had dinner at the Mission Inn Restaurant.

February 18, 2007

Today we're having our big annual party celebrating the Lunar New Year.

According to the Chinese lunisolar calendar, it's the end of the Year of the Dog, and the start of the Year of the Pig. The lunar calendar inevitably drifts away from the solar one, because there are 12.368 lunar months per year. So, occasionally they need to stick in an extra "intercalary month". That caused this Year of the Dog to officially have "two springs" &mdash so it was especially auspicious for marriage!

That's why we got married yesterday: we wanted to do it before the Year of the Dog ended.

(Don't worry; I don't actually believe in this stuff. But, they say it works even if you don't believe in it.)

With the help of a bevy of Chinese grad students, we're making several hundred jiaozi — the traditional Chinese New Year's dumplings:

February 19, 2007

My student Derek Wise, who is finishing his thesis this Spring, just got a postdoc job at the math department of U. C. Davis! And my student Jeffrey Morton, who is also finishing up, got a job at the University of Western Ontario! Hurrah!

For their theses, Derek and Jeff are both working on a problem that's exercised me for years: seeing BF theory as an extended topological field theory in all dimensions, and understanding its relation to quantum gravity. Derek got pulled in the direction of geometry; Jeff got pulled in the direction of *n*-categories, so a casual observer might not even notice that they're working on the same subject. But they are! And, I hope this becomes clearer in their future work. They may wind up doing other things. Derek will probably be talking with Greg Kuperberg about quantum topology and Steve Carlip about quantum gravity, while Jeff will be talking to Dan Christensen about quantum gravity and categories, and also visiting the Perimeter Institute. All this could be just what they need to dig deeper into the topics touched on by their theses... or they could move in other directions.

Another student is leaving me as well: Mike Stay. He hasn't even finished his qualifiers yet, but he's already been doing excellent work on category-theoretic logic and quantum computation. Unfortunately, he has a family to support, and they're going broke on the salary we give our grad students. Since he understands cryptography and computer security issues, he was able to get himself a job at Google with an eye-poppingly large salary. He may continue working with me from afar.

All this will slash the number of my grad students here at UCR from 5 to 2. Right now this seems like a good thing: I'm feeling overworked, tired and burnt out. It's not just because I have lots of students: this quarter I'm the graduate recruitment advisor and serving on some hiring committees. I'm teaching classes on quantization, computation, and algebraic topology. I just got married! I just threw a huge party. Every week I discuss math with James Dolan, Alissa Crans and Danny Stevenson. I'm blogging heavily. And, I'm trying — with little success — to finish up 3 big papers. No, 4.

All these things are individually lots of fun. But, I need more time to do... nothing in particular.

February 22, 2007

Lisa's left yesterday (Wednesday) to give a talk at Penn State, and she's coming back on Sunday. So, I have a bit more spare time. Last night I had fun listening to some of the nasty music Lisa doesn't like &mdash like this album:

I even added it as an entry to my list of favorite music. I don't think belongs up there with Bach, but it's good, and

eventually my list will be a lot longer, so it will fit in.

February 23, 2007

On December 2nd I wrote about a virtual reality environment called "Second Life". Here's an update on that:

> **Virtual Loses its Virtues**
>
> By Alana Semuels, Los Angeles Times Staff Writer
> February 22, 2007
>
> Like any pioneer, Marshal Cahill arrived in a new world curious and eager to sample its diversions. Over time, though, he saw an elite few grabbing more than their share.
>
> They bought up all the plum real estate. They awarded building contracts to friends. They stifled free speech.
>
> Cahill saw a bleak future, but he felt powerless to stop them. So he detonated an atomic bomb outside an American Apparel outlet. Then another outside a Reebok store.
>
> As political officer for the Second Life Liberation Army, Cahill is passionately committed to righting what he considers the wrongs of a world that exists only on the computer servers of Linden Lab in San Francisco.
>
> Linden is the company behind Second Life, a virtual world in which Internet users act out parallel fantasy lives. They date. They build houses. They work. Some players support themselves in real life by selling goods or services in the game.
>
> Some see the space as a utopia free of real-world constraints, where they can build their vision of a perfect realm from scratch. It's a place where denizens can reinvent themselves as a supermodel or a rodent, own an island or fly, no plane necessary, to a virtual Grauman's Chinese Theatre.
>
> In the last year, the number of people who had visited Second Life skyrocketed from 100,000 to 2 million. As the population grows, early denizens are learning the truth of Jean-Paul Sartre's observation "Hell is other people."
>
> The website is facing the problem that many would-be utopias faced before it: When building the ideal world, it's impossible to change while remaining perfect in everyone's eyes.
>
> Cahill and his compatriots say they don't necessarily mind the new residents, but they want more influence in deciding the future of the virtual world. Most important, they want Linden Lab to allow voting on issues affecting their in-world experience.
>
> "The population of the world should have a say in the running of the world," Cahill said during an in-world interview. Cahill is this participant's online name, incidentally. He refused to reveal his real-world name for fear of banishment from Second Life.
>
> The army has staged a number of protests in Second Life to publicize its position. Three gun-toting members shot customers outside American Apparel — bullet wounds in Second Life are not fatal but merely disrupt a user's experience &mdash and Reebok stores last year.
>
> Then they stepped up the campaign, exploding nukes, which manifested themselves in swirling fireballs that thrust users at the scene into motionless limbo.
>
> Cahill said the group targeted in-world corporate locations to draw real-world attention to its cause.

> Long-term Second Life residents have given Cahill and his conspirators money to buy virtual guns and other weapons. Cahill says he believes that 80% of long-term residents support his cause.
>
> Cahill, an entrepreneur who splits his time between London and San Francisco in the real world, compares himself to John Adams, the second U.S. president. Adams would have been considered a terrorist by his foes, Cahill said, because he helped lead the American Revolution. The Second Life Liberation Army, he said, is just trying to make the world a better place.
>
> [....]

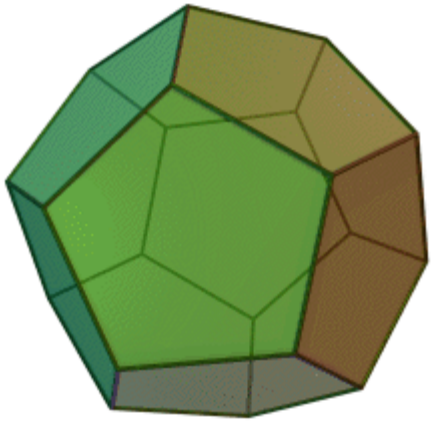
The story goes on to explain that Cahill and others are protesting the arrival of real-world corporations in Second Life. Companies are starting to do this because it makes them look cool. Linden Lab likes it, because big companies have the money it takes to help keep the game going. According to Peter Ludlow, editor of *Crypto Anarchy, Cyberstates, and Pirate Utopias*, chain stores such as American Apparel are being dropped into "this fantasy world with unicorns and flying elephants. It's an eyesore." Some disgruntled residents are moving on to new sites, such as Multiverse. And so it goes...

For more try these:

- *Second Life Liberation Army* blog, including full text of the above LA Times article.
- *Open Source, Open Genomics, Open Content* blog, including interview with Second Life's Philip Rosedale on the arrival of big business in Second Life.

February 24, 2007

A few weeks ago I got an email from a secretary at the Dartmouth College math department, saying I'd received a small package there. She only knew about me because I'd given a public lecture there last fall, called Tales of the Dodecahedron.



She said the package was from England, originally addressed to:

John Baez,
Mathematician,
University of California,
Irvine, USA

Of course I'm at UC Riverside, not UC Irvine. Someone had crossed out this address and written:

John Baez
Department of Mathematics

6188 Kemeny Hall
Dartmouth College
Hanover, NH
03755-3551

She had no idea who did this, or why. Did some postal worker, or some mathematican at Irvine, know I'd given a talk at Dartmouth? That's the only explanation I can dream up!

She said the package was a CD from one "Celeste de Vine", and that she'd forward it to me.

Anyway, I got the package a while ago. It contains a letter:

> Dear John,
>
> Please find enclosed a novel, "Mr. Grumles' Dream", that is about a 14 year old girl who is learning to overcome her dyslexia by writing a book about a Theory of Everything. Her mentor in the story, a man who has a keen interest in the Nature of Reality, is also dyslexic, as indeed, is the author. The work is an attempt to give a rather black comic insight into the dyslexic mind for those who do not suffer from this affliction, and, how this disabling condition with all of its negative social and psychological consequences can be overcome.
>
> As it is a work of fiction and proceeds from the book will be going to the charity Dyslexia Action, I hope you enjoy the use that I have made of the Feature, "Out of the Void", that you were named in, for the journal, New Scientist. You will be in good company, as even a cursory glance at the list of the Venerable contributors will soon reveal.
>
> With 1 in 5 children suffering from "learning difficulties" - a term already heavily laden with negative connotations - and a large % of those dyslexic, it is a global problem with enormous social consequences that needs to be addressed right now.
>
> I'd like to think that my book may go some way in redressing these problems by providing a very positive take on the condition, while at the same time, provide more than just hope for the dyslexic. It has taken me over 3 hours to write this letter but I would like to think that it is coherent and - convincing. Ditto the book, if in a somewhat more humorous vein.
>
> Yours,
> Celeste de Vine

A touching note! Now I will look at the book.

Hmm, it's interesting...

February 26, 2007

Education is incredibly important: it's how the human race leverages itself forward. This idea is widely accepted, though often in a degraded form which focuses solely on the economic benefits of a well-trained "labor pool". But that's another matter — right now I want to rant about something else: given the importance of education, how little we know about how it works!

For example, we're just realizing how much praise of the wrong sort can *hurt* children:

- Po Bronson, How not to talk to your kids, New York Magazine, February 19, 2007.

An excerpt:

> For a few decades, it's been noted that a large percentage of all gifted students (those who score in the top 10 percent on aptitude tests) severely underestimate their own abilities. Those afflicted with this lack of perceived competence adopt lower standards for success and expect less of themselves. They underrate the importance of effort, and they overrate how much help they need from a parent.
>
> When parents praise their children's intelligence, they believe they are providing the solution to this problem. According to a survey conducted by Columbia University, 85 percent of American parents think it's important to tell their kids that they're smart. In and around the New York area, according to my own (admittedly nonscientific) poll, the number is more like 100 percent. Everyone does it, habitually. The constant praise is meant to be an angel on the shoulder, ensuring that children do not sell their talents short.
>
> But a growing body of research — and a new study from the trenches of the New York public-school system — strongly suggests it might be the other way around. Giving kids the label of "smart" does not prevent them from underperforming. It might actually be causing it.
>
> For the past ten years, psychologist Carol Dweck and her team at Columbia (she's now at Stanford) studied the effect of praise on students in a dozen New York schools. Her seminal work — a series of experiments on 400 fifth-graders — paints the picture most clearly.
>
> Dweck sent four female research assistants into New York fifth-grade classrooms. The researchers would take a single child out of the classroom for a nonverbal IQ test consisting of a series of puzzles — puzzles easy enough that all the children would do fairly well. Once the child finished the test, the researchers told each student his score, then gave him a single line of praise. Randomly divided into groups, some were praised for their intelligence. They were told, "You must be smart at this." Other students were praised for their effort: "You must have worked really hard."
>
> Why just a single line of praise? "We wanted to see how sensitive children were," Dweck explained. "We had a hunch that one line might be enough to see an effect."
>
> Then the students were given a choice of test for the second round. One choice was a test that would be more difficult than the first, but the researchers told the kids that they'd learn a lot from attempting the puzzles. The other choice, Dweck's team explained, was an easy test, just like the first. Of those praised for their effort, 90 percent chose the harder set of puzzles. Of those praised for their intelligence, a majority chose the easy test. The "smart" kids took the cop-out.
>
> Why did this happen? "When we praise children for their intelligence," Dweck wrote in her study summary, "we tell them that this is the name of the game: Look smart, don't risk making mistakes." And that's what the fifth-graders had done: They'd chosen to look smart and avoid the risk of being embarrassed.
>
> In a subsequent round, none of the fifth-graders had a choice. The test was difficult, designed for kids two years ahead of their grade level. Predictably, everyone failed. But again, the two groups of children, divided at random at the study's start, responded differently. Those praised for their effort on the first test assumed they simply hadn't focused hard enough on this test. "They got very involved, willing to try every solution to the puzzles," Dweck recalled. "Many of them remarked, unprovoked, 'This is my favorite test'" Not so for those praised for their smarts. They assumed their failure was evidence that they weren't really smart at all. "Just watching them, you could see the strain. They were sweating and miserable".
>
> Having artificially induced a round of failure, Dweck's researchers then gave all the fifth-graders a final round of tests that were engineered to be as easy as the first round. Those who had been praised for their effort significantly improved on their first score — by about 30 percent. Those who'd been told they were smart did worse than they had at the very beginning — by about 20 percent.

There's a lot more in this interesting article.

And here's another fascinating thing Dweck seems to have discovered: teaching children how the brain develops new

neurons when you learn stuff can *help them learn!*

- Michelle Trudeau, Students' view of intelligence can help grades, Morning Edition, National Public Radio, February 15, 2007.

Again, an excerpt:

> A new study in the scientific journal *Child Development* shows that if you teach students that their intelligence can grow and increase, they do better in school.
>
> All children develop a belief about their own intelligence, according to research psychologist Carol Dweck from Stanford University.
>
> "Some students start thinking of their intelligence as something fixed, as carved in stone," Dweck says. "They worry about, 'Do I have enough? Don't I have enough?'"
>
> Dweck calls this a "fixed mindset" of intelligence.
>
> "Other children think intelligence is something you can develop your whole life," she says. "You can learn. You can stretch. You can keep mastering new things."
>
> She calls this a "growth mindset" of intelligence.
>
> Dweck wondered whether a child's belief about intelligence has anything to do with academic success. So, first, she looked at several hundred students going into seventh grade, and assessed which students believed their intelligence was unchangeable, and which children believed their intelligence could grow. Then she looked at their math grades over the next two years.
>
> "We saw among those with the growth mindset steadily increasing math grades over the two years," she says. But that wasn't the case for those with the so-called "fixed mindset." They showed a decrease in their math grades.
>
> This led Dweck and her colleague, Lisa Blackwell, from Columbia University to ask another question.
>
> "If we gave students a growth mindset, if we taught them how to think about their intelligence, would that benefit their grades?" Dweck wondered.
>
> So, about 100 seventh graders, all doing poorly in math, were randomly assigned to workshops on good study skills. One workshop gave lessons on how to study well. The other taught about the expanding nature of intelligence and the brain.
>
> The students in the latter group "learned that the brain actually forms new connections every time you learn something new, and that over time, this makes you smarter."
>
> Basically, the students were given a mini-neuroscience course on how the brain works. By the end of the semester, the group of kids who had been taught that the brain can grow smarter, had significantly better math grades than the other group.
>
> "When they studied, they thought about those neurons forming new connections," Dweck says. "When they worked hard in school, they actually visualized how their brain was growing."
>
> Dweck says this new mindset changed the kids' attitude toward learning and their willingness to put forth effort. Duke University psychologist, Steven Asher, agrees. Teaching children that they're in charge of their own intellectual growth motivates a child to work hard, he says.
>
> "If you think about a child who's coping with an especially challenging task, I don't think there's anything

> better in the world than that child hearing from a parent or from a teacher the words, 'You'll get there.' And that, I think, is the spirit of what this is about."
>
> Dweck's latest book, *Mindset: The New Psychology of Success*, gives parents and teachers specific ways to teach the growth mindset of intelligence to children.

It makes me a little nervous reading two amazing discoveries in education by the same person in the course of a week. I hope these findings are confirmed — or disconfirmed! But either way, I wish someday we'd get serious about learning how to teach people. We could start a virtuous circle of rapid cultural development. The results could be amazing!

Right now the United States seems to be heading the other direction:

- U.S. Government Info, U.S. high schools get bad report card.

February 27, 2007

In response to yesterday's entry, a friend writes:

> Hi,
>
> Just reading your diary - interesting stuff about educating kids. I found the first part less interesting than the second - the first being, in my view, really obvious, but the second (teaching them neuroscience) being absolutely fantastic.
>
> There's some sort of converse to the first part (telling children they're intelligent makes them do worse; telling them they tried really hard makes them do better) that I haven't quite figured out, but it's something to do with the fact that I was really bad at sport at school, and my teachers always accused me of not trying hard enough. The thing is I was already trying exceedingly hard - I was just fundamentally bad at sport, and they couldn't believe any human being could be trying hard and *still* be so bad. The result was that I eventually gave up trying at all, became sulky and argumentative, and pretended to be ill during sports lessons as much as possible. It seems related somehow...

In reply to my February 16th entry, my friend Garrett Lisi writes:

> Q: What's crazier than a wingsuit?
>
> A: A wingsuit with jet engines.

February 28, 2007

We've had some rain the last couple of days — very nice, because we've only had 10% of our usual rain this year, and the rainy season is almost over. Some are praying for a "March miracle" to make up the deficit, but it seems unlikely. We'll take what we can get out here in the desert.

To a desert dweller, anyone who complains of rain sounds like a spoiled brat, unless they're actually suffering floods.

Speaking of desert dwellers, here's a book I'd like to read:

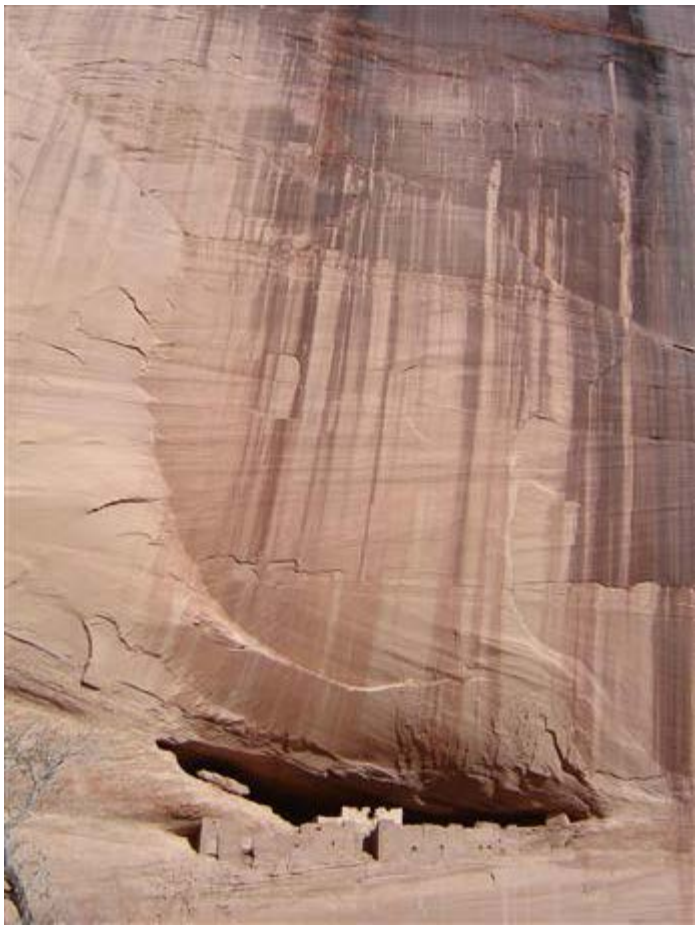
- Craig Childs, *House of Rain: Tracking a Vanished Civilization Across the American Southwest*, Little, Brown, New York, 2007.

It's about some puzzles of archeology. In her *Los Angeles Times* review of February 25th, Judith Lewis writes:

> What happened to the great civilizations of the Southwest that flowered so exquisitely and flickered out so abruptly? In addition to the Anasazi, there were the Hohokam, who built complex irrigation systems near

what is now Phoenix. And then came the Salado, "a massive cultural convergence based in east-central Arizona, where migrants collided with numerous indigienous heritages that had been in place for centuries." (Like "Anasazi," the name refers to an epoch rather than a unified tribe.) At Paquimé, a vibrant people kept birds for sport and food, built great houses and watered their fields. By the end of the 15th century, some 200 years after the disappearance of the Anasazi, all these indigenes were gone. When the Spanish arrived in the 16th century, the "probably met with only small, scattered populations, feeble resistance to thundering columns of conquistadors clad in leather and steel."

I've been fascinated by this stuff at least since 2005, when I visited some Anasazi ruins in Canyon de Chelly on a trip to Arizona:



Here's another — the latest by the ecologist and poet Gary Snyder:

- Gary Snyder, *Back on the Fire*, Shoemaker and Hoard, 2007.

It's a book of essays, the central one called "Lifetimes with Fire", about wildfires in the western United States, and the time he spent as a youth working in a fire lookout tower in the Cascades, and our failure to treat wildfires as an unavoidable, necessary part of nature, and the cycle of rebirth:

> How many times
> have I thrown you
> back on the fire

And here's another:

- Stephen M. Meyer, *The End of the Wild*, The MIT Press, Boston, 2007.

An excerpt:

> For the past several billion years evolution on Earth has been driven by small-scale incremental forces such as sexual selection, punctuated by cosmic-scale disruptions.plate tectonics, planetary geochemistry, global climate shifts, and even extraterrestrial asteroids. Sometime in the last century that changed. Today the guiding hand of evolution is unmistakably human, with earth-shattering consequences.
>
> The fossil record and statistical studies suggest that the average rate of extinction over the past hundred million years has hovered at several species per year. Today the extinction rate surpasses 3,000 species per year and is accelerating rapidly — it may soon reach the tens of thousands annually. In contrast, new species are evolving at a rate of less than one per year.

> Over the next 100 years or so as many as half of the Earth's species, representing a quarter of the planet's genetic stock, will either completely or functionally disappear. The land and the oceans will continue to teem with life, but it will be a peculiarly homogenized assemblage of organisms naturally and unnaturally selected for their compatibility with one fundamental force: us. Nothing — not national or international laws, global bioreserves, local sustainability schemes, nor even "wildlands" fantasies — can change the current course. The path for biological evolution is now set for the next million years. And in this sense "the extinction crisis" — the race to save the composition, structure, and organization of biodiversity as it exists today — is over, and we have lost....

All three of these books are about the same thing.

For my March 2007 diary, go here.

The space goes on.
But the wet black brush,
tip drawn to a point,
lifts away. - Gary Snyder

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home

For my February 2007 diary, go here.

Diary - March 2007

John Baez

March 3, 2007

Today there was a nice radio program about the speech accent archive — try browsing it to hear how speakers of different languages pronounce English. They also have transcriptions into the International Phonetic Alphabet.

I spent most of the day gardening, shopping for produce at the country store out in Fontana, buying some more herbs and a cute little succulent to plant in the garden, and working on the computer.

And, I ordered 3 CDs from Amazon. I've been feeling a bit starved for new music lately, so I got these:

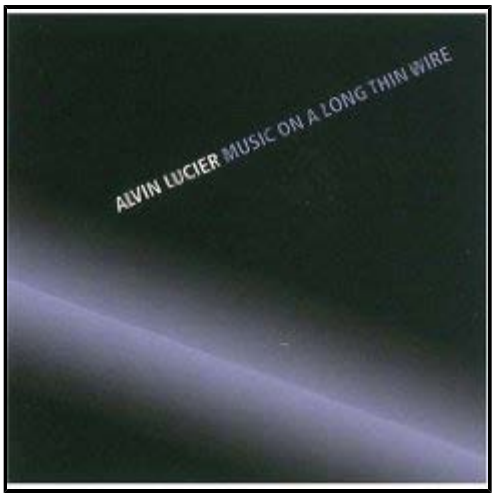
- Gotan Project, *Lunatico*.

Gotan Project is the group that pioneered techno-tango in their first album, *La Revancha del Tango*. So, I've been eager to hear their second try, but also a bit scared — was the first just a novelty? People have been saying good things about the second, so after hesitating for months I broke down and ordered it. It's supposed to be less techno, more tango.

- Jacques Loussier Trio, *Erik Satie: Gymnopedies, Gnossienes*. Samples here and here.

Satie's piano music has a strange charm that can't be improved, so the idea of setting it for a jazz trio (piano, bass, drums) sounds a bit obnoxious — but when I heard the above samples on National Public Radio, I actually liked them! It's especially intriguing when the rhythm of a piano piece you know well is tampered with a bit. Again I'm a bit scared that I'll be disappointed by this music: maybe it will sound worse in large quantities than in tiny snippets. But, I decided to take a risk. At the worst, it should make acceptable background music.

- Alvin Lucier, *Music on a Long Thin Wire*.



I heard someone raving about this in some list of the 20 best pieces of modern music. It sounds intriguing, since I like ultra-minimalist music and explorations of texture:

> A 50 foot length of taut wire passes through the poles of a large magnet and is driven by an oscillator; the vibrations of the wire are miked at either end, amplified and broadcast in stereo. The thin wire is set vibrating four times at four different frequencies; what results is not the low drone one might expect from a long, vibrating wire, but a complexity of evocative, ethereal chords. First released on Lovely Music in 1980, *Music on a Long Thin Wire* is a classic example of Alvin Lucier's investigations into the physics of sound and the sonic properties of natural processes.

March 8, 2007

Lisa and I went to Richard Block's birthday party.

Block is an expert on Lie algebras, and there's a fun story about him and Murray Gell-Mann, the physicists who one the Nobel prize for inventing "quarks". Actually quarks were part of a mathematical scheme which Gell-Mann called the Eightfold Way, because it was based on the 8-dimensional Lie algebra su(3).

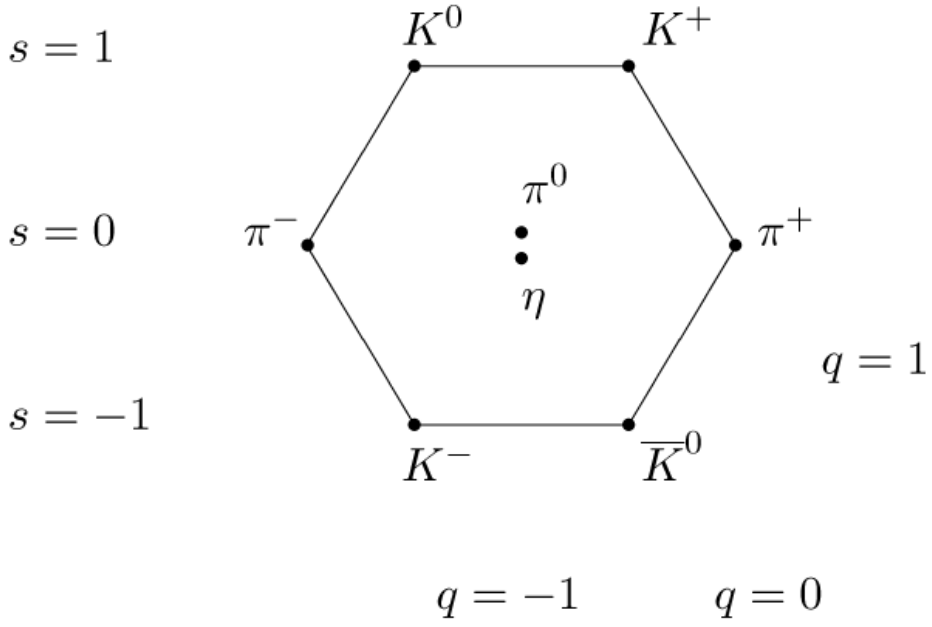
The story goes like this:

Murray Gell-Mann's dream was to find a Lie algebra whose representations could model the observed baryons and mesons. A long time ago Heisenberg had invented a theory like this based on the Lie algebra su(2). This was able to account for baryons and mesons known at the time, but a lot more were discovered later. Gell-Mann knew this Lie algebra should contain the 3-dimensional Lie algebra su(2), since he wanted his theory to include Heisenberg's. In 1960 he worked on this problem for 6 months. He tried inventing 4-dimensional Lie algebras, then 5-dimensional ones, then 6-dimensional ones, then 7-dimensional ones... and gave up in disgust at this point, since nothing worked.

Then he talked to Richard Block, who is now a emeritus professor here at UCR, but was then an assistant professor at Caltech. Block told Gell-Mann that he'd been reinventing the wheel, and not doing a great job of it either: Élie Cartan had classified simple Lie algebras a long time ago, and after su(2) the smallest one is 8-dimensional, namely su(3).

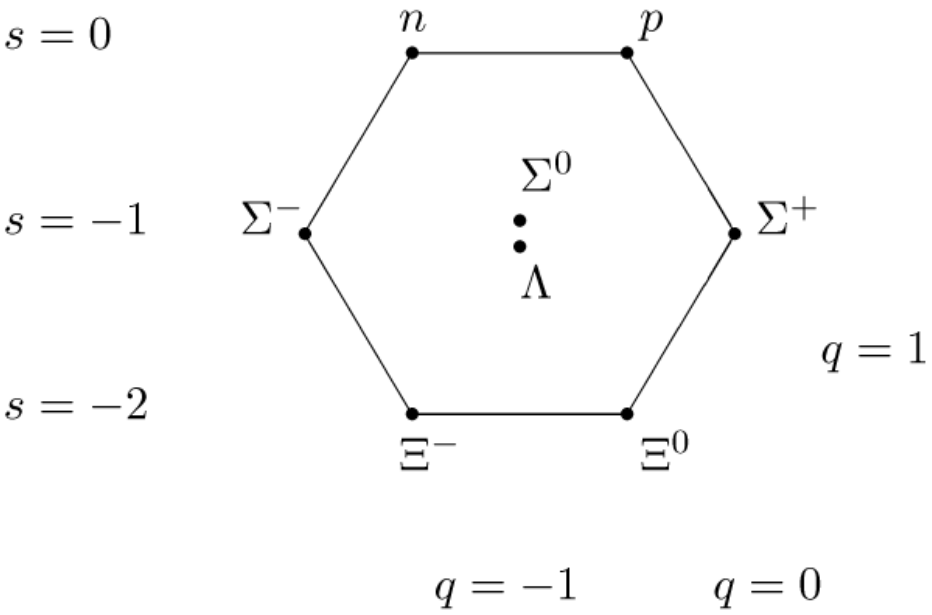
Gell-Mann then invented the Eightfold Way.

I think that at the time, only 7 of the particles in the "meson octet" were known. The Eightfold Way said there should be 8, because su(3) is 8-dimensional. The missing meson — the eta — was discovered later:

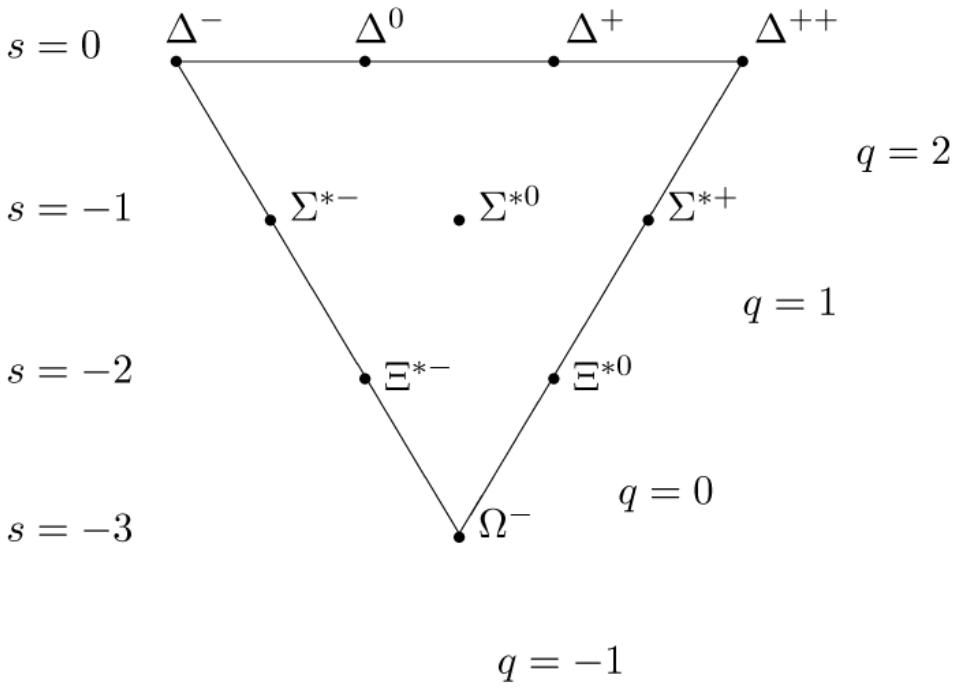


Here *q* stands for electric charge and *s* stands for strangeness — the new ingredient in Gell-Mann's scheme.

I believe all 8 particles in the "baryon octet" were known at that time, too:



Only 4 particles in the baryon decuplet were known: the Δ^-, Δ^0, Δ^+ and Δ^{++}:



But, in June of 1962, at a conference at CERN, the discovery of some more was announced: the Σ^{*-}, Σ^{*0}, and Σ^{*+}, and the Ξ^{*-} and Ξ^{*0}.

This left only one missing!

So, Gell-Mann got up, went to the microphone, and predicted the existence and properties of the last one.

He called this one the Ω^-, since omega is the last letter of the Greek alphabet.

The Ω^- was discovered by Samios and Palmer in 1964. It had just the properties Gell-Mann had predicted, so he won the Nobel prize in 1969.

Richard Block was also the first to write anything about what's now called the Virasoro algebra — a Lie algebra that plays a key role in string theory.

But now Richard Block is retired. He spends a lot of time in his beautiful home up in the hills behind the U.C. Riverside campus, sometimes working on math, sometimes fighting the developers who are trying to buy up every tiny parcel of land in this town and build a McMansion on it. Since a lot of the city council is in bed with the developers — indeed, some of them *are* developers — this is quite a battle. Recently a 90-year-old woman was ejected from a city council meeting — escorted away by cops! — for asking questions about what was going on.

Richard's wife Jane Block is even more active in this battle. They're both part of a group called Friends of the Hills of Riverside.

At his birthday dinner, Richard recounted the tale of some developers who had cleverly tried to measure the size of a lot *from the middle of the road* instead of from the sidewalk, so they could put a bigger house on it. When the Friends of the Hills of Riverside filed a complaint, they were informed that now there's $1080 fee to file a complaint! They paid the fee... and were informed that there was a precedent for this action, because it's been done twice before. The fight isn't over yet.

I realized that people like this — older people who've been in a community for decades, know all the movers and shakers, and have the energy for politics — can make a huge difference in the daily life of a town. There are lots of parks in Riverside that owe their existence to the Friends of the Hills of Riverside and the UCR Neighborhood Association — another group, currently run by Gurumantra Khalsa, who with his wife was also at Richard Block's

party. I tend to have little time for this sort of thing, but maybe I should. Or maybe I should leave it to those who enjoy it.

I met another member of Friends of the Hills of Riverside at Richard's party: Leonard Nunney, a population biologist here at U. C. Riverside. Cool guy!

And, I found out about a great book, a guide to local plants, which should be available for purchase at an open house this weekend. More on that later, I hope.

March 9, 2007

What's this?

Take a guess; then look at the September 6th Astronomy Picture of the Day.

Today's Seminar About Long Term Thinking touches on a theme I'm obsessed by lately:

- Brian Fagan, We are not the first to suffer through climate change, Friday, March 9, 2007.

Fagan is an anthropologist at U.C. Santa Barbara who has written many books, including *The Long Summer: How Climate Changed Civilization*.

Here's Kevin Kelly's summary of Fagan's talk:

> There are two kinds of historians, Brian Fagan says, parachutists and truffle hunters. Parachutists command an overview of the landscape, while truffle hunters dig deeply to uncover marvelous treasures. Fagan is a parachutist. In his talk Fagan emphasized a wide view of human history as it unrolls in the landscape of climate. In our lookout from the parachute, we can see evidence from ice cores, tree rings, fossil pollen, and historical records, all pointing to the conclusion that people in the past have suffered through global warming periods before.
>
> So what happens?
>
> Using data from truffle-hunting historians, Fagan told of how vineyard harvest records in Europe show that England became so warm during the period between 800-1250 AD that England not only had vineyards in its central provinces but it also exported wine to France. The medieval warm period had repercussions throughout society. Iceland and Scandinavia warmed up enough to grow cereal crops, tree lines elevated in mountain areas, and there were longer growing seasons everywhere on the continent.

This warming up of agriculture initiated the first vast clear-cutting of European forests. In the short 200 years between 1100 and 1300, from one-third to one-half of European wooded wilderness was deforested to make way for fields and pastures — shaping the lovely farm scenes we now associate with Europe. (Today only Poland has any remaining virgin forests).

Fagan says the myth of the medieval warm period is that it was warm. There were all kinds of weather extremes. In 1315 it started to rain for seven years. The newly cleared and naked hills eroded, dams burst, disease spread, and prolonged drought followed.

And not just in Europe. Mesoamerica was jolted by long droughts. The Mayan pyramids at Tikal were engineered to act as water collection reservoirs. The collapse of their empire, and others in South America such as the Inca in Peru, are correlated to prolonged droughts.

Indeed, says Fagan, the elephant in the climate room is drought. As recently as the 1800s, prolonged droughts killed 20-30 million people in India during the British Raj period. We have a tendency to believe that modern technology has alleviated our susceptibility to drought, and it has — except for the billions of people on earth today who are living as subsistence farmers.

It is upon these people that Fagan wanted us to focus our attention and care, because it is upon these people that the most serious consequences of global warming will fall. Referring to his own experience of many years as an archeologist in Africa, he painted a vivid image of what a severe drought entails and how a drought can act like a cascading disruption and rapidly destroy a vibrant culture to the point where it disappears completely.

Forget the rocketing "hockey stick" of global warming, he urges. Even mild climate warming produces prolonged droughts, and we should expect more of them. There's already been a 25% increase in droughts globally since 1990. In the next 100 years, we can expect the number of people to be affected by droughts to rise from 3% of the world's population to 30%.

The lesson Fagan wanted us to leave with was that the effects of global warming will be felt greatest on marginal land and marginal peoples — many far from the sea and rising sea levels — and that because of their marginality, the consequences of prolonged drought will not just be inconvenient, but devastating.

In the question and answer period, he was asked what the stricken people can do about it? "Move," he said, "is the only option." If the world is heating up, where would he move to? "Canada. It will be dryer, much warmer, and their politics are reasonable."

March 11, 2007

We bought a new car! After 16 years of good service, our 1991 Honda Civic started making creaky noises and we decided it was time to get a new one — we'd been planning this for a while, but putting it off. We got a Honda EX Sedan. Car technology has changed a lot. We now have air bags, a CD player, one of those keys that unlocks all the car doors when you press a button... and, most futuristic of all, a voice activated navigation system. So, we can now press a button and say "Nearest Thai restaurant" and have our car tell us how to get there. It's really cool.

Unfortunately, the process of buying the car took longer than expected, so we were late in meeting our house guest, the mathematician Eugenia Cheng.

March 13, 2007

Speaking of drought, the one here keeps getting worse:

It's August in March for Fire Agencies

Hector Becerra and Andrew Blankstein, Times Staff Writers
Los Angeles Times
March 13, 2007

As Southern California endures its driest 12 months on record, firefighters are dealing with something new: the yearlong fire season.

The region has not experienced a major rainstorm in nearly a year, with downtown Los Angeles recording just 2.42 inches of rain this season, more than nine inches below normal.

The dry conditions are taking their toll.

The Santa Ana winds that usually roar from October through December have continued with unusual frequency into March, helping fuel fires over the weekend in Orange and Riverside counties as well as smaller blazes Monday near the Griffith Observatory and in Agoura Hills.

Cities across Southern California, including Los Angeles, Westwood, Burbank, San Gabriel, Long Beach, Riverside, Oxnard and Laguna Beach, all set new temperature records Monday, ranging from the mid-80s to the mid-90s.

Local agencies have responded by beefing up fire staffing, treating late winter like the late summer and fall fire season.

"You count on winter and spring as being a respite, a time to regroup, to heal and prepare for the upcoming fire season," said Tim Sappok, the assistant operations chief for the San Bernardino County Fire Department. "Now, normal is abnormal. We aren't seeing the seasonal cycle. We have fuels that are ready to burn. It looks like midsummer, vegetation-wise."

The deep freeze that hit much of the region in January is also worrying firefighters because it killed or damaged countless trees and plants, leaving them vulnerable to fire.

"I know what I see, and I see a lot of things that are not good," said L.A. County Fire Capt. Bob Goldman, who responded to an unseasonal January brush fire in Malibu that destroyed five homes. "You see the lack of tall green grass, the lack of mustard plants growing. I am not seeing any of that. There is no water to get things going."

The dry conditions have residents in fire-prone areas on edge, especially as they look ahead to summer and fall, when the heaviest Santa Ana winds kick in.

Jan Currey, who has lived in Malibu for 23 years, said fires in her area usually start to the east and move west, giving people time to react. But the dry conditions have made even coastal neighborhoods vulnerable, as the January fire on the beach showed. She and her neighbors are bracing themselves.

"I've been here long enough to see patterns," Currey said, "and that if it's dry and windy, it's much worse for fires."

But fire experts said Malibu and other coastal hillside regions up and down the Southern California coast are actually in better shape than other places because they have gotten relatively more rain.

As the hot, dry conditions extend into summer, L.A. County Fire Assistant Chief John Todd said, he is most worried about the foothills and mountains along the San Gabriel Valley, which have received less rain, leaving the grass and shrubs with a much lower moisture level.

"We have areas of L.A. County that are rapidly drying out," Todd said. "Maybe we can get a week or two of actual winter. The thing we don't know is what May and June are going to do. Are we going to get May

> gray and June gloom? It doesn't seem possible right now."
>
> Officials in Orange, Riverside and San Bernardino counties share those concerns, noting that rainfall along inland hillsides and mountain ranges is far below normal.
>
> Consider what Orange County fire investigators found when they examined the brush Monday around the Anaheim Hills wildfire, which burned more than 2,000 acres.
>
> George Ewan, a fire-defense planner for the Orange County Fire Authority, said the moisture levels in vegetation revealed that most of the plants lingered on the brink of death. The vegetation tested looked as if it had been plucked at the end of a long, dry summer.
>
> "If this is the beginning, I don't know where we're going to end up," he said.
>
> Bonnie Bartling, a weather specialist for the National Weather Service in Oxnard, said the forecast does not call for rain in the foreseeable future.
>
> [....]

March 14, 2007

As usual on Wednesdays, I spent the day talking to my students: first an hour with Derek Wise on Cartan geometry and MacDowell-Mansouri gravity, then an hour with Derek and Jeff Morton on topological quantum field theory, then an hour with Jeff on more of the same, then an hour for lunch, then two hours with Alex Hoffnung and John Huerta — alternately about categorifying classical mechanics (Alex's topic) or grand unified theories (John's) — and finally an hour talking with Mike Stay about categories, logic and computation.

This day was different, because Eugenia Cheng was there the whole time. She joined in, and it was a lot of fun.

Tonight there was a dinner for Mike Stay: he's leaving town this weekend to take a job at Google. It's sad to see him go, but it'll be good for him. I hope we keep working on our projects.

At dinner I heard for the first time of the bizarre game of Eton Fives. I'll let you read about it yourself!

March 16, 2007

A retired CEO of Lockheed recently led a National Academies group that prepared a report about the problems with education in the United States, and their economic effects. Here's the report:

- The National Academies, *Rising Above The Gathering Storm: Energizing and Employing America for a Brighter Economic Future*, 2007.

Here's a little article he wrote about it:

- Norman R. Augustine, Learning to compete: how the United States can prosper in a global economy, *Princeton Alumni Weekly*, "Perspective" column, March 7, 2007, 34-37.

He provides some scary statistics for us to ponder:

> Underlying the group's findings is a trend referred to by journalist and economist Frances Cairncross as "the death of distance," a phenomenon having its roots in science and engineering. Its essence is that parties to many transactions no longer need to be in close physical proximity to one another. For example, visitors to one commercial office building near the White House are greeted by a receptionist appearing on a flat-screen display — but she is actually in Pakistan. Similarly, in many U.S. hospitals, patients' CAT scans are read by doctors in Australia or India. A surgeon in New York not long ago removed a patient's gallbladder

in France, using a robot. Many Americans, perhaps unknowingly, had their income taxes prepared last year by accountants in Costa Rica. I was recently provided over my cell phone very accurate real-time driving directions to a building near Washington, D.C., by a gentleman in Bangalore. And we are all familiar with call centers in India, where they now offer courses in speaking English with a Midwestern accent.

What this means to many Americans is that qualified candidates for the jobs they would like to hold are now located all around the world, just a mouse-click away. Furthermore, these candidates — whose numbers swelled by 3 billion after the demise of fundamental Communism — are willing to work for a fraction of the pay to which most Americans have become accustomed, are highly motivated, and are increasingly well educated. I recently visited a factory in Vietnam where 20 assembly workers could be hired for the cost of one in the United States. Six engineers can be hired in India for the cost of one in the United States; five chemists can be hired in China for the cost of one American.

Exacerbating basic wage scales are asymmetries in benefits and other costs; for example, General Motors now spends more on health care for its employees and retirees than on steel; Starbucks more on health care than on coffee; and U.S. industry as a whole more on litigation than on research and development.

The body of evidence regarding the impact of such developments is growing daily. For example:

• Seventy-seven percent of currently planned new research-and-development facilities in the world are to be located in India or China.

• IBM not long ago sold its personal-computer business to a Chinese firm.

• The remnants of what was once America's greatest industrial research institution, the legendary Bell Labs, recently were sold to a French company.

• General Motors and Ford both have junk-bond ratings. In the last five years they have laid off more than one-third of their North American workforces.

• Toyota's market capitalization is more than six times that of Ford and General Motors combined.

• Only one of the 25 largest initial public offerings last year occurred in the United States.

• Bethlehem Steel celebrated its 100th birthday in 2000 by declaring bankruptcy, with its number of employees having dropped by a factor of 14 down to 12,000 — but with 90,000 pensioners seeking benefits.

• The U.S. share of leading-edge semiconductors dropped from 36 percent to 14 percent in the last six years.

• Only three U.S. companies are in the top 10 receiving *U.S.* patents.

• In just a decade, the U.S. trade balance in *high-tech* goods and services switched from a positive $50 billion to a negative $50 billion.

Given such evidence, the unanimous answer of the National Academies committee members to the question, "How well are Americans going to be able to compete for jobs in the years ahead?" was a resounding: "*Not well.*" The highest priority for attention, in the view of the committee, is the substandard quality of K-12 public education in America. Microsoft's Bill Gates put it this way: "When I compare our high schools to what I see when I'm traveling abroad, I'm terrified for our workforce of tomorrow." Former Federal Reserve Chairman Alan Greenspan punctuated that notion, observing, "If you don't solve the (K-12 education) problem, nothing else is going to matter all that much."

It is, of course, a good thing that other nations are prospering; the National Academies would like for

America to continue to be among that group.

At the National Academies website I bumped into something about the widespread dieoff of bees, a topic I wrote about last November 5th:

- Maureen O'Leary, Honeybees decline sharply in U.S., Science in the Headlines, The National Academies, March 8, 2007.
- Committee on the Status of Pollinators in North America, National Research Council, *Status of Pollinators in North America*, 2006.

A quote:

> Across the United States, beekeepers are reporting a loss of 30 percent to more than 70 percent of overall beehives. Experts are calling it "colony collapse disorder," in which bees have started leaving their hives in droves, never to return. They think the phenomenon is tied to recent stresses on the bees.

Our garden is recovering from its near-death during last summer's hot spell, and it's becoming a bee paradise again. If you go in our back yard you'll see lots of bees hovering around the wisteria blossoms — but also lots of bees drinking from the fountain. They practically line up there to drink!

Another interesting article in the normally dull *Princeton Alumni Weekly* concerns the research of sociologist Katherine Newman on the working poor, and psychologist Eldar Shafir on the way real people make economic decisions:

- Kathryn Levi Feldman, Working and spending: what really matters, *Princeton Alumni Weekly*, March 7, 2007, 30-33.

A quote:

> According to Shafir, factors such as hassle or embarrassment can appear inconsequential in standard economic cost-benefit analyses — but they deter people in important ways. One example is the recent debacle over Medicare Part D: Many senior citizens found the choices too difficult to make. "If you talk to the policy-makers, they recognize that facing lots of options is confusing, but feel confident that people will ultimately focus on the important details and make their decisions," he says. Instead, Shafir has found that feeling hassled or conflicted can deter people from making any decision. Similarly, Shafir and his colleagues have observed that residents of low-income neighborhoods often pay more to process checks from local check-cashing services rather than open bank accounts where they might have to navigate an intimidating, unwelcoming, and complicated system. They might patronize a business with more personalized service — even if it costs more &mdash to avoid the "condescension, suspiciousness, or uncertainty offered by many institutions," he says.

This is not news, but I'm glad someone is finally studying it systematically, instead of idealizing it out of existence!

The news in this diary may seem a bit depressing, but I'm actually happy about a sea change that occurred in the U.S. over the last year. People are starting to take global warming seriously, getting sick of their petroleum dependence, and seeing through the propaganda cloud of the Bush administration regarding these and other issues, including the Iraq war. Whether it's happening in time remains an open question — we'll see.

March 19, 2007

I had fun blogging about a rather hyped calculation involving the Lie group E_8, trying to get some details out while everyone else was still scratching their heads over the vague accounts in the popular media. I had the advantage that someone at the American Insitute of Mathematics told me about their website a few days before the press embargo was lifted.

Later I wrote some more about E_8 in week247 of This Week's Finds, using it as a fun way to kick off what I hope will be a long series about the work James Dolan, Todd Trimble and I have been doing on "groupoidification" — a mammoth project unifying all sorts of ideas on symmetry, geometry and logic.

March 20, 2007

My mother called Lisa on her cell phone while we were driving home from shopping. She never does this, usually. She said she had some news for me. I was driving, so I didn't want to talk on the phone... so Lisa said I'd call her back when I got home.

I started worrying that something had happened to my father – did he fall again? Did he have a stroke? Did he die?

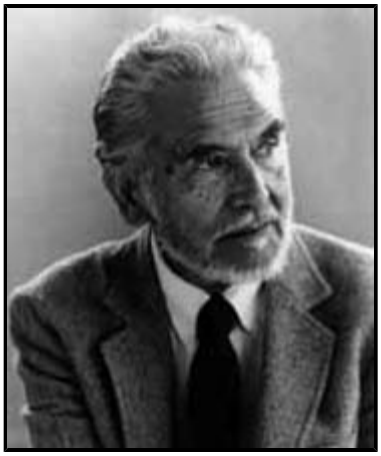
It turned out my father's brother, Albert Baez, had died. He was the one who got me interested in physics in the first place — since his specialty was physics education, he would always come to town with lasers, holographs, diffraction gratings and the like. I especially liked the green corrugated plastic tubes you could whirl over your head to make sounds — different harmonics illustrating the physics of standing waves. This was an example of his interest in low-budget physics education suitable for third-world countries. (That's what they called them then.)

When I was eight he gave me his college physics textbook, *The New College Physics: A Spiral Approach*. I remember staring fascinated at the hand-drawn pictures. Later that's where my interest in particle physics started.

He had the first electronic calculator I ever saw. He gave me Silvanus P. Thompson's classic *Calculus Made Easy*, and that's how I learned calculus. He gave me Feynman's *Lectures on Physics*, and that's how I learned quantum mechanics,

the summer of my junior year of high school, when I was working at a job building trails at a state park, living in a trailer with 9 other guys.

He had a huge effect on my life! And, he was a really cool guy. You can just see it:



For the last year, though, he's been very sick, often bed-ridden, and suffering an almost complete breakdown of his short-term memory. So, my sorrow — and horror — were largely exhausted already.

It rained a bit tonight... just a tiny bit, but we need all the rain we can get.

March 23, 2007

> **Albert V. Baez, 94; physicist and father of Joan Baez, Mimi Fariña**
>
> By Valerie J. Nelson
> Los Angeles Times Staff Writer
> March 23, 2007
>
> Albert V. Baez, a physicist who did pioneering work with X-rays and who was the father of folk singers Joan Baez and the late Mimi Fariña, has died. He was 94.
>
> Baez, who also worked to improve science education worldwide, died of natural causes Tuesday in an elder-care facility in Redwood City, Calif., his family announced.
>
> "In all aspects of his life, he combined personal and professional roles as scientist, environmentalist, teacher and humanitarian," the Baez family said in a statement. "In doing so, he nurtured and conveyed values representing mankind at its best."
>
> Starting in the late 1940s, he helped lay the foundation for the newly developing science of X-ray imaging optics while doing graduate work in physics at Stanford University.
>
> In 1948, working with Stanford professor Paul Kirkpatrick, Baez developed the first X-ray reflection microscope, which could examine living cells. The imaging technique is still used, particularly in astronomy to take X-ray pictures of galaxies and in medicine, said W. Gilbert Clark, a UCLA professor emeritus of physics and Kirkpatrick's nephew.
>
> As a University of Redlands professor in the 1950s, Baez continued developing X-ray technology but took a year off to teach and build a physics laboratory at the University of Baghdad in Iraq.
>
> The Soviet launching of the Sputnik satellite in 1957 ignited a movement in the U.S. to improve science education — a cause that came to dominate his career.

He helped make films aimed at improving the teaching of high school physics before being given a broader opportunity in 1961. The United Nations Educational, Scientific and Cultural Organization named him the first director of its science-teaching division.

Stationed in Paris until 1967, Baez helped developing nations improve their teaching of math and science.

"Science is one of the things needed in these countries if you're going to have a base for a future economy. Otherwise they'll always be the servants of the United States," Baez wrote in an essay in the 1990 book "Mexican Voices/American Dreams."

In retirement, he remained active, including serving as president of Vivamos Mejor (Let Us Live Better). The organization is dedicated to improving the quality of life through science-based education and community development projects in Latin America.

Albert Vinicio Baez was born Nov. 15, 1912, in Puebla, Mexico, and moved to Texas when he was 2.

His father, Alberto Baez, was a Methodist minister, and his mother, Thalia, became a social worker for the YWCA.

Baez grew up in Brooklyn, N.Y., and developed into a "bright, conscientious" boy who had "an insatiable curiosity about everything, especially the construction of crystal set radios," Joan Baez wrote in her 1987 memoir, "And a Voice to Sing With."

He earned a bachelor's degree in math and physics from Drew University in 1933, a master's in math from Syracuse University in 1935 and a doctorate in physics from Stanford in 1950. He taught at those universities and others, including UC Berkeley.

In 1958, after moving to a Boston suburb to teach at the Massachusetts Institute of Technology, he took Joan, then 17, to see a new phenomenon: coffeehouses filled with guitar players and folk balladeers, she wrote in her memoir. Within a year, the future folk star was onstage with them.

Another daughter, Mimi, saw her folk music career peak during her brief performance partnership with her husband, Richard Fariña, who died in 1966. Mimi died in 2001.

Joan Baez admired her father — a Quaker and pacifist — for valuing teaching and turning away from potentially lucrative defense work.

"We would never have all the fine and useless things little girls want.... Instead we would have a father with a clear conscience," she recalled in her memoir. "Decency would be his legacy to us."

In addition to Joan Baez, he is survived by his wife, Joan Bridge Baez; another daughter, Pauline Bryan; three grandchildren; and a great-granddaughter.

Riding a bike.

Family picture, around 1964.
Top row: Joan Bridge Baez, Albert Baez, Joan Baez.
Bottom row: Pauline Marden (now Bryan), Nick Marden, Mimi Fariña, Richard Fariña.

March 24, 2007

The garden is starting to look really nice. Roses and agave:

March 25, 2007

A while back James Dolan told me a bit about thermophiles: organisms that like it hot.

Which ones can take the most heat? Among hyperthermophiles, it seems the winner is *Pyrolobus fumarii*, a microbe of the domain Archaea which lives in hydrothermal vents at the bottom of the Atlantic — at a temperature of 113° C! Yes, that's above the boiling point of water, at least at ordinary pressures. But down there it's not, because the pressure is so high!

In hydrothermal vents, water easily reaches 350° C while remaining liquid. As of 2006, the record temperature for hydrothermal vents was 407° C, observed at a depth of 3000 meters. his is fascinating because at such high temperatures and pressures water is supercritical: there's no sharp distinction between liquid and gas!

Can any life survive *those* temperatures?

Among higher organisms, it seems the Sahara desert ant is the winner. From Wikipedia:

> While no known animal can live permanently at a temperature over 50°C, Sahara desert ants can sustain a body temperature well above 50°C with surface temperatures of up to 70°C.
>
> This ant ventures far from its burrow in the Sahara desert, which has almost no identifiable features, to find food. While venturing out it periodically takes measurements of its angle in respect to the Sun. By doing this the ant can venture far from its nest in search of food. Because of the blistering heat, it can only do this for about 3-5 minutes/day (the hottest time of the day, when all its predators are in hiding from the sun). When the ant finds a dead insect it then looks at the sun and because of its periodic references to the sun's angle it knows exactly what the shortest route back to the nest is.

But, I was reminded to write about these heat-lovers only because the science reporter Davide Castelvecchi sent me a list of his top 10 science stories of 2006, which included one on critters that like it *cold!* Believe it or not, there are bacteria that can live in liquid nitrogen. Castelvecchi wrote:

> As I was reading *New Scientist* last August — the issue with my cover story, as it happens — I stumbled into this tale, told by my friend Douglas Fox. The tale's hero goes by the unlikely name of *Colwellia psychrerythraea* 34H.
>
> *Colwellia* is one of those bugs that have been found, alive and kicking, trapped down deep in the ice of Antarctica. Karen Junge, a microbiologist at the University of Washington in Seattle, was studying *Colwellia* in her lab's freezers, trying to understand how it manages to survive at -20 degrees Celsius.
>
> To check out the bug's metabolism at those temperatures, Junge measured how fast it absorbed an amino acid compared with specimens kept at -80 degrees, where no metabolism would occur. Something was wrong, though: the metabolism of her control specimens didn't stop. So Junge tried sticking them in liquid nitrogen. Even there, at -196 degrees, *Colwellia* kept eating up the amino acid, a sign that it was still biologically active.

There are "obligate thermophiles" that can't survive below 60° C. *Colwellia* is an "obligate psychrophile" - it requires temperatures below 20° to grow on solid media.

If you like this stuff, try reading about other extremophiles.

March 29, 2007

Speaking of extremophiles, my pal Miguel Carrión Álvarez points out the charms of Deinococcus radiodurans!

For my April 2007 diary, go here.

Great ideas come into the world as softly as doves. - Albert Camus

baez@math.removethis.ucr.andthis.edu

home

[For my March 2007 diary, go here.]

Diary - April 2007

John Baez

April 1, 2007

Lisa and I have been together for 20 years. We met sometime during spring break back when I was a postdoc at Yale, so we've decreed that April Fools Day would be our offical anniversary. We spent a night at Laguna Beach to celebrate. In the morning, Lisa did tai chi on the beach.

April 2, 2007

Yay! The Supreme Court of the United States ruled that the Environmental Protection Agency has the authority to regulate carbon dioxide emissions! It was a dangerously close ruling, 5-4, with all the conservatives (Alito, Roberts, Scalia and Thomas) voting against the majority.

April 6, 2007

I've been talking about drought ever since lots of my garden died after a month of over-100-Fahrenheit weather last summer while I was in China. On February 28th, I wrote about ancient desert dwellers of the Southwest, and their mysterious disappearance. On March 9th, I mentioned Brian Fagan's talk on how global warming causes droughts. And on March 13th, I noted that this year is the driest on record here in Southern California.

Somehow the local problem makes the global problem more vivid. Of course, one can't blame a specific year's drought on an overall climate shift — and last winter it was very rainy. But, when you're hoping for rain and keep seeing promising clouds drift by without giving a drop, headlines like this make a bigger impression:

> **Permanent Drought Predicted for Southwest**
>
> Alan Zarembo and Bettina Boxall
> Los Angeles Times Staff Writers
> April 6, 2007
>
> The driest periods of the last century — the Dust Bowl of the 1930s and the droughts of the 1950s — may become the norm in the Southwest United States within decades because of global warming, according to a study released Thursday.
>
> The research suggests that the transformation may already be underway. Much of the region has been in a severe drought since 2000, which the study's analysis of computer climate models shows as the beginning of a long dry period.
>
> The study, published online in the journal *Science*, predicted a permanent drought by 2050 throughout the Southwest — one of the fastest-growing regions in the nation.
>
> The data tell "a story which is pretty darn scary and very strong," said Jonathan Overpeck, a climate researcher at the University of Arizona who was not involved in the study.
>
> Richard Seager, a research scientist at Lamont-Doherty Earth Observatory at Columbia University and the lead author of the study, said the changes would force an adjustment to the social and economic order from Colorado to California.
>
> "There are going to be some tough decisions on how to allocate water," he said. "Is it going to be the cities, or is it going to be agriculture?"
>
> Seager said the projections, based on 19 computer models, showed a surprising level of agreement. "There is only one model that does not have a drying trend," he said.
>
> Philip Mote, an atmospheric scientist at the University of Washington who was not involved in the study, added, "There is a convergence of the models that is very strong and very worrisome."
>
> The future effect of global warming is the subject of a United Nations report to be released today in Brussels, the second of four installments being unveiled this year.
>
> The first report from the Intergovernmental Panel on Climate Change was released in February. It declared

that global warming had become a "runaway train" and that human activities were "very likely" to blame.

The landmark report helped shift the long and rancorous political debate over climate change from whether man-made warming was real to what could be done about it.

The mechanics and patterns of drought in the Southwest have been the focus of increased scrutiny in recent years.

During the last period of significant, prolonged drought — the Medieval Climate Optimum from about the years 900 to 1300 — the region experienced dry periods that lasted as long as 20 years, scientists say.

Drought research has largely focused on the workings of air currents that arise from variations in sea-surface temperature in the Pacific Ocean known as El Niño and La Niña.

The most significant in terms of drought is La Niña. During La Niña years, precipitation belts shift north, parching the Southwest.

The latest study investigated the possibility of a broader, global climatic mechanism that could cause drought. Specifically, they looked at the Hadley cell, one of the planet's most powerful atmospheric circulation patterns, driving weather in the tropics and subtropics.

Within the cell, air rises at the equator, moves toward the poles and descends over the subtropics.

Increasing levels of greenhouse gases, the researchers said, warms the atmosphere, which expands the poleward reach of the Hadley cell. Dry air, which suppresses precipitation, then descends over a wider expanse of the Mediterranean region, the Middle East and North America.

All of those areas would be similarly affected, though the study examined only the effect on North America in a swath reaching from Kansas to California and south into Mexico.

The researchers tested a "middle of the road" scenario of future carbon dioxide emissions to predict rainfall and evaporation. They assumed that emissions would rise until 2050 and then decline. The carbon dioxide concentration in the atmosphere would be 720 parts per million in 2100, compared with about 380 parts per million today.

The computer models, on average, found about a 15% decline in surface moisture — which is calculated by subtracting evaporation from precipitation — from 2021 to 2040, as compared with the average from 1950 to 2000.

A 15% drop led to the conditions that caused the Dust Bowl in the Great Plains and the northern Rockies during the 1930s.

Even without the circulation changes, global warming intensifies existing patterns of vapor transport, causing dry areas to get drier and wet areas to get wetter. When it rains, it is likely to rain harder, but scientists said that was unlikely to make up for losses from a shifting climate.

Kelly Redmond, deputy director of the Western Regional Climate Center in Reno, who was not involved in the study, said he thought the region would still have periodic wet years that were part of the natural climate variation.

But, he added, "In the future we may see fewer such very wet years."

Although the computer models show the drying has already started, they are not accurate enough to know whether the drought is the result of global warming or a natural variation.

"It's really hard to tell," said Connie Woodhouse, a paleoclimatologist at the University of Arizona. "It may

well be one of the first events we can attribute to global warming."

The U.S. and southern Europe will be better prepared to deal with frequent drought than most African nations.

For the U.S., the biggest problem would be water shortages. The seven Colorado River Basin states — Colorado, Wyoming, Utah, Nevada, New Mexico, Arizona and California — would battle each other for diminished river flows.

Mexico, which has a share of the Colorado River under a 1944 treaty and has complained of U.S. diversions in the past, would join the struggle.

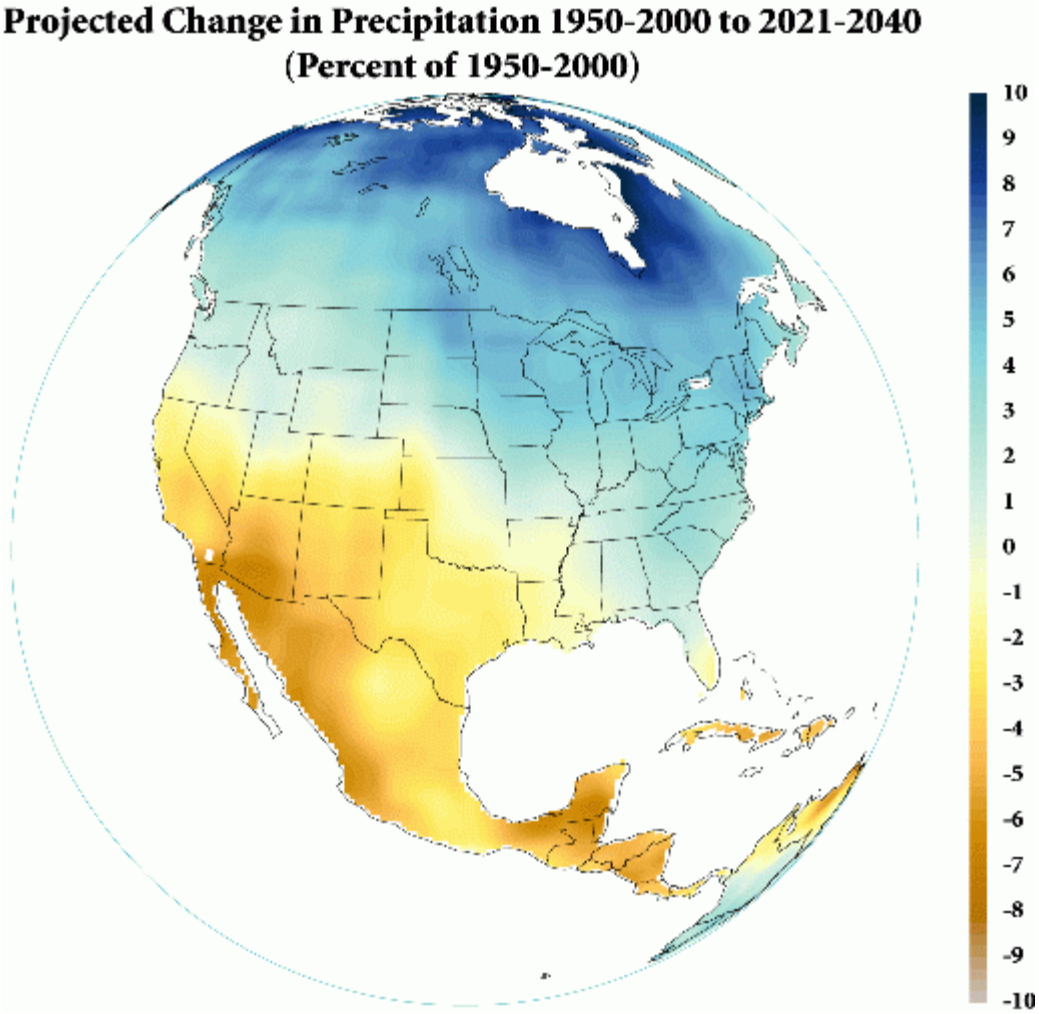
Inevitably, water would be reallocated from agriculture, which uses most of the West's supply, to urban users, drying up farms. California would come under pressure to build desalination plants on the coast, despite environmental concerns.

"This is a situation that is going to cause water wars," said Kevin Trenberth, a scientist at the National Center for Atmospheric Research in Boulder, Colo.

"If there's not enough water to meet everybody's allocation, how do you divide it up?"

Officials from seven states recently forged an agreement on the current drought, which has left the Colorado River's big reservoirs — Lake Powell and Lake Mead — about half-empty. Without some very wet years, federal water managers say, Lake Mead may never refill.

In the next couple of years, water deliveries may have to be reduced to Arizona and Nevada, whose water rights are second to California.



For more details, try:

- Richard Seager, An imminent transition to a more arid climate in southwestern North America.

which is an abridged, freely available version of the full report:

- Richard Seager, Mingfang Ting, Isaac Held, Yochanan Kushnir, Jian Lu, Gabriel Vecchi, Huei-Ping Huang, Nili Harnik, Ants Leetmaa, Ngar-Cheung Lau, Cuihua Li, Jennifer Velez, and Naomi Naik, Model projections of an imminent transition to a more arid climate in southwestern North America, *Science*, April 5, 2007.

Speaking of droughts, today I photographed some cacti and succulents that I bought last Saturday at the UC Riverside Botanic Gardens spring sale. If I list them by name here, I can look up their names after I've forgotten:

Astrophytum myriostigma
Bishop's cap or bishop's hat,
a cactus from the high plains of Mexico,
which likes dry soil without humus.

Coryphanta bumamma

Graptopetalum paraguayense
Ghost plant or mother of pearl plant,
a succulent from Mexico with leaves that fall off at the slightest touch.
Luckily you can propagate new ones from these fallen leaves!

Pleiospilos simulans
The platblaar-lewerplant,
seriously threatened in its natural habitat
near Jansenville in the Eastern Cape Province of South Africa.

April 9, 2007

On April 28th of last year I mentioned how coyotes were moving into American suburubs. Here's another sign of that: Riverside has a new policy about coyotes.

Sometimes the world gets so weird you can only laugh... here's a headline that didn't actually make the newspapers, but should have:

Australian Convicted in Kangaroo Court

April 14, 2007

Lisa is gone this weekend, attending a conference in St. Louis.

Next weekend I'm leaving for France, to a workshop on the Philosophical and Formal Foundations of Modern Physics. It's is being held at a country estate called Les Treilles in the Var near Nice, in southern France. It sounds nice:

> The estate is situated in a landscape of hills and valleys at an average altitude of 600 m. It includes agricultural plots (vines, olive trees terraced on "restanques", lavender) and spacious areas of natural land with a great variety of local flora and woodland. A network of paths meandering through the property are particularly suited for reflection.
>
> The guests' activities are centred around the "Grande Maison" which contains a conference room, the library, the kitchen and the dining area. Broadband Internet access with Wifi is available there.
>
> Guests are lodged in a number of houses spread out over the estate, the closest to the Grande Maison only a couple of minutes away. Cars are available to reach more remote houses (up to two kilometres following

> the road), but walking remains by far the most agreeable means of transport.
>
> Each house has between one and three rooms with a shower or bathroom, one or two kitchens particularly intended for breakfast. There are telephones, but not yet broadband connections. Each guest will find the necessary household linen and, in accordance with the express wish of the founder, a torch and an umbrella.

Of course, in British English, "torch" means "flashlight". I remember being confused about that, once upon a time. I would wonder, when reading novels, "Why are the British so primitive, carrying around torches like cavemen?". And they ate "pudding" for dessert all the time!

I'd been hoping Carlo Rovelli would attend this workshop, but it looks like a student of his is taking his place. It's fun talking about quantum mechanics in the French countryside, but a lot more fun with friends. I'll know Lucien Hardy (a radical physicist and all-around nice guy I met at the Perimeter Institute), and Jeffrey Bub (slightly — he's a well-known philosopher of quantum mechanics whom I briefly met at PI), and Hermann Nicolai (a string theorist and fan of exceptional Lie groups at the Albert Einstein Insitute in Golm), and Rob Spekkens (by name only: he thinks we can observe a quantum superposition of an atom and a molecule). I'll have to get to know them better.

Hmm — maybe I should do something smart and find out what everyone at the conference does before I go to it. What a concept! I'm not naturally very good at people things.

I want to read this book — it got surprisingly good reviews:

- Anthony Grafton, *The Footnote: a Curious History*, Harvard U. Press, Cambridge, Massachusetts, 1997.

Watch out! Greg Egan pointed out that in the director's cut of the movie String Kings I'm being played by the star of the The Sopranos:

> To celebrate his release from San Quentin, and as a reprisal for the recent spate of hits, crime math kingpin John Baez — played by James Gandolfini with perm wig and glasses — orders the blowing up of a workshop taking place on non-perturbative aspects of M(afia)-Theory. During a lunch break in the seminars, a wire is noticed protruding from one of the boxes of ordered pizzas and Italian food, about a second before the ensuing explosion takes out the conference. Very good effects and stunt work as some postdoc string theorists are blown back and somersault about 270 degrees before being blown through windows, but basic laws of conservation of momentum and angular momentum do not seem to be being properly obeyed — something one really should expect in a film that deals with theoretical physics at this high level.

April 15, 2007

I'm enjoying listening to the Grateful Dead's album *Blues for Allah*. I remember first hearing this in the room of my friend Chip Wendt at 2 Dickinson St., back when us misfits and counterculture sorts at Princeton used that house as a vegetarian cooperative. For years the only two Dead albums I've listened to are *Workingman's Dead* and *American Beauty*. Both these are easy-going, soulful, acoustic-sounding, relaxed, yet perfectly crafted. More recently I got *Shakedown Street*, which is a bit too clean and studio-polished for what I want from the Dead: it's very good, but doesn't have the feeling of a bunch of hippie virtuoso musicians who like to hang out on the front porch jamming. *Blues for Allah* is different yet again: more jazzy fusion and Middle-Eastern influences, more trippy. It doesn't fit together in the satisfying way that *American Beauty* and *The Workingman's Dead* do — maybe it's just too stylistically diverse. But, it's full of cool musical ideas.

I've always like the subtly reggae-inflected song Crazy Fingers. It's fun hearing that again.

Yay! It's raining! Goes well with some of the lyrics from Crazy Fingers:

Cloud hands reaching from a rainbow
Tapping at the window touch your hair

April 25, 2007

I'm at a conference on Philosophical and Formal Foundations of Physics, where I gave a talk on Quantum Quandaries: a Category-Theoretic Perspective. As I mentioned before, we're having this conference at Les Treilles, a big country estate in the hills near Nice. It's a beautiful place:

The participants are staying in small cottages; I'm sharing one with Lucian Hardy. It was so far from the main building that they gave us a car to drive. Each morning we bring in a basket to get our breakfast supplies restocked.

Everybody had lunch and dinner together — excellent French cuisine:

From left to right, the people at the front table are the string theorist Hermann Nicolai, a fellow who'd been staying at Les Treilles to write a book, Patricia Kauark-Leite, Lucien Hardy, Christopher Timpson, and one of the conference organizers, Michel Bitbol.

I wrote about the conference in week250 and week251 of This Week's Finds, but only touched on one aspect - the mathematics of quantum theory. The conference as a whole was much more philosophical, and touched on general relativity as well as quantum theory. I still need to write up some stuff Hermann Nicolai told me about gravity, billiards and Weyl chambers.

The first photo above was taken by Marc Lachièze-Rey. You can see more photos by him here. Here's another: I'm pondering the mysteries of the universe, or at least the mysterious power of coffee to combat jet-lag:

Marc works in the Astroparticule et Cosmologie group at CNRS in Paris. There are a lot of universities in Paris, and I don't understand the whole system, but this group is at Université Paris 7. He's invited me to spend some of July 2008 visiting this group. That sounds great, especially since I'm spending *this* July in Paris visiting Paul-André Melliès and the PPS (Preuves, Programmes et Systèmes) group of CNRS, also at Paris 7.

Paris is wonderful; I'd like to get to know it better, and it's nice to have a little continuity in life, so I'm looking forward to spending time there two summers in a row. I used to visit Cambridge England quite often, but I haven't been there for a long time.

April 28, 2007

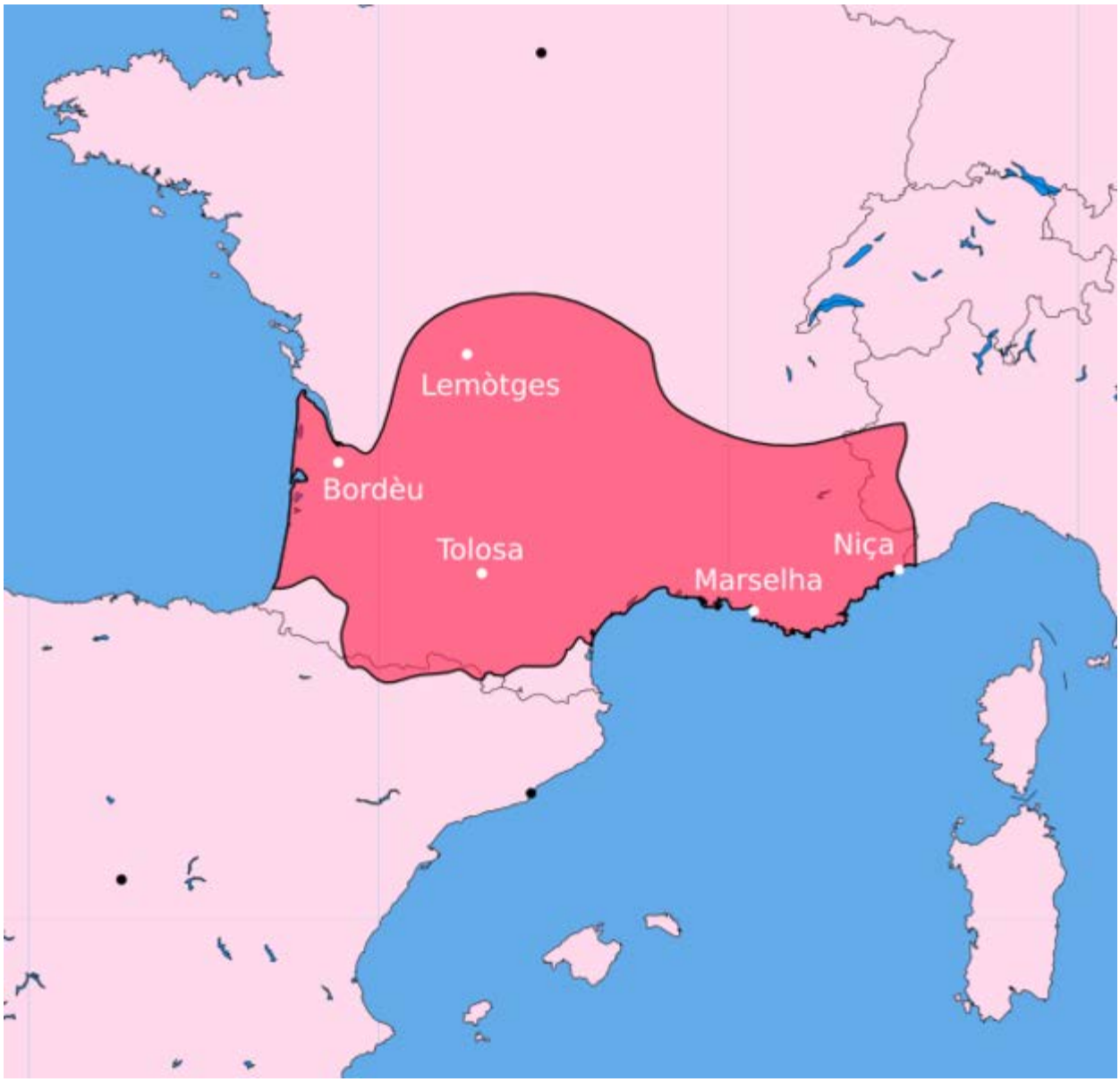
I spent my last day in France visiting Eugenia Cheng in Nice, a charming city on the Riviera, less wealthy and decadent than neighboring Monaco and Cannes:

The narrow streets and tall buildings keep the old part of town cool during the hot Mediterranean summer — even without air conditioning. Smart!

Near the border with Italy, this city has a rich history going back to its days as the Greek colony of Nicaea. I was charmed by some traces of its old language: Nissart, also called Niçard or Niçois. It's a dialect of Occitan.

Never heard of Occitan? It's also called Langue d'Oc — a term that goes back to Dante, who distinguished between the Romance languages that say "oïl" for yes, those that say "si", and those that say "oc". You may have heard of Provençal: that's the biggest dialect of Occitan, and the poetry of its troubadors is famous.

Occitan is spoken througout Occitania, otherwise known as Aquitania:



Nice is on the far eastern end of Occitania. Where France meets Spain, Occitan gives way to Catalan, which is quite similar, but regarded as a separate language.

I wish I knew Portuguese, Spanish, French and Italian, and maybe some Occitan. Then I could hike along the shore of the Mediterrean from Portugal all the way to Trieste, on Itay's border with Slovenia... and the Romance dialects I'd encounter would form a kind of continuum. Reality is richer, messier, more interesting than the system of precise borders we use to demarcate it! That's why I'm fascinated by Nissart — just as I'm fascinated by Nahwá.

You can learn Nissart online if you know French. You can also see a French-Nissart dictionary. But if that's too much work, you can visit a silly website that lists what it claims are "four essential travel phrases" in many languages. These phrases are:

1. Where is my room?
2. Where is the beach?
3. Where is the bar?
4. Don't touch me there!

In French, they are:

1. Où est ma chambre?

2. Où est la plage?
3. Où est le bar?
4. Ne me touchez pas là!

In Nissart, they are:

1. Doun es la mieu cambra?
2. Doun es la plaia?
3. Doun es la buveta?
4. Noun mi toucas aqul!

In Provençal, they are:

1. Ont es la mia cambra?
2. Ont es la plaja?
3. Ont es lo bar?
4. Me tòques pas aicí!

In Catalan, they are:

1. On és la meua habitació?
2. On és la platja?
3. On és el bar?
4. No em toques ací!

Here are some other comparisons, taken from the Wikipedia article on Occitan:

Latin	*Occitan*	*Catalan*	*French*	*Italian*	*Spanish*	*Portuguese*	*Romanian*	*English*
cantare	**cantar (chantar)**	**cantar**	**chanter**	**cantare**	**cantar**	**cantar**	**cânta**	**to sing**
capra	**cabra (chabra, craba)**	**cabra**	**chèvre**	**capra**	**cabra**	**cabra**	**capră**	**goat**
clavis	**clau**	**clau**	**clef/clé**	**chiave**	**llave**	**chave**	**cheie**	**key**
ecclesia, **basilica**	**glèisa**	**església**	**église**	**chiesa**	**iglesia**	**igreja**	**biserică**	**church**
formaticum (caseus)	**formatge (hormatge)**	**formatge**	**fromage**	**formaggio**	**queso**	**queijo**	**caş**	**cheese**
lingua	**lenga (lengua)**	**llengua**	**langue**	**lingua**	**lengua**	**língua**	**limbă**	**language**
nox, noctis	**nuèch (nuèit)**	**nit**	**nuit**	**notte**	**noche**	**noite**	**noapte**	**night**
platea	**plaça**	**plaça**	**place**	**piazza**	**plaza**	**praça**	**piaţă**	**[city] square**
pons, pontis	**pont (pònt)**	**pont**	**pont**	**ponte**	**puente**	**ponte**	**punte**	**bridge**

For my May 2007 diary, go here.

All that I serve will die, all my delights,
the flesh kindled from my flesh, garden and field,
the silent lilies standing in the woods,
the woods, the hill, the whole earth, all
will burn in man's evil, or dwindle
in its own age. Let the world bring on me
the sleep of darkness without stars, so I may know
my little light taken from me into the seed
of the beginning and the end, so I may bow
to mystery, and take my stand on the earth
like a tree in a field, passing without haste
or regret toward what will be, my life
a patient willing descent into the grass.

— Wendell Berry

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Diary - May 2007

John Baez

May 1, 2007

Lisa and I had Gregory Benford and his wife over for dinner, along with Melissa Conway, head of special collections at the UCR library. Why? Well, Benford writes science fiction, and UC Riverside has perhaps the world's best library of science fiction, horror and fantasy: the Eaton Collection. This helped lure Benford, who is based at UC Irvine, over to UCR to be a writer in residence for a couple of weeks. Lisa has taught some courses in science fiction: though her specialty is comparative classics, between China and Greece, she's in a comparative literature department and gets to do fun things like that. So, we had a little SF-based dinner.

I've really enjoyed some of Benford's novels, especially In the Ocean of Night and Across the Sea of Suns, which convey better than any book I'd read before how *big* space is... and how long it takes to cross. Too many SF stories try to skip over the tiresome process of crossing lightyears of space, often by positing "warp drives" or "hyperspace".

So, it was interesting to meet Benford. He's an opinionated somewhat smart-alecky fellow... a brash techno-optimist, but with a good sense of humor.

He's really gung-ho about a company he's involved with (and maybe owns? — I forget). It sounds pretty interesting. A while back, Michael Rose bred a strain of fruit flies to live more than twice as long as usual, by the simple expedient of taking a bunch of flies and not letting them reproduce until they were old, for many generations. Benford's company bought a bunch of these "Methuselah flies" and had their genes sequenced, finding about 720 genes that seem associated with longevity. Now they're looking for medical supplements that affect the expression of these genes in humans! Apparently a bunch of treatments *claimed* to make you live longer *don't* affect the expression of these genes: so far, the only one that *does* is omega-3 fatty acids from fish. But Benford seems to have more up his sleeves than fish oil: he expects his company to make a lot of money from knowing the genes that affect longevity.

He's also signed up with Alcor to have his head removed and frozen when he dies, so maybe he can be revived when technology improves. He said something like "Hey, it's a long shot — but my odds are a lot better than yours!" He was unsympathetic to Melissa's opinion that the currently available lifespan was quite enough for her. He seemed to think this could only be the result of a mistaken belief in an afterlife.

(I've had a bunch of conversations about life extension with a friend who has a contract with Alcor. Personally it seems I'm not interested in drastic measures to extend my life. I feel pretty satisfied with what I've done already. I don't seem to have a desperate desire to do a lot more. If a longer lifespan were available without much hassle, and with a reasonable expectation of not going senile, I'd probably take it. But, in practice, I'm more worried about staying alive as an unhappy shadow of my former self than I am about dying.)

He thinks "carbon puritanism" is hopeless as a solution to global warming. I think he advocated sequestration; though elsewhere he's suggested blocking some of the Sun's light using astroengineering.

We talked a bit about string theory, loop quantum gravity and the like. He thinks string theory is in trouble... maybe he said so even before I told him I worked on loop quantum gravity, shortly after he saw the sculpture of a Calabi-Yau manifold that my grad students had given me as a wedding present. What to do about the vast landscape of string vacua? How to choose among them? He said we should test theories to see if they predict fractal structures — or as I'd prefer to put it, complex structures on a wide range of distance scales. That seems pretty darn tough to me.

We also talked a bit about astrophysics. He said he'd written some papers about enormous glowing filaments near the center of the Milky Way. I hadn't known about these! He said the biggest one could be a million years old, perhaps

formed by some energetic event, maybe a star falling into the central black hole. Here's a quote from an online expository paper he wrote:

> **The Electrodynamic Snake at the Galactic Center**
>
> Gregory Benford
>
> Five years ago radio astronomy revealed the oddest and longest filament yet discovered at our galactic center: a uniquely kinked structure about 150 light years long and two to three light years wide — the Snake. Its large kinks are its brightest parts. There is energetic activity at one end and a supernova bubble at the other, which the Snake appears to penetrate unharmed.
>
> How does nature form stable, long-lived magnetic structures which display considerable polarization (about 60% at 10.55 GHz in the Snake)? In 1988 I had modeled others of the dozens of filaments seen uniquely at the galactic center in terms of an electrodynamic view, in which currents set up coherent magnetic pinches. Such self-organizing filaments can exist in laboratory plasmas for long times; the galactic ones could be at least a million years old, as estimated by the time that shear forces would disrupt them.
>
> The electrodynamic view uses pinch forces of currents to form filaments, driven by the $E = v \times B$ of conducting molecular clouds moving across a strong milliGauss ambient, ordered field. A return current must then flow at larger radii, making a closed loop which has a springy flexibility, able to withstand the turbulent velocity fields known near the galactic center. The picture then anticipates that aberrant molecular clouds, moving contrary to the general galactic rotation, should accompany each filament. This prediction has held up as more filaments were found.

Cool. I want to learn more about this — I wrote some more in week252.

We also talked a lot about science fiction writers. Benford is one of a breed of writers from UC San Diego including Vernor Vinge, Kim Stanley Robinson and others. He enjoys talking about these people, and also Robert Heinlein, Arthur C. Clarke, Harlan Ellison and others. For the first time I got the impression of a kind of fraternity of SF writers who all know each other and gossip about each other. Quite unlike Greg Egan — the SF writer I know best — Benford is deeply involved in things like writing workshops, fan conventions, academic conferences, and so on.

May 10, 2007

Fire season is starting early this year, due to the drought! Right after they controlled the Griffith Park fire near the Los Angeles zoo and observatory — shown above — another fire forced people to evacuate the town of Avalon, on Catalina Island:

Luckily, neither caused any loss of life.

May 13, 2007

Right now we've got lots of roses blooming in the back yard, and the bougainvillea, and verbena, and lavender... it's really nice. Our enormous African basil, which seemed to die last summer, is gradually growing back from the roots and becoming enormous again, with purplish leaves and lots of fragrant purple flowers that the bees enjoy.

Today when I went out back I saw a rabbit, a ground squirrel, and a baby ground squirrel all sitting near each other! I scared them all away, because I don't like them eating our vegetables. The rabbit ducked under a fence, the ground squirrel scurried up a wall, and the baby scurried up afterwards... and fell back down! It tried again and made it the second time. Just learning the ropes, I guess.

Squirrels are fairly rare here, at least compared to back east. Instead of the Eastern gray squirrel, *S. carolinensis*, we have the California ground squirrel, *S. beecheyi*, which I've never yet warmed to — perhaps because my first encounter with them was seeing the holes they dug in our back yard. Maybe I should reconsider. They have their fans, and let's face it: they're cute.

Later I kept hearing a chirping sound out back — I hear it now, too. It went on and on and on... I thought it was a bird, but I took a look, and it was a ground squirrel: an adult, standing on a cactus! Probably the same one. I think it was keeping tabs on the baby, sort of telling it where home was.

I also saw a lot of baby goldfinches and thrushes today, drinking from the fountain with their parents.

It's really spring!

I've been much more aware of finches ever since we bought a finch sock feeder. They ate all the seeds in that — we need to refill it — but now I see them around more, probably just because I *recognize* them more easily.

Long-time readers of this diary may note that I've slacked off talking about global warming precisely when all the news — at least the US news — has gone wild talking about it all the time. I guess I don't feel the need to be the canary in the coal mine anymore. But, global warming is the big news story that just won't quit. Here are a couple interesting items.

> **Ancient Eruptions of Carbon Dioxide Traced to Oceans**
>
> **Researchers say the gas may have accelerated Earth's warming after an ice age.**
>
> Alan Zarembo, Los Angeles Times Staff Writer
> May 11, 2007
>
> The oceans burped ... twice.
>
> About 13,000 and 18,000 years ago, carbon dioxide poured into the atmosphere in two giant belches that drove concentrations of the greenhouse gas from 180 to 265 parts per million, where it held relatively steady until the Industrial Revolution.

> Scientists have long known about the jump in gas levels from looking at ice cores. They suspected the carbon dioxide originated in a deep, carbon-rich reservoir in the oceans but had no way to explain how the gas could accumulate and then be released so suddenly.
>
> Reporting in the journal *Science* today, researchers said they found the answer in a sample of sediment drilled in the Pacific Ocean.
>
> ""This new study nails it," said J.R. Toggweiler, an oceanographer at the National Oceanographic and Atmospheric Administration, who was not involved in the study. "If there were any doubters, I don't think they have a leg to stand on."
>
> The researchers first correlated the bands of sediments in the core drilled off Baja to the Greenland ice cores. That allowed them to create a matching timeline over the last 38,000 years.
>
> Embedded in the 50-foot-long Baja core were shells left by bottom-dwelling microorganisms. The researchers analyzed the shells to determine the ratio of two isotopes, carbon-12 and carbon-14.
>
> Carbon-14 is produced by cosmic rays in the atmosphere. Thus, water that stays deep in the oceans for thousands of years contains relatively little carbon-14 and lots of carbon-12.
>
> The researchers found two periods that stood out for low carbon-14 levels.
>
> The levels meant that the water during those periods was barely circulating to the surface. Carbon from decaying organic material was accumulating in the deep. The old water eventually rose to the surface, releasing its carbon dioxide in an enormous burp.
>
> Each of the gas releases was recorded in the Greenland ice cores.
>
> Thomas Marchitto, a marine geologist at the University of Colorado at Boulder and a lead author of the new study, said matching the rise of old water to the atmospheric changes provides strong evidence that the gas came from the ocean.
>
> The burps injected 700 gigatons of carbon dioxide into the atmosphere as Earth was already emerging from an ice age. What started the warming is unknown, but scientists said the release of the gas accelerated it.
>
> Over a 10,000-year span, global temperatures rose by more than 7 degrees Fahrenheit.
>
> Since the Industrial Revolution began in the mid-18th century, the burning of fossil fuels has added 250 gigatons of carbon dioxide to the atmosphere, raising the carbon dioxide concentration to 385 parts per million and spurring a temperature increase of nearly 2 degrees.
>
> Current emissions are 7 gigatons a year. About half of that is absorbed by oceans.
>
> One mystery about the burps remains: Where did they originate? The sediment sample from Baja was merely a trace left as the old water passed by on its way to the surface. "We still need to find the original reservoir," Marchitto said.

I wonder how sure they are that these CO_2 burps came "as the Earth was already emerging from an ice age". I can imagine something like this *causing* the end of an ice age.

And, most of all, I wonder where the CO_2 came from! Previous industrial civilizations? 

The relevant paper is:

- T. M. Marchitto, S. J. Lehman, J. D. Ortiz, J. Flückiger and A. van Geen, Marine radiocarbon evidence for the

mechanism of deglacial atmospheric CO_2 rise, *Science*, May 10, 2007.

and there's also a story to set it in perspective:

- Ralph F. Keeling, Deglaciation mysteries, *Science*, Perspectives, May 10, 2007.

And here's another interesting story. Luckily, unlike the stories above, you can read it for free online!

- David Talbot, Planning for a climate-changed world, *Technology Review*, May/June 2007.

It shows people are taking climate change seriously — except for the Bush administration. A few key quotes:

> But while there's still uncertainty about the rate at which sea levels are rising, it has become increasingly clear that temperature increases alone could severely tax a large city's infrastructure. Late last year, the Union of Concerned Scientists in Cambridge, MA, released a report titled *Climate Change in the U.S. Northeast.* Produced in collaboration with climate scientists, the report predicts that by midcentury, northeastern cities could be experiencing an average of 30 to 60 days of temperatures above 90°F (32°C) each year, up from 10 to 15 days historically. By the end of the century, these cities could see 14 to 28 days of temperatures over 100ºF (38°C), if the higher-emission scenarios are realized.
>
> [...]
>
> Colorado Springs, CO, is a boomtown in an arid region — just one of many cities that rely for water on the melting snowpack of the nearby mountains, delivered via the Colorado River and Arkansas River watersheds. Many other cities get their water similarly from the Sierra Nevada Mountains of California. But right now, the western United States is facing a slow-motion water-supply catastrophe wrought by climate changes that will inexorably reduce the snowpack. "The western U.S. is really not in good shape at this point," says Linda Mearns, a climatologist at the National Center for Atmospheric Research (NCAR) in Boulder, CO, where she is director of the Institute for the Study of Society and Environment. This has become fairly clear "even without the regional detail" in climate models, she adds.
>
> But the regional detail is still important for deciding how, where, and when to respond. Consider the Homestake Reservoir. High in the Rocky Mountains, not far from Vail, CO, it is part of a network of reservoirs and pipelines that feed water to Colorado Springs. In June 2006, the reservoir filled at the unprecedented average rate of nearly two feet per day. Because of higher temperatures earlier in the season, the snowpack was melting more quickly than usual.
>
> The unprecedented may become routine as global warming makes more precipitation fall as rain, while what snow there is melts ever faster. That's worrisome: a reservoir that fills more quickly than expected can stress a dry levee. And there are other concerns. At what point will earlier snowmelt translate into summer water shortages? Will early spring torrents raise the risk of downstream flooding? Will more-intense spring rainfalls increase sediment, overwhelming filtration systems and washing more pollutants into the water supply? And these climate-related questions arise at a time when rapid population growth is already stressing water resources.
>
> [...]
>
> Two days after I saw the NCAR simulations, I visited Ted Scambos, lead scientist at the University of Colorado's National Snow and Ice Data Center (NSIDC) in Boulder. Scambos studies ice dynamics to understand the rate at which the ice sheets of Antarctica and Greenland are responding to climate change. He and other scientists at NSIDC spend their days poring over satellite data, studying how glaciers slide down ancient hidden fjords and how warmer ocean water and the glaciers' own meltwater lubricate their progress. "We are warming so fast that the earth is still staggering backwards from the warming," Scambos said. "We may have already crossed the threshold of the last warm period, a time when people were growing grain in Iceland and raising dairy cattle in southeastern Greenland. And even if you flattened out

> greenhouse emissions right now, my hunch is that all the arctic sea ice in summer will eventually disappear."
>
> "We're really, really in trouble," he continued. "It's just a question of time. People say climate has changed before and people adapted. That is true. But there weren't six billion of us, with all the arable land working as hard as it could, and every one of those areas counting on climate more or less staying the same. All our infrastructure is built around this climate. Personally, I think we have a strong moral obligation to respond in a fashion that gives people a century from now a reasonable chance of making their way ahead. We should do something."
>
> The ability to "do something," however, depends on getting information that is much better and more detailed. And that will depend on increasingly precise computer models and more monitoring equipment to feed data into those models. Not every city has a Goddard Institute for Space Studies in its backyard, Cynthia Rosenzweig points out. She says every local government should be given the tools to understand how global warming will affect its community. "We need a national capacity for scenarios, to provide every locality in the nation with the input variables they need for projecting impacts and preparing adaptations," she says. "We should begin to incorporate sea-level rise into plans for coastal development. We should improve our responses to heat waves — now — so we can be prepared for greater frequency and duration. And we should consider the potential for more droughts — how we would manage for more droughts and floods."
>
> But from NASA to the NOAA to the National Science Foundation and the U.S. Department of Energy, the budget picture is dismal. In 2005 dollars, the annual federal budget for climate-change research has been slashed from more than $2 billion in the mid-1990s to less than $1.6 billion today. Earlier this year, a National Academy of Sciences report warned that Earth-observing satellites — basic hardware for monitoring climate change — were at "great risk" of blinking out. Without urgent investment, the report warned, 40 percent of sensors and other instruments aboard NASA spacecraft could stop functioning before the end of the decade. "At these agencies, earth-science and climate — science budgets are either level or decreasing in real dollars," says MIT's Ronald Prinn. "Under those circumstances, what is needed for helping out states and cities is just not going to appear. It is a sad state of affairs. At a time when we should be trying to help at the regional to the local level, with sound advice, we are facing this incapability to have accurate forecasts at the local level that make the advice worth taking."

Last year NASA changed its mission statement, removing "to understand and protect the Earth" from its list of objectives. Along with the National Academy of Sciences, The American Association for the Advancement of Science warns that climate monitoring satellites are in jeopardy as spending shifts towards military and manned space flight programs.

While the US federal government plays ostrich, 31 states joined forces on May 9th to form The Climate Registry: a system for collecting "an accurate, complete, consistent, transparent and verified set of greenhouse gas emissions data".

May 14, 2007

Lisa is back! She'd gone to a conference in Granada on Thursday the 3rd, stopping off to visit our friend Julie Strauss in Greenwich en route. Now she's back. It's 12:30 am, and we had a little dinner... she's pretty darn tired.

She left a booklet about the Alhambra on my side of the bed... I want to look at it! I'm really jealous, since I'm fascinated by Andalusia. Luckily, there's a good chance I'll go to Granada myself in the summer of 2008, since there some category theorists there have invited me to stop by before a conference on homotopy theory and higher categories in Barcelona. Lisa will probably come along and visit her colleague there.

After a good night's sleep...

My friend Chris Lee came to U. C. Riverside and gave a talk on "Mapping evolutionary pathways of HIV-1 drug

resistance using conditional selection pressure". Very simply, the idea is to do statistical analyses of the HIV virus genome to see how it evolves. This virus mutates very rapidly, and develops resistance to all the drugs we throw at it. So, we need to understand the evolutionary pathways to design courses of treatment that don't just help it do better at evolving resistance. Luckily, there's enough data to do this now. Chris is using his knowledge of statistics to get the information out of this data:

- Lamei Chen and Christopher Lee, Distinguishing HIV-1 drug resistance, accessory, and viral fitness mutations using conditional selection pressure analysis of treated versus untreated patient samples, *Biology Direct* **1** (2006), 14.

Later we went out with Lisa to a tapas bar, and wound up dreaming of what it would be like if people could make money by spotting externalities involving public goods.

May 18, 2007

What should we do about climate change? Read what some experts have to say:

- Marilyn Berlin Snell, Climate exchange: cool heads tackle our hottest issue, *Sierra*, May/June 2007.

The main thing we need is a carbon tax — but this is just one of *many* things we need.

May 20, 2007

We did a few hours of gardening today; a lot of work but satisfying. Preparing for a summer of extreme drought and fires, I removed some dried-up bushes from the slope behind the house, and raked up a bunch of leaves from the toyon tree.

Everything is blooming and beautiful! But, I find it hard to take photos that capture the mood of the place. I guess my eye automatically zooms in on this or that nice feature and slides right over the duller bits. Photos come out looking busy, and often washed-out, thanks to the bright California sun.

Here are some of the plants in bloom today:

- A little tea rose I gave Lisa for Valentine's Day last year has tripled in size. Now it's blooming like mad:

The other red flowers in back are some species of salvia (that is, sage).

- African blue basil is actually tinged with purple:

It grows to an enormous size, and it tastes a bit like Thai basil. Bees love it.

Another rose:

It's nestled amid what I've been told is germander, though now I'm suspicious: does germander ever have blue flowers?

May 27, 2007

This article points out how smaller sample sizes tend to increase the variance, or standard deviation, of any quantity being measured:

- Howard Wainer, The most dangerous equation, *American Scientist*, May-June 2007, 249-256.

Most people don't know this, so they make lots of mistakes when reasoning with statistics.

For example: most of the counties in the United States with the highest rates of kidney cancer tend to be rural. There must be something about the rural lifestyle that causes kidney cancer, right? *But wait:* most of the counties in the United States with the *lowest* rates of kidney cancer *also* tend to be rural.

Why? Because these counties tend to have lower populations. Smaller sample size, more variance!

Wainer gives lots of other cool examples. For example, small public schools in the United States tend to dominate lists of the very best schools. But, they also tend to dominate lists of the very worst! If you only notice one of these facts, you're likely to leap to a wrong conclusion.

But here's the most important example... if it's true. Wainer suggests that men dominate women in many fields of academia not because their *average* ability is better, but because their *variance* is higher! He shows that in many standardized tests the variance is higher for men. And, he gives a plausible explanation: with only one X chromosome, men have only one copy of certain genes, where women have two. Redundancy reduces variance. So, we can expect more men to be geniuses in any given field... *and* more men to be complete idiots!

May 28, 2007

It's Memorial Day. Here's one thing to remember, from the *Riverside Press Enterprise*:

> Riverside produced a selfless heroine and martyr who has not been given enough recognition. This person was a student nurse named Charlotte Waggoner Fay who had graduated in 1916 from Riverside Girls High School. She was called to help with the case overload at Riverside City Hospital during the influenza pandemic of 1918.
>
> Charlotte worked around the clock to assist the many victims of the terrible flu. Not yet a registered nurse, she gave the profession her all.
>
> Often the sufferers of influenza would appear to recover only to die from a secondary infection such as pneumonia or tuberculosis.
>
> Unwilling to leave the sick persons in her charge, Charlotte worked to the point of exhaustion. In this weakened state, she caught the flu and died Oct. 28, 1918. World War I was still raging and Charlotte was not yet 22 years old. She had worked in the nursing field for two years.

For my June 2007 diary, go here.

Leading by examples can be effective way to enact change. The sum of many small acts caused the problem, so only the sum of many small acts will solve the problem. - Patrick Gonzalez

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Diary - June 2007

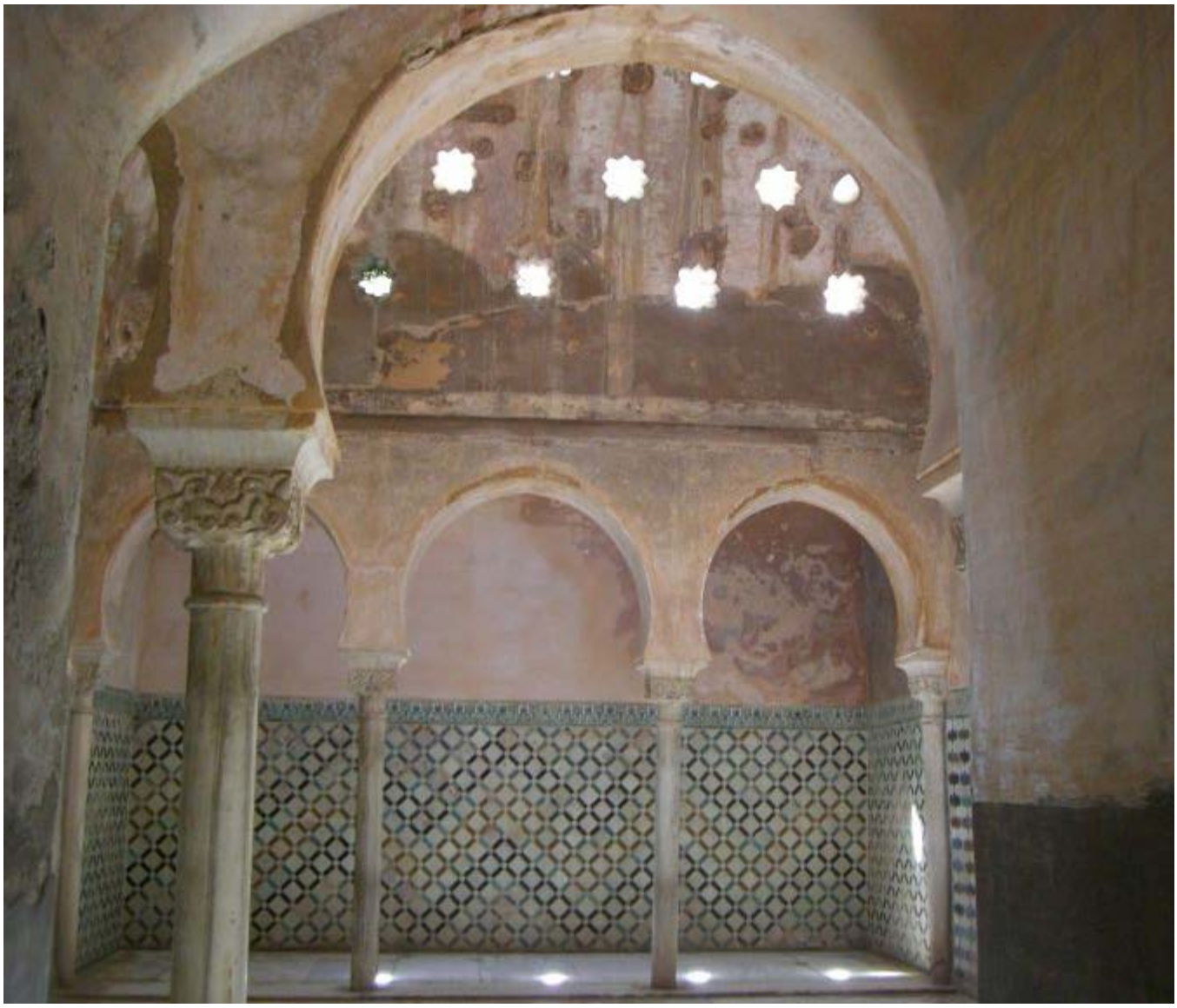
John Baez

June 1, 2007

I've been fond of Andalusia for quite a while now, without ever having been there. So, I was really excited when Lisa finally showed me the pictures she took at the Alhambra when she visited Granada in May.

Here's one taken from a parapet looking down into the town, and one of a pool:

Here's a bath inside the Alhambra:



But the best part is all the tilework inside! A tiny taste:


لا غالب
إلا الله

June 7, 2007

It's the last day of class! Yay!

I learned a lot from teaching undergraduate number theory — for example, I learned how Gauss and Eisenstein proved quadratic reciprocity in a tour de force of elementary methods. I also made some progress in understanding how cohomology theory infiltrates physics and computation in my seminars on Quantization and Cohomology and Cohomology and Quantization. I didn't do a great job on my undergraduate differential equations course — I've taught that a bunch of times, and I was just too busy to do anything different this time.

The quarter was quite exhausting. My number theory class was at 8 am, directly followed by the differential equations class. I prepared for these classes while falling asleep the night before. Then I'd pop up at 6:30 am, make coffee, prepare some more, make breakfast, and charge out the door at 7:30.

In fact I tried to prepare for classes ahead of time, on Mondays. But, as the quarter ran on and I wore out, I'd sometimes slack off, leaving more work to the last minute.

It's interesting how much of what we accomplish in life is limited only by our "energy". This "energy" is a mysterious but crucial biological-spiritual commodity. It's not the same as the physicist's concept of energy.

It seems to come in different forms: joie de vivre, élan vital, gumption, zest, vigor, pep, spirit and chi. I wonder how scientifically it's been studied.

We can set up a plan of action and then, after carrying it out successfully for a month or two, simply "run out of energy" and let it collapse. Carrying out a plan takes energy. A spontaneous approach often helps us *build up more* energy. That's called "following the tao". But sometimes it seems there's a need to plan.

Perhaps you're wondering why I'm saying such obvious stuff! It's because people sometimes marvel at my inexaustible energy. It doesn't seem special to me... until I run out, like this spring.

June 11, 2007

Lisa went to Hong Kong today; we'll hook up again after I come back from visiting my parents in DC.

June 15, 2007

My grad students Derek and Jeff handed in their theses! We're all very glad this is done. They were working hard to the very last minute. Not very good planning — and indeed, this contributed to my burnout this spring. But they did a lot of interesting, substantial work.

I'm dying to tell the world about it! I'll give a talk about Derek's thesis at the Astroparticule et Cosmologie group in Paris Université 7 pretty soon. I'll find some other venue to talk about Jeff's.

June 16, 2007

Chris and Menakshee visited. Among many other things, they told me about this book:

- Wade Davis, *The Serpent and The Rainbow*, Simon and Schuster, New York, 1997.

It's about voodoo and zombies in Haiti. Its conclusions are remarkable and controversial. Quoting a Wikipedia article:

> Wade Davis, a Canadian ethnobotanist, presented a pharmacological case for zombies in two books, *The Serpent and the Rainbow* (1985) and Passage of *Darkness: The Ethnobiology of the Haitian Zombie* (1988). Davis traveled to Haiti in 1982 and, as a result of his investigations, claimed that a living person can be turned into a zombie by two special powders being entered into the blood stream (usually via a wound). The first, *coup de poudre* (French: 'powder strike'), induced a 'death-like' state because of tetrodotoxin (TTX), its key ingredient. Tetrodotoxin is the same lethal toxin found in the Japanese delicacy fugu, or pufferfish. At near-lethal doses (LD50= 5-8µg/kg), it can leave a person in a state of near-death for several days, while the person continues to be conscious. The second powder, composed of dissociatives like datura, put the person in a zombie-like state where they seem to have no will of their own. Davis also popularized the story of Clairvius Narcisse, who was claimed to have succumbed to this practice. There remains considerable skepticism about Davis's claims, and opinions remain divided as to the veracity of his work, although there is wide recognition among the Haitian people of the existence of the "zombi drug". The vodoun religion being somewhat secretive in its practices and codes, it can be very difficult for a foreign scientist to validate or invalidate such claims.

June 18, 2007

Today Derek Wise graduated and I "hooded" him — a medieval ritual, with everyone dressed in academic regalia. Here I am in the academic procession:

When Derek's name was called we walked onto the stage and then he handed me the so-called "hood" (actually a sash-like thing), turned around, and bent down a bit. I put it over his head and tried to make sure it hung correctly from his neck. Then he walked down the aisle to get his picture taken with the chancellor of the university, Frances Cordova:

Clearly more knowledgeable than I, she adjusted his hood a bit before the shot. 151 graduate students went through the same ceremony that night.

Derek did this because his whole family came to see him graduate. The night before they even threw a surprise party for him! It was the first surprise party I'd ever attended — to me they're mainly events that happen in TV sitcoms. Derek had been told it was a meeting of his church group... which it was, but he wasn't told it was a party. Just as in the sitcoms, he got a headache right before the party and didn't want to go. His wife Sylena somehow managed to persuade him without giving away the secret.

My other student graduating this year, Jeffrey Morton, did not go to graduation ceremony. He came to the party, though. So did Danny Stevenson and his wife — Danny has been a visiting assistant professor at UCR for the last 3 years, working with me on things like nonabelian gerbes and 2-groups. He'll be taking off for Hamburg in the fall, to work with my pal Urs Schreiber.

So, there will be 3 fewer people around to work with next year. I'll miss them a lot. But, frankly, I look forward to a bit more peace and quiet — I hope it will help cure my overworked and harried mood.

Of course I'll keep working with all these folks. I plan to help Derek and Jeff chop their theses into publishable pieces and grow those pieces into perfect papers. I'm working with Danny on two papers right now, "A classifying space for nonabelian cohomology" and (joint with Alissa Crans and Urs Schreiber) "Canonical representations of 2-groups". But, I won't be having weekly meetings with them anymore. I'll still have weekly meetings with my grad students Alex Hoffnung, John Huerta, and Chris Walker, my former student Alissa Crans, and my longtime collaborator Jim Dolan. There's also a new grad student coming this fall who knows a lot of physics and wants to work with me, but maybe I'll

let him wait a year before we get into weekly meetings.

I need to keep finding ways to stop spreading myself too thin. One possibility is to get all my grad students to attend a single joint meeting; this gives them less individual attention but gives them a chance to learn more stuff. Alex will be categorifying classical mechanics according to the strategy outlined in my course on quantization and cohomology. John will be working on the algebra of grand unified theories. Chris will be working on groupoidification, which will also be the topic of next year's seminar. Right now Alex and John have both been attending each other's meetings with me, but Chris (just getting started) has been separate. Is it too ambitious to insist that they all learn *all* of this stuff? Is it too ambitious for me to be thinking about all these things at once? Maybe I'd make faster progress, and feel happier, if I focused on fewer topics at a time... and get a bunch of grad students working on the same thing. For a long while I've been trying to broaden my scope, but maybe that's reached the point of diminishing returns.

I'll have to keep thinking about this stuff. My life is out of kilter, but I'm pretty good at solving problems when I tackle them head-on (I tell myself).

June 22, 2007

I'm visiting my parents.

On Tuesday the 19th I woke up at 3:45 am and got ready to fly to my parent's house — or more precisely, Dulles airport in northern Virginia. My shuttle was to pick me up at 5:30, but I just couldn't sleep thinking about all the little things I had to do. A lot of emails, since my folks are the only people in the Western hemisphere who are still without internet access. That's part of the charm of visiting them, actually, but it requires some pre-planning. Email Bob Coecke to tell him I probably couldn't come to Oxford this summer. Email Thomas Strobl to tell him the title of my talk in Vienna this summer: "Higher gauge theory and elliptic cohomology" — same talk as in Oslo, part of my new work-reduction strategy. Email Paul-André Mellies to ask him what to do when I show up in Paris. A few more emails while I'm at it...

Everything goes fine until I reach Denver; then a huge storm system on the east coast holds up our flight 3 hours, and our flight has to detour to work around the thunderstorms, so I show up at Dulles around 10:30 instead of 6:30.

In Denver I bought the new biography of Einstein, to keep myself entertained:

- Walter Isaacson, *Einstein: His Life and Universe*, Simon and Schuster, New York, 2007.

It's a good book — I recommend it. So, the delays were not an inconvenience.

I also did a little math, trying to understand my crazy idea, inspired by Garrett Lisi's work, of Cartan connections as having a "bosonic" and "fermionic" part. But I was too sleepy to go beyond some easy preliminary calculation. Clearly some new idea is needed to jump to the next stage, and for this — let me just remind myself, since I almost forgot — I should read those papers on analogies between general relativity and superfluid helium-3, where the metric tensor is built from two copies of a fermionic coframe field, just as a bosonic condensate is built from "Cooper pairs" of helium-3 atoms... or something like that. I'll download those papers when I return to civilization.

At Dulles my baggage failed to emerge from the maw of the machine, but not just mine: a woman asked me — twice, not instantly recognizing me the second time — whether the baggage from Denver was really showing up at this carousel, and eventually I started looking around, and then a nice guy said "Hey, our baggage is over here!" Someone had taken a bunch of it off the carousel and set it in some inconspicuous spot. I found my suitcase, and after a long wait caught a cab.

The cab driver didn't know Great Falls, so I had to guide him through the woods along dark and hilly roads towards my parents' house. He became increasingly fearful as he saw deer by the road — they can jump out and cause accidents. When we entered my parent's neighborhood, pitch-black except for the distant gleam of mansions here and there, he said "It's so dark here!" I replied "A lot of rich people live here — with horse barns and stuff." He said "Is that what rich people like? Living in the dark?"

(In case you're wondering, my parents are not rich. They just saved money and built a house way out in the woods.)

When we finally reached the gravel road my parents lived on, he practically moaned "Oh, this road is really bad!" I laughed and told him he could drop me off there. He obliged me apologetically, and drove off.

I hiked down the completely dark but perfectly familiar gravel road with my suitcase in hand, listening to the forest creatures. But then, I couldn't find my parents' driveway! It was embarrassing: I could see their house perfectly well, off in the distance, but it was so darn dark I couldn't spot the driveway. It felt like a dream: after a long flight with many delays, one winds up walking to ones parents house, lost in a spooky forest....

It reminded me of once when I went to a loop quantum gravity conference at the Albert Einstein Institute, maybe Loops '05. I took a train from Berlin to the small town of Golm, arriving late at night. I got off at the train station and suddenly realized how rural it was: no signs to the hotel, not many street signs, nobody to ask, just gravel roads trailing off into the darkness. Luckily I had a map, but it wasn't completely clear how to reach the hotel, so I had to hike around in the dark for quite a while before I figured it out. I sort of enjoy this kind of thing, as long as there's no real danger. It's also sort of scary. The well-lit grid of civilization slowly falls away, and you're out there alone in the night...

Anyway: I considered hiking straight through the woods to my parents' house, but I decided things were already interesting enough, so instead I called my mom and ask her to drive down the driveway a bit, just so I could see where it was. And so she did, and then it was obvious.

So, I got home shortly before midnight. A long and strange day. My dad was already in bed, but I said hi to him anyway.

Since then I've been talking to my parents, doing stuff with them, and working on a paper for the *Mathematics and Narrative* conference in Delphi this summer. I really like the title of this paper: "Why Mathematics is Boring". Unfortunately my file for this paper is called "boring.tex", which doesn't inspire me to work on it. But, I've finally gotten rolling on the project, and it's getting fun.

I should be working on it now. I'm sitting at my mom's desk looking out at the forest, listening to some music by Hossam Ramzy, *The Best of Farid Al Atrash*. Here's what I'm seeing:

This photograph doesn't really capture the beauty of the scene, since the camera saturates when the light gets too bright, showing white blobs where I see sunlit beech leaves with distinct veins, gently stirring in the breeze.

June 26, 2007

I got back home last night. Lisa got back from Hong Kong the previous day.

It's great to be back! We could have a lot of fun here this summer. It seems a bit unnecessary, and tiring, to zip off to Paris on the 30th. But, we've made our plans already, so off we'll go. It'll be fun.

I say "we've made our plans", but we're not sure yet whether we'll be staying on rue Lepic in Montmartre, or right near Luxembourg Garden. The latter seems a bit more convenient and nice.

June 27, 2007

Getting ready to go... it looks like we're staying near Luxembourg Garden, at 44 rue Monsieur le Prince. It's an apartment on the 4th floor, with no elevator and (possibly worse) no air conditioning. But, it's nicely located.

I got some interesting links from Andrew Stringer. His friend Dr. Jennifer McElwain at University College Dublin noticed that the pores in plant leaves — technically called "stomata" — tend to close when there's a lot of carbon dioxide in the atmosphere. She then studied fossil plant leaves and noticed that they had fewer stomata right around the end-Triassic and mid-Jurassic extinctions! This suggests that these mass extinctions were related to volcanic eruptions, which would emit large amounts of carbon dioxide and cause bursts of global warming.

Some references:

- Understanding Evolution, Ancient fossils and modern climate change: the work of Jennifer McElwain.
- K. J. Willis and J. McElwain, *The Evolution of Plants*, Oxford U. Press, Oxford, 2002.

June 28, 2007

It's a bit embarrassing to get my news on biology from *The Economist*, but oh well... it's a good magazine. Seems there's been a paradigm shift in genetics when I wasn't looking. Junk DNA ain't "junk" anymore! A bunch of it codes for RNA molecules that shuttle about doing important jobs.

- Really new advances, *The Economist*, June 14, 2007.

I'll quote a little:

> It is beginning to dawn on biologists that they may have got it wrong. Not completely wrong, but wrong enough to be embarrassing. For half a century their subject had been built around the relation between two sorts of chemical. Proteins, in the form of enzymes, hormones and so on, made things happen. DNA, in the form of genes, contained the instructions for making proteins. Other molecules were involved, of course. Sugars and fats were abundant (too abundant, in some people). And various vitamins and minerals made an appearance, as well. Oh, and there was also a curious chemical called RNA, which looked a bit like DNA but wasn't. It obediently carried genetic information from DNA in the nucleus to the places in the cell where proteins are made, rounded up the amino-acid units out of which those proteins are constructed, and was found in the protein factories themselves.
>
> All that was worked out decades ago. Since then, RNA has been more or less neglected as a humble carrier of messages and fetcher of building materials. This account of the cell was so satisfying to biologists that few bothered to look beyond it. But they are looking now. For, suddenly, cells seem to be full of RNA doing who-knows-what.
>
> And the diversity is staggering. There are scnRNAs, snRNAs and snoRNAs. There are rasiRNAs, tasiRNAs and nat-siRNAs. The piRNAs, which were discovered last summer, are abundant in developing sex cells. No male mammal, nor male fish, nor fly of either sex, would be fertile without them. Another RNA, called XIST, has the power to turn off an entire chromosome. It does so in females because they, unlike males, have two X chromosomes and would otherwise get an unhealthy double dose of many proteins. There is even a "pregnancy-induced non-coding RNA", cutely termed PINC. New RNAs are rushing forth from laboratories so rapidly that a group called the RNA Ontology Consortium has been promised half a million dollars to prune and tend the growing thicket of RNA-tailed acronyms.
>
> In the light of this abundance, perceptions about what a gene is need to change. Genes were once thought of almost exclusively as repositories of information about how to build proteins. Now, they need to be seen for what they really are: RNA factories. Genes for proteins may even be in the minority. In a human, the number of different microRNAs, one of the commonest of the newly discovered sorts of RNA, may be as high as 37,000 according to Isidore Rigoutsos, IBM's genome-miner in chief. That compares with the 21,000 or so protein-encoding genes that people have.
>
> Philosophers of science love this sort of thing. They refer to it as a paradigm shift. Living through such a shift is confusing for the scientists involved, and this one is no exception. But when it is over, it is likely to have changed people's views about how cells regulate themselves, how life becomes more complex, how certain mysterious diseases develop and even how the process of evolution operates. As a bonus, it also opens up avenues to develop new drugs.

The business about "it is beginning to dawn on biologists that they have got it wrong" sounds like journalistic exaggeration. If you click on some of the links you'll see that research on all these subjects is well underway. Indeed, the amount of work done so far is so vast it's scary! When you look at things like the National Center for Biomedical Ontology and the Gene Ontology Consortium — massive projects seeking to keep track of all the structures and concepts involved in various portions of biology — you get some sense of how huge a project we're undertaking: *trying to completely understand life at the molecular level*.

Our feeble brains are not enough to keep track of the complexity. We need all the help from computers we can get.

One big and rather simple question, though, is how much the central dogma of molecular biology will be called into question. This is the idea that information flows from DNA to the organism through expression of proteins but not back, except indirectly, via natural selection. Quoting some more of the *Economist* article:

> Ronald Plasterk, of the University of Utrecht, in the Netherlands, suggests that microRNAs are important in the evolution of the human brain. In December's *Nature Genetics*, he compared the microRNAs encoded by chimpanzee and human genomes. About 8% of the microRNAs that are expressed in the human brain were unique to it, much more than chance and the evolutionary distance between chimps and people would predict.
>
> Such observations suggest evolution is as much about changes in the genes for small RNAs as in the genes for proteins — and in complex creatures possibly more so. Indeed, some researchers go further. They suggest that RNA could itself provide an alternative evolutionary substrate. That is because RNA sometimes carries genetic information down the generations independently of DNA, by hitching a lift in the sex cells. Link this with the fact that the expression of RNA is, in certain circumstances, governed by environmental factors, and some very murky waters are stirred up.
>
> **It's evolutionary, my dear Watson**
>
> What is being proposed is the inheritance of characteristics acquired during an individual's lifetime, rather than as the result of chance mutations. This was first suggested by Jean Baptiste Lamarck, before Charles Darwin's idea of natural selection swept the board. However, even Darwin did not reject the idea that Lamarckian inheritance had some part to play, and it did not disappear as a serious idea until 20th-century genetic experiments failed to find evidence for it.
>
> The wiggle room for the re-admission of Lamarck's ideas comes from the discovery that small RNAs are active in cells' nuclei as well as in their outer reaches. Greg Hannon, of the Cold Spring Harbor Laboratory in New York State, thinks that some of these RNA molecules are helping to direct subtle chemical modifications to DNA. Such modifications make it harder for a cell's code-reading machinery to get at the affected region of the genome. They thus change the effective composition of the genome in a way similar to mutation of the DNA itself (it is such mutations that are the raw material of natural selection). Indeed, they sometimes stimulate actual chemical changes in the DNA — in other words, real mutations.
>
> Even this observation, interesting though it is, does not restore Lamarckism because such changes are not necessarily advantageous. But what Dr Hannon believes is that the changes in question sometimes happen in response to stimuli in the environment. The chances are that even this is still a random process, and that offspring born with such environmentally induced changes are no more likely to benefit than if those changes had been induced by a chemical or a dose of radiation. And yet, it is just possible Dr Hannon is on to something. The idea that the RNA operating system which is emerging into view can, as it were, re-write the DNA hard-drive in a predesigned way, is not completely ridiculous.
>
> This could not result in genuine novelty. That must still come from natural selection. But it might optimise the next generation using the experience of the present one, even though the optimising software is the result of Darwinism. And if that turned out to be commonplace, it would be the paradigm shift to end them all.

(As Toby Bartels notes, what generates genuine novelty in the current Darwinian paradigm is not natural selection but mutation. Mutation generates novel organisms, and natural selection weeds out those that don't reproduce enough.)

For more, try this:

- Gisela Storz, An expanding universe of noncoding RNAs, *Science* **296** (17 May 2002) 1260-1263.

As if this weren't cool enough, my student Mike Stay (now working at Google) pointed out that Craig Venter's team has just succeeded in giving a bacterium a complete genome transplant:

- Philip Ball, Genome transplant makes species switch: one type of bacterium has been reprogrammed into another, *Nature*, June 28, 2007.

This is part of the quest for artificial life, which I discussed in my October 27, 2005 diary entry. The Craig Venter Institute has a Synthetic Biology group working on creating artificial life forms. Venter says they're close to synthesizing from scratch the entire genome of a small bacterium, *Mycoplasma genitalium*. If that genome could be put into a bacterium using the method announced today, Venter could claim he has made the first synthetic life form. Of course this is "cheating" in at least two senses: it uses an already functioning cell, and it uses the genome of an existing bacterium. The fun will start when they put in a novel, human-crafted genome.

June 29, 2007

I'm sure you've heard of the memo signed by Alberto Gonzales, now Attorney General of the United States, which claimed that the "new paradigm" of the war against terrorism "renders obsolete Geneva's strict limitations on questioning of enemy prisoners". And I'm sure you know what followed: torture at Abu Ghraib and elsewhere, a worldwide network of secret prisons, kidnappings at airports, and more.

You've probably also heard how the Bush administration began a massive program of secret wiretapping of US citizens, in direct contradiction to the Foreign Intelligence Surveillance Act.

And, more recently, you've probably heard how Dick Cheney claimed the office of the vice presidency was "not an entity within the executive branch" of the US government — and clearly not part of the legislative or judicial branches, either, hence exempt from regulations governing any branch of government!

I could list many more examples of how the Bush administration has flouted the Constitution, federal laws, and international treaties.

Ever wonder about just how this tide of lawlessness started, and who is behind it?

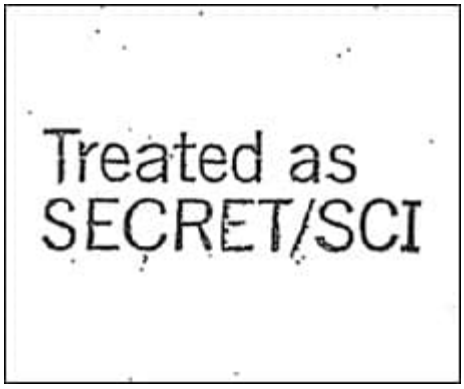
To a surprisingly large extent there's one man behind it: Dick Cheney. For the full story — or the little we know so far " read this:

- Barton Gellman and Jo Becker, Angler: the Cheney vice presidency, *Washington Post*, June 23-26, 2007.

It's gripping reading for anyone who cares about democracy, and how democracy can start to unravel thanks to the work of a ruthless and skillful man.

Here's a taste of his methods:

> Stealth is among Cheney's most effective tools. Man-size Mosler safes, used elsewhere in government for classified secrets, store the workaday business of the office of the vice president. Even talking points for reporters are sometimes stamped "Treated As: Top Secret/SCI." Experts in and out of government said Cheney's office appears to have invented that designation, which alludes to "sensitive compartmented information," the most closely guarded category of government secrets. By adding the words "treated as," they said, Cheney seeks to protect unclassified work as though its disclosure would cause "exceptionally grave damage to national security."



A document from the Office of the Vice President is stamped "Treated as Secret/SCI"

> Across the board, the vice president's office goes to unusual lengths to avoid transparency. Cheney declines to disclose the names or even the size of his staff, generally releases no public calendar and ordered the Secret Service to destroy his visitor logs. His general counsel has asserted that "the vice presidency is a unique office that is neither a part of the executive branch nor a part of the legislative branch," and is therefore exempt from rules governing either. Cheney is refusing to observe an executive order on the handling of national security secrets, and he proposed to abolish a federal office that insisted on auditing his compliance.

And, the truly scary thing is how he never gives up, even when he seems to be defeated:

> Cheney and his allies, according to more than two dozen current and former officials, pioneered a novel distinction between forbidden "torture" and permitted use of "cruel, inhuman or degrading" methods of questioning. They did not originate every idea to rewrite or reinterpret the law, but fresh accounts from participants show that they translated muscular theories, from Yoo and others, into the operational language of government.
>
> A backlash beginning in 2004, after reports of abuse leaked out of Iraq's Abu Ghraib prison and Guantanamo Bay, brought what appeared to be sharp reversals in courts and Congress — for Cheney's claims of executive supremacy and for his unyielding defense of what he called "robust interrogation."
>
> But a more careful look at the results suggests that Cheney won far more than he lost. Many of the harsh measures he championed, and some of the broadest principles undergirding them, have survived intact but out of public view.

> The vice president's unseen victories attest to traits that are often ascribed to him but are hard to demonstrate from the public record: thoroughgoing secrecy, persistence of focus, tactical flexibility in service of fixed aims and close knowledge of the power map of government. On critical decisions for more than six years, Cheney has often controlled the pivot points — tipping the outcome when he could, engineering stalemate when he could not and reopening debates that rivals thought were resolved.

June 30, 2007

I'm taking off for Paris today. I'm supposed to meet Paul-André at the Café Delmas, across from 2 Place de la Contrescarpe:

But before I go — some thoughts.

In her song "Same Time Tomorrow", Laurie Anderson asks:

And I what I really want to know is:
are things getting better, or are they getting worse?

It seems like an inane question, posed that way, without any qualifications. And indeed that's part of her point: we can't help wanting to know the answer to this question, even though it's unanswerably vague. I'm not sure what the point of this diary is, but sometimes it seems like an extended meditation on precisely this question.

That said, here's some evidence that things are getting better. (I've presented plenty for the opposite side.) Sometimes you get the impression that chronic ailments are getting more common as people live longer... but this book claims otherwise:

- Robert Fogel, *The Escape From Hunger and Premature Death, 1700–2100: Europe, America and the Third World*, Cambridge U. Press, Cambridge, 2004.

By their mid to late 60's, veterans from the US civil war (on the Union side) suffered from an average of 6 chronic conditions. For 65-year old American whites today, the number is 2.

There's a lot more here to remind us how things have been getting better. Of American children born between 1835 and 1845, nearly 25% died as infants, and another 15% died before the age of 15. Those who survived to adulthood suffered persistent malnutrition. In large cities like Boston, New York and Philadelphia, life expectancy at birth in 1830 was 24 years. On top of that, they worked an average of 78 hours a week.

Of course, all the improvements since then have come at a tremendous cost to our environment. So, things will only be "getting better" in a sustainable way if we change our habits.

One piece of good news here is that while the world's population is expected to grown from 6.5 billion to 9 billion from now to the year 2050, it's now expected to decline after that. Birth rates are dropping worldwide. In no major industrial country besides the US do women have more than 2 children on average. In China they have 1.7 — though you may not have heard, the 1-child policy does not apply to couples who are themselves only children. In Germany they have 1.4. In

Italy, just 1.3. In the United States the average is 2.1.

This is added incentive to make a transition to a mindset where "growth" is measured not in terms of GNP, but GNP *per capita*, or some other statistic that's an even better indicator of *how well people are living on average*. We've got to stop thinking that bigger is better, and instead realize that *better* is better.

If not, we still run the danger of seriously screwing up the planet for a long time.

James Lovelock argues in this book:

- James Lovelock, *The Revenge of Gaia: Why the Earth Is Fighting Back — and How We Can Still Save Humanity*, Penguin Books, London, 2006.

that the time is past for "sustainable development" — he wants "sustainable retreat". From September 12th 2006 *New York Times* article:

> Q. Why do you call it global heating and not global warming?
>
> A. Warming is something that's kind of cozy and comfortable. You think of a nice duvet on a cold winter's day. Heating is something you want to get away from.
>
> Q. What's your perception of where we're headed with even conservative predictions for growth of both populations and energy use?
>
> A. I think we're headed straight back to the Earth's second stable state, which is a hot state that it's been in many times before in the past. It's about 14 degrees warmer than it is in these parts of the world now.
>
> It means roughly that most life on the planet will have to move up to the Arctic basin, to the few islands that are still habitable and to oases on the continents. It will be a much-diminished world.
>
> Q. Can you explain why you think nuclear power is so vital?
>
> A. The really bad thing we did way back when was starting to burn things in the atmosphere to get energy. We started with fire, just cooking food, and probably could have gotten away with that. But once we started burning forests to drive the animals out as a cheap way of hunting, then we started on our downward course. What we're doing now with fossil fuels is just as bad.
>
> We live in a nuclear-powered universe. We're the oddballs by getting energy from burning carbon.
>
> My justification of nuclear power is that we've reached a stage now where the dire things that threaten us are so great that even the results of an all-out nuclear war pale into insignificance as unimportant compared to what's going to happen. Q. You seem to say we have to get over the idea that renewable energy sources &emdash; wind, solar &emdash; in the short run, are a useful way out of this.
>
> A. I feel they're largely gestures. If it makes people feel good to shove up a windmill or put a solar panel on their roof, great, do it. It'll help a little bit, but it's no answer at all to the problem.
>
> Q. What is it about this issue that you think fails to capture adequate public or political attention?
>
> A. I think it's mainly because scientists, and I include myself amongst them, have not really understood what was going on until very, very recently. And also scientists tend to look at things much too academically.
>
> What really got me to write the book was going to a meeting at the Hadley Center, a big climate lab near where I live, and talking to all the people there. And Sandy came with me, and we both got the impression that they were talking about the Earth as if it was another planet, not something they were actually standing

on.

And they're all talking about their own separate little bit. One was talking about glaciers melting, another about tropical forests in trouble. But they didn't put it together as a whole-planet phenomenon. And when you did that, then each of their gloomy stories together became a devastating thesis.

Q. You say in the book that sustainable development is a fantasy, essentially, and you have a different notion for what needs to happen, of 'sustainable retreat'.

A. At six-going-on-eight-billion people, the idea of any further development is almost obscene. We've got to learn how to retreat from the world that we're in. Planning a good retreat is always a good measure of generalship.

Q. If you could take any facet of society &emdash; elected officials, doctors, writers &emdash; and show them one thing that you think could motivate the scale of change you're talking about, any idea what you might do?

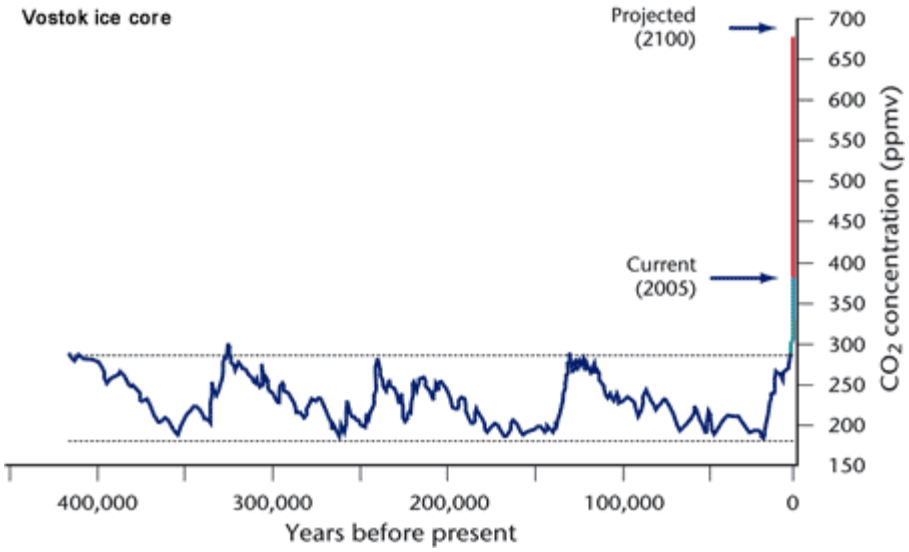
A. I would take them on a trip to the parts of the world where the changes are now maximum, and that is the Arctic. For example, not many years ago explorers were walking with dogsleds all the way to the North Pole regarding it as a great adventure. It's only a matter of perhaps 30 years when they'll have to go there in a sailboat.

Q. You seem to have two messages at once. One is sort of a hopeful sense of the innovative and adaptable aspect of humans, and the other is that we're going to need all those skills.

A. The human species has been on the planet for a million years now. We've gone through seven major climatic changes that are equivalent to this. The ice ages were shifts in climate comparable with this one that's coming. And we've survived.

That series of glaciations and interglacials put the pressures on us to select the kind of human that could adapt. And we're the progeny of them. And we're just up against a new and different stress. Maybe we'll come out better.

We'll see!



For my July 2007 diary, go here.

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home

For my June 2007 diary, go here.

Diary - July 2007

John Baez

July 1, 2007

Our trip to Paris was basically uneventful, but our arrival was delayed. We found Paul-André and his daughter standing in front of the Café Delmas; they hopped into the cab, and we all went to meet our landlord, Jean-Jacques de Balasy.

We've got a cute one-bedroom apartment on the fourth floor of a building at 44 Rue Monsieur le Prince — which sounds so much nicer than what I jokingly call it: "Mister the Prince Street". It's in the 5th arrondissement, a little bit east of Jardin du Luxembourg. As you walk to it from the south, this is what you'll see:

As we walked around the apartment we noticed several lights hung at a height of 5 feet, the most inconvenient being directly in front of the sink. The landlord said, "My wife is quite short. You will have many confrontations with this lamp."

He was right — and so far, the lamp has won every time.

There are some other quirky features. For example, there's broadband internet — but you can't use the phone while using the computer! Instead, the phone will take a message... which you can then access via the television.

Despite all this, the place is charming:

July 2, 2007

It's nice to listen to some new new music in a new place — it brings back memories later on. So, I bought a CD of Scarlatti's *Stabat Mater* at the classical music store around the corner. This rich choral work featuring 10 soloists seems to fill our apartment up to its sloping ceilings. I'd first heard it when visiting my parents last month — the Gulbenkian Choir performed it at the Freer. The instrumental accompaniment takes a back seat on this piece, but it features the theorbo, which I'd never seen before: it's a kind of overgrown lute. I bought the version by the Concerto Italiano.

Today we walked around the Latin Quarter. Here's Lisa in front of the Sorbonne:

Today is the day that exam scores were posted for all schools in France, from elementary schools to the Sorbonne. Students and some parents lined up, anxiously awaiting the results:

Perhaps it was no coincidence that many cars parked next to the Sorbonne had these fliers placed on their windshields, advertising math tutoring:

Just for fun, I began taking photographs of streets named after mathematicians... or more precisely, of the street signs. Here are two guys who probably didn't need tutoring to pass their math exams:

Descartes you surely know. Paul Painlevé may be most famous as a politician in France, but mathematicians know him for his work on differential equations.

I need to get Rue Monge and Rue Laplace!

July 6, 2007

I'm developing a routine of meeting Paul-André Melliès at Café Rostand at 10 in the morning. We've been discussing category theory. Somewhat to my surprise, he's studied Jordan–Hölder theorems from the viewpoint of rewrite rules, while I've been wondering if there's some sort of braided monoidal category implicit in such theorem — as is evident in Joyal and Street's work on Hecke algebras, at least in a special case. In his approach he's bumped into some diagrams resembling the Yang–Baxter equation, which also shows up in braided monoidal categories. So, we're trying to understand each other's ideas. It's fun having no fixed agenda and suddenly stumbling on a puzzle like this.

A few days ago Lisa installed wireless internet in our apartment, after I bought a nice little portable wireless router at fnac for this purpose. It worked nicely, but the next morning the TV stopped working — all the gadgets in this joint are connected. After some struggle we managed to get the phone to work even when the wireless internet was on, but the TV remained recalcitrant. This evening the landlord came and did his best, but gave up and said his wife would try later.

July 7, 2007

In the morning Lisa and I had our usual croissants and coffee — there's a bakery downstairs, and each day the aroma of fresh-baked croissants drifts up, so they're hard to resist. We went on a long walk to the west end of Saint-Germaine, looking for a market that sold soap, not finding it. Then we walked back east along the Seine, then down south a bit — where I managed to snap a picture of Rue Lagrange:

In the afternoon Lisa's friend Agnes Chalier visited:

After tea, we all walked over to the Right Bank:

On the way back home, I took a detour and got a shot of Rue Monge:

In the evening I finished my talk on Derek Wise's work, which I'll give on Tuesday at the AstroParticule et Cosmologie group at Université Paris 7.

July 8, 2007

I bagged another one — Rue Laplace, just north of the Pantheon:

Over at the *n*-Category Café, someone pointed out a list of mathematicians with Paris streets named after them. There are over a hundred! But, it looks like Rue Malus and Rue Malebranche are the only ones left in the 5th arrondissement. In the 6th, just Rue Le Verrier! So, soon I'll have to go further afield if I want to keep playing this game.

As David Corfield points out, I can get Rue Newton, Rue Euler, Rue Galilée and Rue Kepler if I go south of Étoile, a big intersection north of the Seine.

But in case you're wondering: I'm doing lots of other fun stuff, too!

July 9, 2007

When I started talking about climate change in this diary, back in 2004, I felt a strong need to collect information and publicize it. The issue wasn't getting much attention in the US media, and every news item was "balanced" by quotes from "climate change skeptics" saying there was nothing to worry about. I was aghast when I realized how many of these "skeptics" were funded by Exxon.

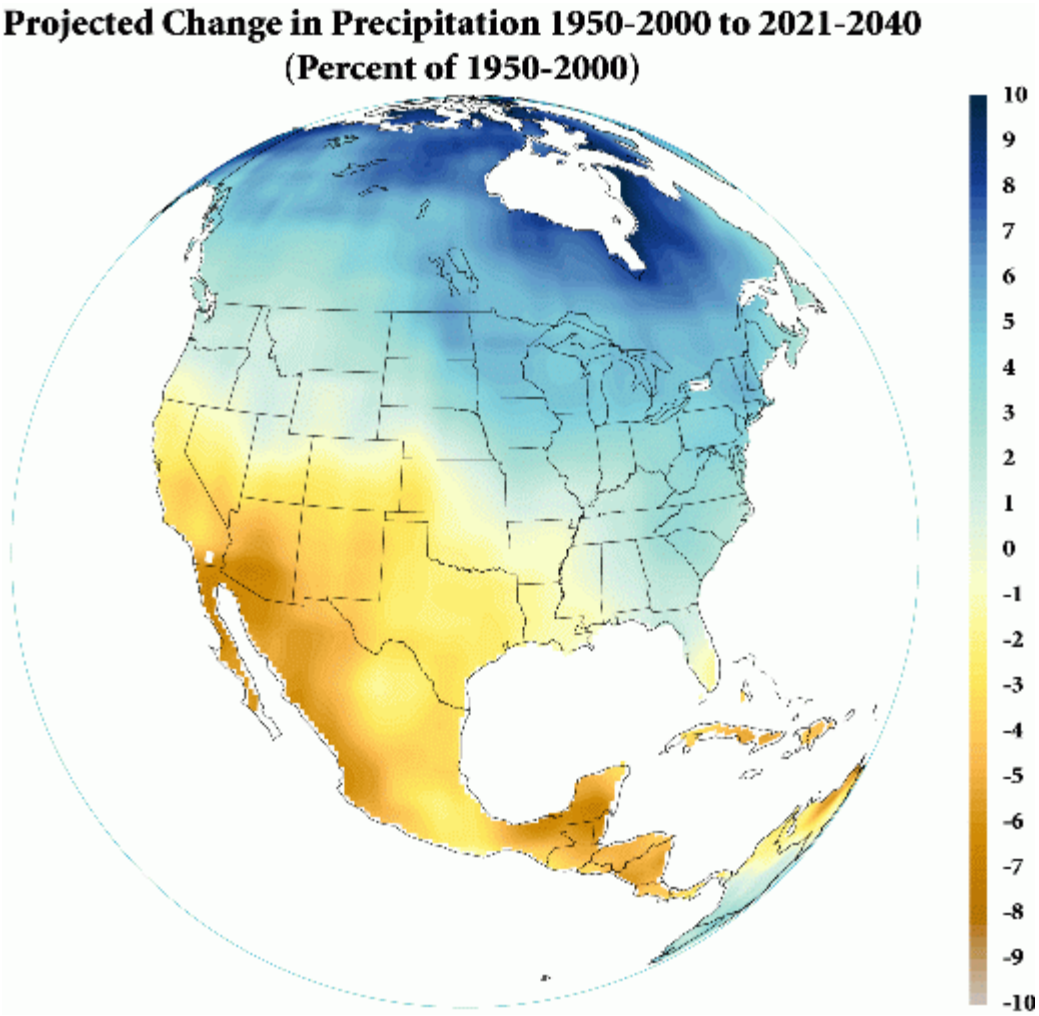
Now the situation has changed. The threat of global warming is finally accepted, not just in the rest of the world, but even here in the US:

- Kathleen Schalch, Cities take on Kyoto challenge to cut emissions, *All Things Considered*, NPR, July 31, 2007.

It happened in the last two years. What made the difference? Here's an interesting analysis:

- Eric Weiner, American conscience waking up to climate change, *Weekend Edition*, NPR, Saturday July 7, 2007.

Briefly: it's not so much Al Gore as Hurricane Katrina and other disasters, including the drought in the Western US, which seems like a harbinger of things to come:



Though no *one* such disaster can be conclusively linked to global climate change, these are the sort of things that people experience directly — they cut through the chatter:

- Richard Harris, A family vacations amid a changing landscape, *Morning Edition*, NPR, July 9, 2007.

I don't like to discuss the most alarming climate change scenarios, since they're speculative, and even the *less* speculative predictions should be scary enough to goad us into action. But, I have questions about the recent work of James Lovelock and James Hansen.

Lovelock has a theory about global warming and algae in the ocean. Some consider it alarmist "climate porn"; other's dont'. I hope it is! Here's the idea in a nutshell, from a website called Ration the Future:

> **Algae extinction**: In 2006, NASA satellites showed that phytoplankton — which absorb carbon dioxide — are finding it harder to live in the more stratified layers of the warmer ocean, which restrict the mixing of vital nutrients. Since 2000, when the sea surface temperatures began to rise more noticeably, the photosynthetic productivity of phytoplankton have decreased in some ocean regions by 30 per cent. James Lovelock points out that as the ocean surface temperature warms to over 12° C, "a stable layer of warm water forms on the surface that stays unmixed with the cooler, nutrient-rich waters below. This purely physical property of ocean water denies nutrients to the life in the warm layer, and soon the upper sunlit ocean water becomes a desert", recognized by the clear azure blue, dead water of 80 per cent of today's ocean surface. In such nutrient-deprived water, ocean life cannot prosper and soon "the surface layer is empty of all but a limited and starving population of algae". Algae, which comprise most of the ocean's plant life, are the world's greatest CO_2 sink, pumping down carbon dioxide, as well as contributing to cloud cover by releasing dimethyl sulphide into the atmosphere, gas "connected with the formation of clouds and with climate" (Lovelock 2006: 23), so that warmer seas and less algae will likely reduce cloud formation and further enhance positive feedback. Severe disruption of the algae/DMS relation would signal spiralling and irreversible climate change.
>
> Algae prosper in waters below 10° C so as the climate warms, the algae population reduces. In computer modelling of climate warming and regulation carried out by James Lovelock and Lee Kump (Lovelock 2006:31-33), it was found that "as the carbon dioxide abundance approached 500 ppm (or a rise of about 3°), regulation began to fail and there was a sudden upward jump in temperature. The cause was the failure of the ocean ecosystem. As the world grew warmer, the algae were denied nutrients by the expanding warms surface of the oceans, until eventually they became extinct. As the area of ocean covered by algae grew smaller, their cooling effect diminished and the temperature surged upwards." The end result was a temperature rise of 8° C above pre-industrial levels, which would result in the planet being habitable only from the latitude of Melbourne south to the south pole, and northern Europe, Asia and Canada to the north pole. Everything in between would be desert and uninhabitable, billions of people would not be able to survive.

If any experts on algae or climate change read this, please send me an email and comment!

My friend the mathematician Bruce Bartlett points out another scary possibility, raised by the famous climate scientist James Hansen and reported by George Monbiot in his usual hair-raising style:

- James Hansen *et al*, Climate change and trace gases, *Philosophical Transactions of the Royal Society A* **365** (May 18, 2007), 1925-1954.

To quote the scary part:

> **Planet Earth today: imminent peril**
>
> The imminent peril is initiation of dynamical and thermodynamical processes on the West Antarctic and Greenland ice sheets that produce a situation out of humanity's control, such that devastating sea-level rise will inevitably occur. Climate forcing of this century under BAU [business as usual] would dwarf natural forcings of the past million years, indeed it would probably exceed climate forcing of the middle Pliocene, when the planet was not more than 2-3°C warmer and sea level 25±10 m higher (Dowsett et al. 1994). The climate sensitivities we have inferred from palaeoclimate data ensure that a BAU GHG [greenhouse gas] emission scenario would produce global warming of several degrees Celsius this century, with amplification at high latitudes.
>
> Such warming would assuredly activate the albedo-flip trigger mechanism over large portions of these ice

sheets. In combination with warming of the nearby ocean and atmosphere, the increased surface melt would bring into play multiple positive feedbacks leading to eventual nonlinear ice sheet disintegration, as discussed by Hansen (2005). It is difficult to predict time of collapse in such a nonlinear problem, but we find no evidence of millennial lags between forcing and ice sheet response in palaeoclimate data. An ice sheet response time of centuries seems probable, and we cannot rule out large changes on decadal time-scales once wide-scale surface melt is underway. With GHGs continuing to increase, the planetary energy imbalance provides ample energy to melt ice corresponding to several metres of sea level per century (Hansen et al. 2005b).

With this danger in mind, it is appropriate to closely monitor ice sheet conditions. Area of summer melt on Greenland increased from approximately 450000 km^2 in the first few years after satellite observations began in 1979 to more than 600000 km^2 in recent years (Steffen et al. 2004). Iceberg discharge from Greenland increased markedly over the past 15 years. Mass loss increased from 4-50 $km^3\ yr^{-1}$ in 1993-1998 to 57-105 $km^3 yr^{-1}$ in 1999-2004, based on radar altimeters, with probable losses at the higher ends of those ranges (Thomas et al. 2006). Recent analyses of satellite gravity field data yield a net annual loss of 101±16 $km^3 yr^{-1}$ during 2003-2005 (Luthcke et al. 2006).

The gravest threat we foresee starts with surface melt on West Antarctica and interaction among positive feedbacks leading to catastrophic ice loss. Warming in West Antarctica in recent decades has been limited by effects of stratospheric ozone depletion (Shindell & Schmidt 2004). However, climate projections (Hansen et al. 2006b) find surface warming in West Antarctica and warming of nearby ocean at depths that may attack buttressing ice shelves. Loss of ice shelves allows more rapid discharge from ice streams, in turn a lowering and warming of the ice sheet surface, and increased surface melt. Rising sea level helps unhinge the ice from pinning points.

West Antarctica seems to be moving into a mode of significant mass loss (Thomas et al. 2004). Gravity data yielded mass loss of approximately 150 $km^3\ yr^{-1}$ in 2002-2005 (Velicogna & Wahr 2006). A warming ocean has eroded ice shelves by more than 5 m yr^{-1} over the past decade (Rignot & Jacobs 2002; Shepherd et al. 2004). Satellite QuickSCAT radiometer observations (Nghiem et al. 2007), initiated in 1999, reveal an increasing area of summer melt on West Antarctica and an increasing melt season over the period of record. Attention has focused on Greenland, but the most recent gravity data indicate comparable mass loss from West Antarctica. We find it implausible that BAU scenarios, with climate forcing and global warming exceeding those of the Pliocene, would permit a West Antarctic ice sheet of present size to survive even for a century.

Our concern that BAU GHG scenarios would cause large sea-level rise this century (Hansen 2005) differs from estimates of IPCC [The International Panel on Climate Change] (2001, 2007), which foresees little or no contribution to twenty-first century sea-level rise from Greenland and Antarctica. However, the IPCC analyses and projections do not well account for the nonlinear physics of wet ice sheet disintegration, ice streams and eroding ice shelves, nor are they consistent with the palaeoclimate evidence we have presented for the absence of discernable lag between ice sheet forcing and sea-level rise.

The best chance for averting ice sheet disintegration seems to be intense simultaneous efforts to reduce both CO_2 emissions and non-CO_2 climate forcings. As mentioned above, there are multiple benefits from such actions. However, even with such actions, it is probable that the dangerous level of atmospheric GHGs will be passed, at least temporarily. We have presented evidence (Hansen et al. 2006b) that the dangerous level of CO_2 can be no more than approximately 450ppm. Our present discussion, including the conclusion that slow feedbacks (ice, vegetation and GHG) can come into play on century time-scales or sooner, makes it probable that the dangerous level is even lower.

Present knowledge does not permit accurate specification of the dangerous level of human-made GHGs. However, it is much lower than has commonly been assumed. If we have not already passed the dangerous

> level, the energy infrastructure in place ensures that we will pass it within several decades.
>
> We conclude that a feasible strategy for planetary rescue almost surely requires a means of extracting GHGs from the air. Development of CO_2 capture at power plants, with below-ground CO_2 sequestration, may be a critical element. Injection of the CO_2 well beneath the ocean floor assures its stability (House et al. 2006). If the power plant fuel is derived from biomass, such as cellulosic fibres grown without excessive fertilization that produces N_2O or other offsetting GHG emissions, it will provide continuing drawdown of atmospheric CO_2.

Again, I'd appreciate comments from climate scientists.

July 10, 2007

Yesterday I explained why I'm less worried about public awareness of climate change than I used to be. But public awareness is the easy part: actually *doing* something is the hard part.

It seems unrealistic to solve the problem just by conservation and switching towards hydropower, wind, solar, and so on — though all these are important parts of bringing about a low carbon economy. People knowledgeable about global warming are increasingly looking towards nuclear power and carbon sequestration.

Nuclear power brings risks with it: in the US people complain about nuclear waste being stored in their vicinity, but this pales compared to the danger of too many people getting ahold of nuclear bombs — or even just dirty bombs.

My colleague Thomas Payne in the computer science department told me about an idea some people are considering as a carbon-free solution to our energy problems: reactors that use thorium. It's a lot more common than uranium, and all the thorium mined can be used in a reactor, as compared with just a small amount of the uranium — namely, the isotope U-235. So, there's a lot more nuclear energy in the form of thorium than in uranium. Perhaps more importantly, it's harder to create nuclear bombs from its byproducts. But how much harder? And how feasible is this idea, anyway? Here are some handy sources of information:

- Amit Asaravala, Thorium fuels safer reactor hopes, *Wired*, 07.05.05.
- Transcript, links and further information for 'Thorium Reactors', Australian Broadcasting Corporation, 1998.
- Thorium, UIC Briefing Paper #67, Uranium Information Centre Ltd.

From the UIC briefing, here's the good news:

> Thorium, as well as uranium, can be used as a nuclear fuel. Although not fissile itself, thorium-232 (Th-232) will absorb slow neutrons to produce uranium-233 (U-233), which is fissile. Hence like uranium-238 (U-238) it is fertile.
>
> In one significant respect U-233 is better than uranium-235 and plutonium-239, because of its higher neutron yield per neutron absorbed. Given a start with some other fissile material (U-235 or Pu-239), a breeding cycle similar to but more efficient than that with U-238 and plutonium (in slow-neutron reactors) can be set up. The Th-232 absorbs a neutron to become Th-233 which normally decays to protactinium-233 and then U-233. The irradiated fuel can then be unloaded from the reactor, the U-233 separated from the thorium, and fed back into another reactor as part of a closed fuel cycle.
>
> Over the last 30 years there has been interest in utilising thorium as a nuclear fuel since it is more abundant in the Earth's crust than uranium. Also, all of the mined thorium is potentially useable in a reactor, compared with the 0.7% of natural uranium, so some 40 times the amount of energy per unit mass might theoretically be available (withouit recourse to fast breeder reactors).
>
> A major potential application for conventional PWRs [pressurized water reactors] involves fuel assemblies

arranged so that a blanket of mainly thorium fuel rods surrounds a more-enriched seed element containing U-235 which supplies neutrons to the subcritical blanket. As U-233 is produced in the blanket it is burned there. This is the Light Water Breeder Reactor concept which was successfully demonstrated in the USA in the 1970s.

It is currently being developed in a more deliberately proliferation-resistant way. The central seed region of each fuel assembly will have uranium enriched to 20% U-235. The blanket will be thorium with some U-238, which means that any uranium chemically separated from it (for the U-233) is not usable for weapons. Spent blanket fuel also contains U-232, which decays rapidly and has very gamma-active daughters creating significant problems in handling the bred U-233 and hence conferring proliferation resistance. Plutonium produced in the seed will have a high proportion of Pu-238, generating a lot of heat and making it even more unsuitable for weapons than normal reactor-grade Pu.

A variation of this is the use of whole homogeneous assembles arranged so that a set of them makes up a seed and blanket arrangement. If the seed fuel is metal uranium alloy instead of oxide, there is better heat conduction to cope with its higher temperatures. Seed fuel remains three years in the reactor, blanket fuel for up to 14 years.

Since the early 1990s Russia has had a program to develop a thorium-uranium fuel, which more recently has moved to have a particular emphasis on utilisation of weapons-grade plutonium in a thorium-plutonium fuel.

The program is based at Moscow's Kurchatov Institute and involves the US company Thorium Power and US government funding to design fuel for Russian VVER-1000 reactors. Whereas normal fuel uses enriched uranium oxide, the new design has a demountable centre portion and blanket arrangement, with the plutonium in the centre and the thorium (with uranium) around it. The Th-232 becomes U-233, which is fissile - as is the core Pu-239. Blanket material remains in the reactor for 9 years but the centre portion is burned for only three years (as in a normal VVER). Design of the seed fuel rods in the centre portion draws on extensive experience of Russian navy reactors.

The bad news:

Despite the thorium fuel cycle having a number of attractive features, development even on the scale of India's has always run into difficulties. Problems include:

- the high cost of fuel fabrication, due partly to the high radioactivity of U-233 chemically separated from the irradiated thorium fuel. Separated U-233 is always contaminated with traces of U-232 (69 year half life but whose daughter products such as thallium-208 are strong gamma emitters with very short half lives);
- the similar problems in recycling thorium itself due to highly radioactive Th-228 (an alpha emitter with 2 year half life) present;
- some weapons proliferation risk of U-233 (if it could be separated on its own); and
- the technical problems (not yet satisfactorily solved) in reprocessing.

Much development work is still required before the thorium fuel cycle can be commercialised, and the effort required seems unlikely while (or where) abundant uranium is available. In this respect international moves to bring India into the ambit of international trade will be critical. If India has ready access to traded uranium and conventional reactor designs, it may not persist with the thorium cycle.

Nevertheless, the thorium fuel cycle, with its potential for breeding fuel without the need for fast-neutron reactors, holds considerable potential long-term. It is a significant factor in the long-term sustainability of nuclear energy.

For more on thorium and nuclear power in general, see my July 11th entry.

Today I gave my talk on Derek's work at Université Paris 7, down in the 13th arrondissement. That gave me a chance to photograph this street sign:

Louis de Broglie won the Nobel prize in physics for his work on the wave nature of the electron, but for some reason he's listed in the MacTutor biographies of mathematicians and (more importantly) the list of mathematicians with Paris streets named after them. So, I decided to give him the benefit of the doubt. His brother Maurice was an experimental physicist who worked on X-ray diffraction and spectroscopy.

July 11, 2007

Thomas Payne sent me a couple more references on thorium:

> Hi John,
>
> Cool! (Pardon pun.)
>
> Two web sites worth checking:
>
> - Kirk Sorensen, Energy from Thorium. This guy has collected tons of stuff. He is a big proponent of molten salt reactors and makes a good case for them.
>
> - Liz William, Green nuclear power coming to Norway, *Cosmos*, May 24, 2007. Report on Norway's decision to go forward with Thorium.

I'm going to the Abel Symposium in Norway later this summer — at least if I manage to buy airplane tickets. I'd been meaning to see some glaciers before they melt. Now I'll also have to ask people what they think about thorium power!

Thomas Riepe sent me this link, which argues that nuclear power is unfeasible for political reasons — terrorism, limitations of the International Atomic Energy Agency, and so on:

- Frank Barnaby and James Kemp, *Too Hot to Handle? The Future of Civil Nuclear Power*, July 2007.

We can expect the argument over nuclear power to heat up — along with the weather — for the next few decades.

July 12, 2007

Today Lisa and I went to the Louvre. We viewed a few carefully chosen slices of their enormous collection.

First, the Islamic art, which helped satisfy my yearning for everything to do with Andalusia. The richness of art, philosophy, science and technology not just in Granada and Cordoba, but in Cairo, Baghdad, Isfahan and many other capitals, all while Europe was suffering through the dark ages, is somehting I find very alluring.

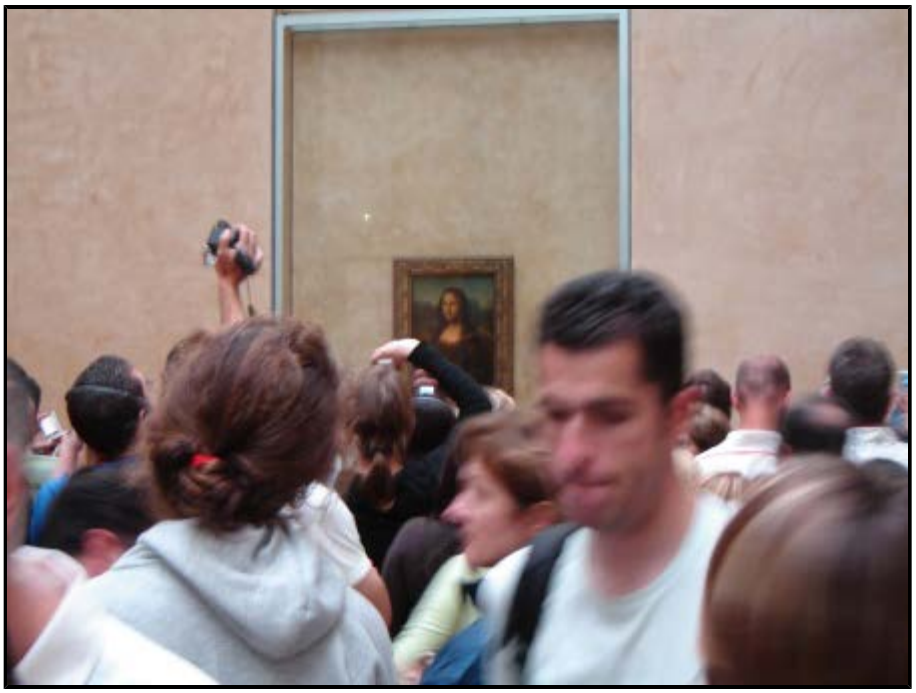
I really like this celestial sphere — acquired in Cairo in the 1800s, it's an Indian copy of one made in Iran around 1285. Click on the image for a more detailed version, where you can see the Arabic script:

Then, Italian Renaissance painting.

It's amazing to walk through galleries, stumble on a strikingly expressive portrait, and discover that it's a da Vinci.

This is a painting of Lucrezia Crivelli, the second mistress of Ludovico Sforza, duke of Milan in the latter half of the 1400s. The painting is called La Belle Ferrionère, after the chain on her forehead, called a ferronière. I'd seen a somewhat similar portrait by Da Vinci in the National Gallery in Washington D.C. — sometimes also called La Belle Ferronière, but more commonly the Lady with an Ermine.

I thought I'd be too jaded by images of the Mona Lisa to get excited by the real thing... but to my surprise, I was tremendously moved by the vast crowds gathered to see it, like pilgrims paying reverence to a holy icon. The cameras flashing, the video recorders, the cell phones held aloft to capture a glimpse, almost overwhelmed the tiny painting itself.



This feeling — of an almost pathetic fragment of the past being cherished and nearly overwhelmed by adulation — of the tragic erosion of history under the ravages of time — struck me even more strongly as I ascended the steps towards the Winged Victory of Samothrace.

From the Wikipedia article:

> The Victory is one of the great surviving masterpieces of sculpture from the Hellenistic period, despite the fact that the figure is significantly damaged, missing its head and outstretched arms. By an unknown artist, (presumably Rhodian in origin), the sculpture is thought to date from the period 220 to 190 BC.
>
> The statue stands on a rostral pedestal of gray marble representing the prow of a ship, and figures the goddess as she descended from the skies to the triumphant fleet. Rendered in white Parian marble, the figure originally formed part of the Sanctuary of the Great Gods. Before losing her arms, Nike's right arm was raised, either to bring a trumpet to her lips as she is depicted on coins or to crown the naval victor. The prow is made of grey marble from Lartos. The statue has been reassembled in stages since its original discovery in 1863. The prow was reconstructed from marble debris at the site by Champoiseau in 1879 and assembled in situ before being shipped to Paris. The discovery in 1948 of the hand raised in salute, which matched a fragment in Vienna, established the modern reconstruction.

> The right wing is a symmetric plaster version of the original left one. Various other fragments have since been found: in 1950 one of the statue's hands was found on Samothrace and is now in a glass case in the Louvre next to the podium on which the statue stands. Neither the arms nor the head have been found.

The past is not only passed, physics tells us that much of it is truly erased, and in a very real sense *does not exist* — any more than the future does. The broken Venus de Milo yet again made me think how many of our best achievements are shattered or ruined — and perhaps loved all the more precisely for that reason.

While standing here, I overheard a smartaleck teenager ask his friend: "Why does everyone feel they need to take photos of famous stuff they've already seen?"

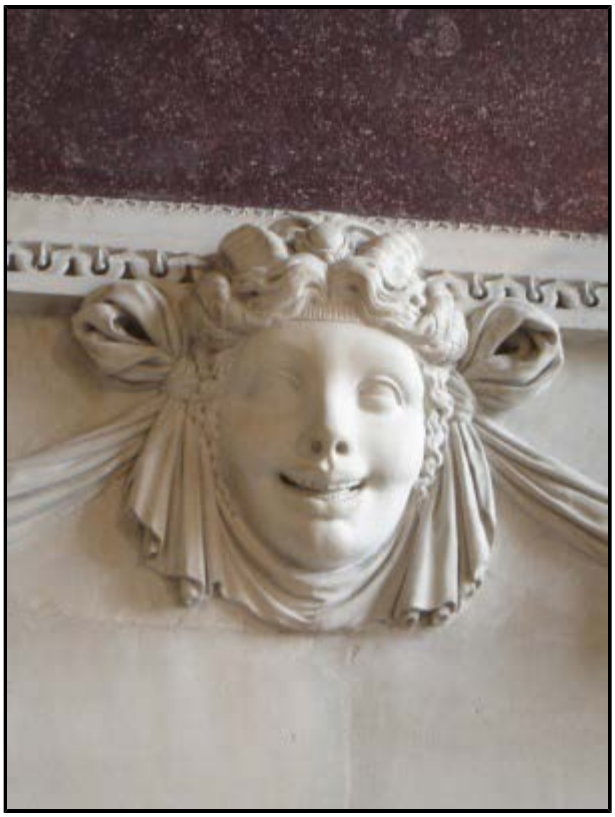
One can react to the mortality of all things philosophically, like Marcus Aurelius here, once emperor of Rome and now a statue among many in the Louvre, who wrote:

Of the life of man the duration is but a point,
its substance streaming away, its perception dim,
the fabric of the entire body prone to decay,
and the soul a vortex,
and fortune incalculable, and fame uncertain.
In a word: all things of the body are as a river,
and the things of the soul as a dream and a vapour;
and life is a warfare and a pilgrim's sojourn,
and fame after death is only forgetfulness.

Observe constantly that all things take place by change,
and accustom thyself to consider that
the nature of the Universe loves nothing so much as to change the things which are,
and to make new things like them.

Or one can immerse oneself in the moment, like this Roman child... or this Roman duck:

The fellow who decorated the walls would probably say I need to lighten up:



July 15, 2007

In Paris, fire stations hold public dances on the night before Bastille Day! Unfortunately we missed those. Yesterday, on Bastille Day itself, we went on a long walk around Montparnasse. We missed the military parade, which for the first time featured troops from throughout the European Union. After dinner, we caught a nice glimpse of the fireworks near the Eiffel Tower by standing west of the Pantheon.

But today, we saw the most impressive and cheerful sight of all: people lining up to try riding bikes from the new Parisian communal bike program!

A New French Revolution's Creed: Let Them Ride Bikes

Katrinn Benhold, New York Times

PARIS, July 15 — About a dozen sweaty people pedaled bicycles up the Champs-Élysées on Sunday toward the Arc de Triomphe, as onlookers cheered.

These were not the leading riders of the Tour de France racing toward the finish line, but American tourists testing this city's new communal bike program.

"I'm never taking the subway again," said a beaming Justin Hill, 47, a real estate broker from Santa Barbara, Calif.

More than 10,600 of the hefty gray bicycles became available for modest rental prices on Sunday at 750 self-service docking stations that provide access in eight languages. The number is to grow to 20,600 by the end of the year.

The program, Vélib (for "vélo," bicycle, and "liberté," freedom), is the latest in a string of European efforts to reduce the number of cars in city centers and give people incentives to choose more eco-friendly modes of transport.

"This is about revolutionizing urban culture," said Pierre Aidenbaum, mayor of Paris's trendy third district, which opened 15 docking stations on Sunday. "For a long time cars were associated with freedom of movement and flexibility. What we want to show people is that in many ways bicycles fulfill this role much more today."

Users can rent a bike online or at any of the stations, using a credit or debit card and leave them at any other station.

A one-day pass costs 1 euro ($1.38), a weekly pass 5 euros ($6.90) and a yearly subscription 29 euros

($40), with no additional charges as long as each bike ride does not exceed 30 minutes. (Beyond that, there is an incremental surcharge, to make sure that as many bikes as possible stay in the rotation.)

July 16, 2007

I met the mathematical physicist Joseph Kouneiher, who promised me a tour of the old observatory in Paris, to be led by his friend Cécile Barbachoux. I also met his colleague Frédéric Hélein, who has an organ in his office (!) and played some Bach on it for us. They have written a fascinating paper comparing two approaches to multisymplectic geometry, which is a kind of generalization of the usual geometrical description of classical mechanics from particle to strings and higher-dimensional branes. I had read Rovelli's work on this, and I've given some lectures on how it might let us "categorify" classical mechanics, but I hadn't known the rich history and the amount of work that's been done on this subject! I'm really excited.

I also met Michel Egeileh, a grad student who wrote his thesis on the relation between Cartan geometry, supergravity and Higgs fields. This has interesting relations to Derek Wise's work, and indeed cites it. A taste of what adapting to climate change is like: in this case, drought on the Cape Verde islands:

- Jon Hamilton, Irrigation brings harvests back to Cape Verde, Climate Connections, Morning Edition, July 16, 2007.

July 17, 2007

Today Lisa and I went on the promised tour of L'Observatoire de Paris. I'd been a bit confused, mistaking the rusty green observatory near the Pantheon with the real thing — the main old observatory in Paris, on Avenue Denfert-Rochereau.

I forgot my camera, so all the pictures that follow were taken by Lisa.

We met the astrophysicist Cécile Barbachoux at the entrance of what seemed like a typical dull modern office. She then led us through it into a wonderful world full of gardens and old buildings.

The first thing we saw were these stables:

They're now used as rooms for constructing astronomical equipment, but the observatory was constructed at the behest of Louis the Fourteenth, starting around 1667, when horses were very much the thing.

We then walked past some gardens and came to the house where the director of the observatory lives:

Note the spooky dark doorway below — there are many secret passages, stairways, and underground laboratories here!

The first director of the observatory was Giovanni Domenico Cassini, who apparently lived in this location before the observatory was even built. He's famous for discovering the first 4 moons of Saturn, the Cassini division in Saturn's rings, the Great Red Spot of Jupiter, and so on.

Rounding the bend we came to the grand entrance and saw a big statue of Urbain Le Verrier, who was director from 1873 to 1877. Le Verrier specialized in celestial mechanics, and used perturbations in the orbit of Uranus to predict the location of Neptune.

Even more interesting to me was this plaque:

Here is where Ole Rømer measured the speed of light in 1676! — with the help of Christiaan Huygens, and the shadow of Jupiter's moon Io. As someone fascinated by relativity, the first measurement of something so important as "la vitesse de propagation de la lumière" has always seemed very exciting to me.

Inside the observatory, Cécile used her specially procured ring of keys to open various secret doors and show us wonders starting with Foucault's telescope, which is made of wood:

Léon Foucault is more famous for his pendulum, which he used to demonstrate the rotation of the Earth. In fact, every scientist in Paris received an invitation to L'Observatoire de Paris to see this pendulum on February 3rd, 1851. Napoleon III later created a post of Physicist Attached to the Imperial Observatory specially for Foucault, during the time Le Verrier was director, and this is when Foucault began making telescopes.

We then ascended many flights of stairs until we reached the roof:

where we saw a marvelous view of Paris.

We scrambled over the roof and entered the observatory proper:

Inside, it was very dark, and dominated by a huge telescope:

Apparently this old telescope is still used in some demonstrations, just for fun — but nowadays, even a small modern telescope can do better.

We then descended a small spiral staircase, getting a nice view of the steel reinforcements that support the heavy telescope, and eventually worked our way to the library. Here we saw many more nice old telescopes:

We also saw sextants, globes, celestial spheres, heliostats, and other curiosities — for example, a marble statue of Cassini, as well as this one of Laplace:

The celestial sphere at his feet is a nice classical allusion: it reminds me of a statue of Athena in the Louvre, where she is for some reason holding such a sphere, more typically the property of Urania.

Pierre-Simon Laplace is now most famous for his work on probability theory, celestial mechanics and the like, but he also directed L'Observatoire de Paris. The astronomer Delambre later wrote:

> ... never should one put a geometer at the head of an observatory; he will neglect all the observations except those needed for his formulas.

This could equally well have been said about Hamilton, who also lived in an observatory, and made his wife do most of the observations!

To reach her office, she needs to climb yet another twisty little spiral staircase — the place is full of them. I find it very romantic, but I wonder how many aging astronomers have plunged to their deaths here.

She showed us this astrolabe:

This was made by a 16-year-old student as part of the observatory's educational program!

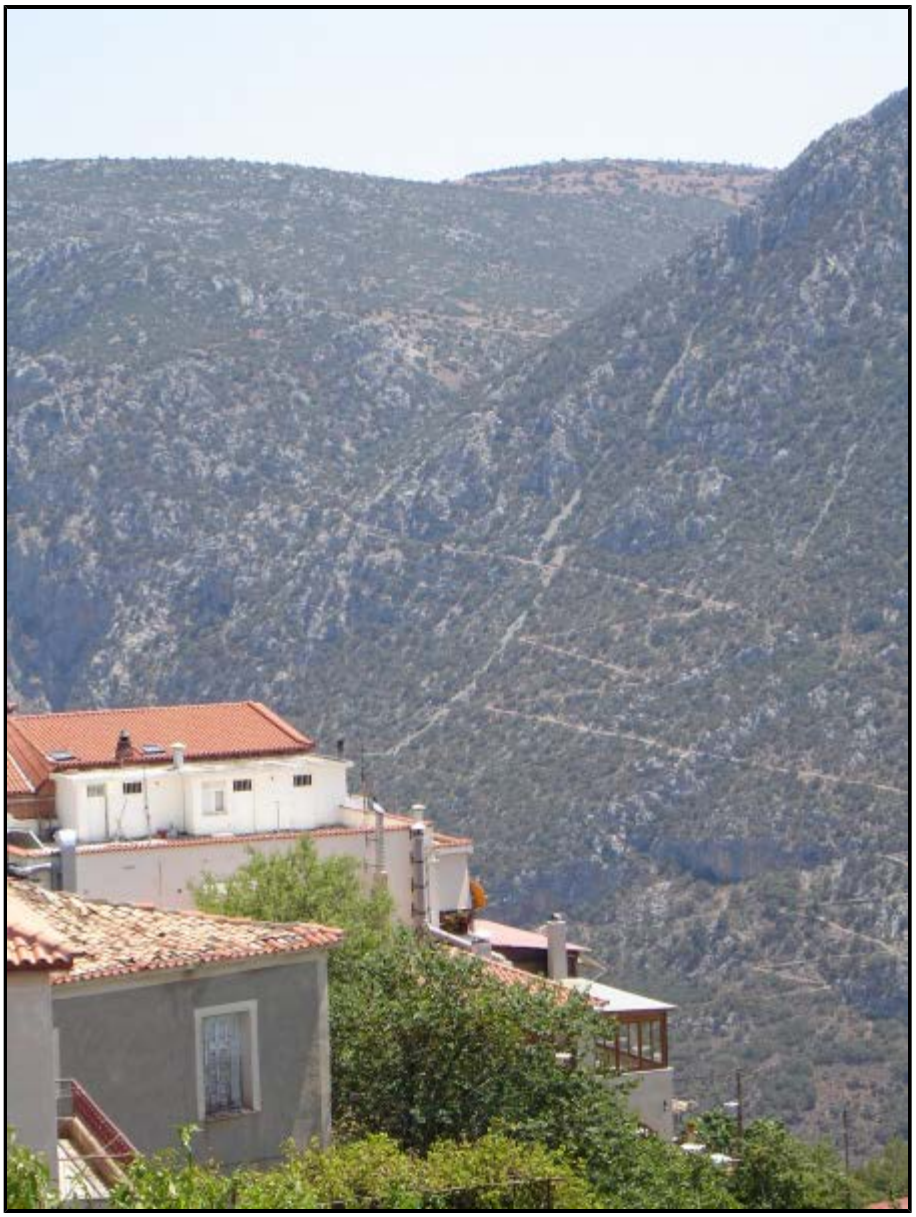
On our way out, we caught a nice view of some smaller observatories:

We then met Joseph Kouneiher and went to a café near Montparnasse. Much to my surprise, Joseph told us that Leibniz had invented a calculating device, the stepped reckoner, in 1674. Two prototypes were built. One was lost in an attic of the University of Göttingen until a worker found it in 1879 — while fixing a leak in the roof! It's now in the State Museum of Hanover.

July 19, 2007

We left Paris today. We were sad to leave so soon! I was just getting to know the place. Luckily, there's a good chance we'll visit again next summer.

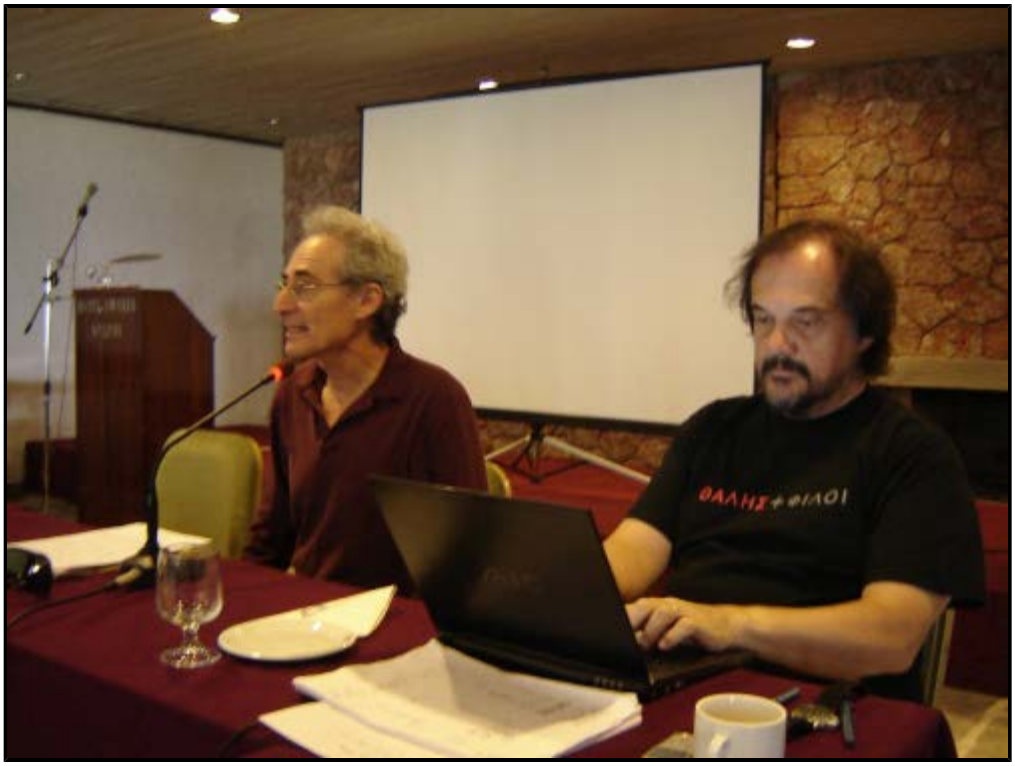
We flew to Athens; David Corfield flagged us down as we passed through customs, and we took the 2-hour ride to Delphi in a van with some other arrivals. Delphi is perched on the slopes of Mount Parnassus, with a view of the Bay of Corinth. It's a dramatic place:



July 20, 2007

The conference on Mathematics and Narrative began today. I gave the first talk: Why Mathematics is Boring. The conference was put on by Thales and Friends, a group spearheaded by the writer Apostolos Doxiadis, famous for his

bestseller *Uncle Petros and Goldbach's Conjecture*. The conference was run with a lot of help from the number theorist Barry Mazur:



Barry Mazur and Apostolos Doxiadis

David Corfield, Colin McLarty and Michael Harris

During the conference I talked a lot to my pal the philosopher David Corfield. This was the first time he met Lisa, and the the first time I met his wife. All four of us hung out a lot with Colin McLarty — a philosopher, historian of mathematics and category theorist whom I'd gotten to know at Lawvere's 60th birthday conference, in Florence. As philosophers of math who understand and love categories, Colin and David have gotten to know each other over the years, and I enjoy talking to them a lot.

I also got acquainted with the algebraic geometer Michael Harris, who happens to work at Paris 7, where I was visiting just before coming to Greece! Unfortunately I was too polite (or shy) to ask Barry Mazur or Michael Harris many questions about étale cohomology, the Langlands program and so on. But, I got a nice second-hand account of the étale fundamental group from McLarty, who had quizzed Mazur about it — part of the research McLarty is doing for a paper on Grothendieck.

Federica La Nave, Amir Alexander, Peter Galison and Jan Christoph Meister

I also met a lot of other interesting people. For example, I'd enjoyed Peter Galison's book *Einstein's Clocks, Poincaré's Maps*, so it was fun to meet him. I was surprised to discover he's making a film on government secrecy in the post-9-11 era. He showed a draft version of this film, and it's really good! It should come out early next year.

Everyone at this conference is interviewing someone else. These interviews will supposedly be transcribed and edited, to appear with the papers we're presenting. This afternoon I got interviewed by Federica La Nave, a historian of mathematics at Hong Kong University, who is currently working on the role of belief in Rafael Bombelli's discovery of imaginary numbers: first he didn't "believe in" these numbers, but later he did.

July 21, 2007

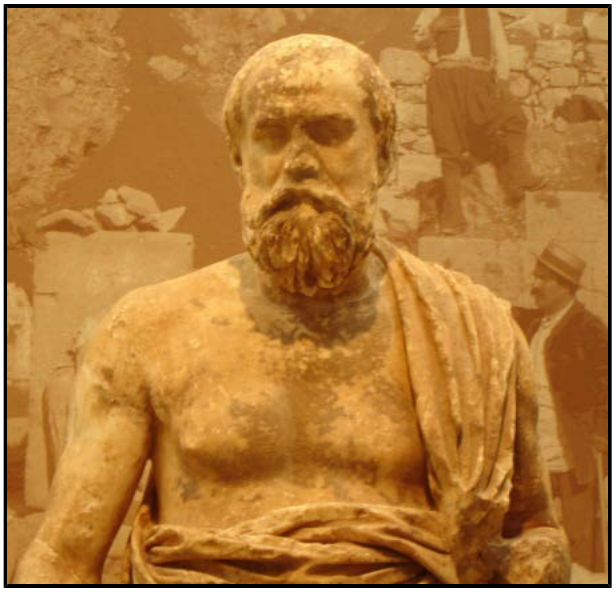
This afternoon I went to the oracle at Delphi. It would take a long time to describe, so I'll just show you some pictures I took. First, a few artifacts in the museum:

Two kouroi from around 600 BC.
These guys are big: over 2 meters tall.

The Naxian sphinx, from around 570 BC.

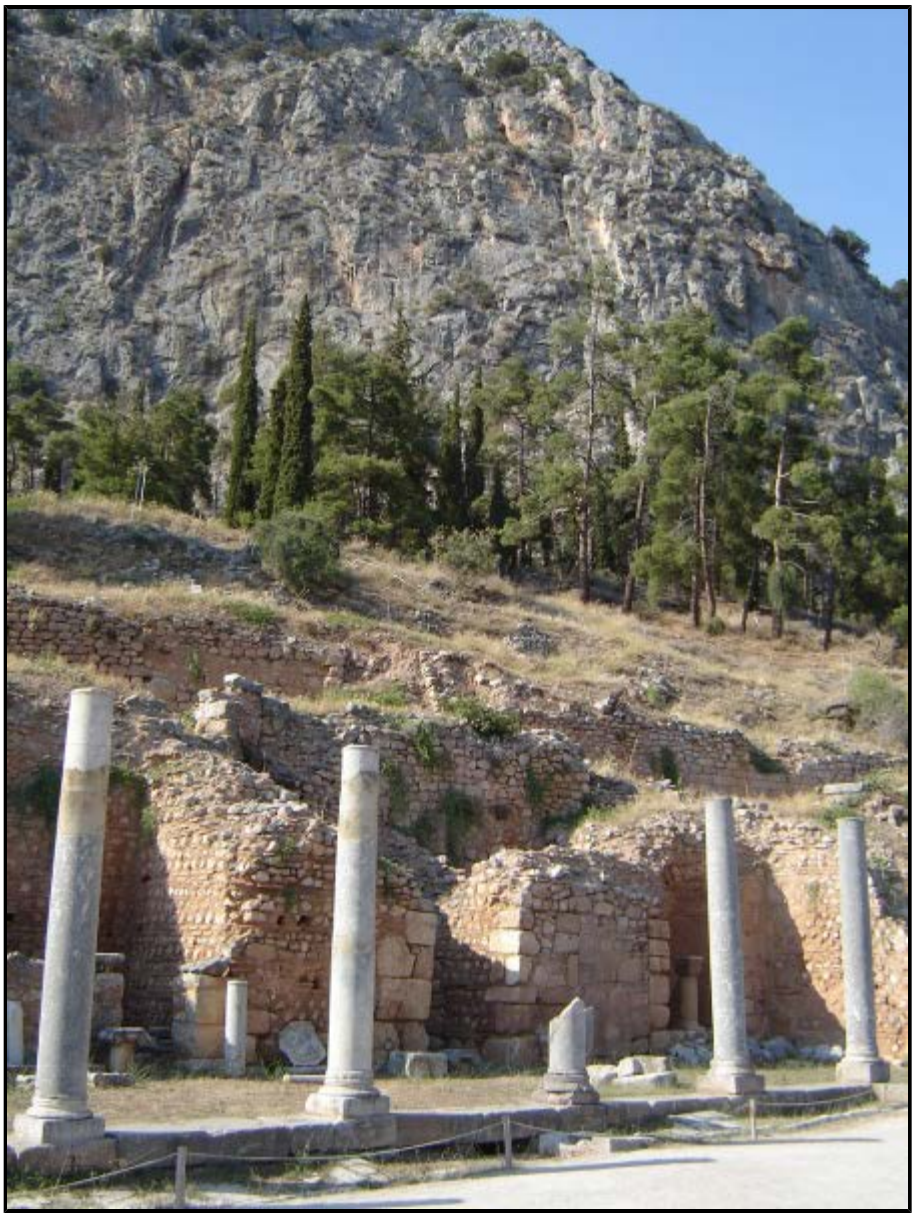
Part of the frieze from the treasury of Siphnos, from 525 BC.

This scene depicts the battle of the gods and the titans.
Many Greek cities donated wealth to Delphi, which was kept in treasuries.



Statue of a philosopher, from around 280 BC.

Then, some pictures from the oracle itself. This is a truly mind-blowing place, both for its rugged natural beauty and the mythology and history behind it. The Oracle of Delphi played an important role in Greek culture for *over a millennium*: from around 750 BC to around 400 AD. That makes it one of the longest-lived institutions in the world!



Stoa of the Athenians

Treasury of Athens, built around 490 BC to commemorate the Battle of Marathon.

Stone of the Sibyl, at left. Temple of Apollo, at right.

Stones near the Temple of Apollo.

The Temple of Apollo.
This temple is where the Pythia actually did her thing.

Another view of the Temple of Apollo.

This *Scientific American* article is quite interesting, and its claims, while surprising, seem quite widely accepted:

- John R. Hale, Jelle Zeilinga de Boer, Jeffrey P. Chanton and Henry A. Spiller, Questioning the Delphic oracle, *Scientific Americian*, August 2003.

I'll quote the beginning, just to tempt you:

> The temple of Apollo, cradled in the spectacular mountainscape at Delphi, was the most important religious site of the ancient Greek world, for it housed the powerful oracle. Generals sought the oracle's advice on strategy. Colonists asked for guidance before they set sail for Italy, Spain and Africa. Private citizens inquired about health problems and investments. The oracle's advice figures prominently in the myths. When Orestes asked whether he should seek vengeance on his mother for murdering his father, the oracle encouraged him. Oedipus, warned by the oracle that he would murder his father and marry his mother, strove, with famous lack of success, to avoid his fate.
>
> The oracle of Delphi functioned in a specific place, the adyton, or "no entry" area of the temple's core, and through a specific person, the Pythia, who was chosen to speak, as a possessed medium, for Apollo, the god of prophecy. Extraordinarily for misogynist Greece, the Pythia was a woman. And unlike most Greek priests and priestesses, the Pythia did not inherit her office through noble family connections. Although the Pythia had to be from Delphi, she could be old or young, rich or poor, well educated or illiterate. She went through a long and intense period of conditioning, supported by a sisterhood of Delphic women who tended the eternal sacred fire in the temple.

The Classical Explanation

Tradition attributed the prophetic inspiration of the powerful oracle to geologic phenomena: a chasm in the earth, a vapor that rose from it, and a spring. Roughly a century ago scholars rejected this explanation when archaeologists digging at the site could find no chasm and detect no gases. The ancient testimony, however, is widespread, and it comes from a variety of sources: historians such as Pliny and Diodorus, philosophers such as Plato, the poets Aeschylus and Cicero, the geographer Strabo, the travel writer Pausanias, and even a priest of Apollo who served at Delphi, the famous essayist and biographer Plutarch.

Strabo (64 B.C.-A.D. 25) wrote: "They say that the seat of the oracle is a cavern hollowed deep down in the earth, with a rather narrow mouth, from which rises a pneuma [gas, vapor, breath; hence our words "pneumatic" and "pneumonia"] that produces divine possession. A tripod is set above this cleft, mounting which, the Pythia inhales the vapor and prophesies."

Plutarch (A.D. 46-120) left an extended eyewitness account of the workings of the oracle. He described the relationships among god, woman and gas by likening Apollo to a musician, the woman to his instrument and the pneuma to the plectrum with which he touched her to make her speak. But Plutarch emphasized that the pneuma was only a trigger. It was really the preconditioning and purification (certainly including sexual abstinence, possibly including fasting) of the chosen woman that made her capable of responding to exposure to the pneuma. An ordinary person could detect the smell of the gas without passing into an oracular trance.

Plutarch also recorded a number of physical characteristics about the pneuma. It smelled like sweet perfume. It was emitted "as if from a spring" in the adyton where the Pythia sat, but priests and consultants could on some occasions smell it in the antechamber where they waited for her responses. It could rise either as a free gas or in water. In Plutarch's day the emission had become weak and irregular, the cause, in his opinion, of the weakening influence of the Delphic oracle in world affairs. He suggested that either the vital essence had run out or that heavy rains had diluted it or a great earthquake more than four centuries earlier had partially blocked its vent. Maybe, he continued, the vapor had found a new outlet. Plutarch's theories about the lessening of the emission make it clear that he believed it originated in the rock below the temple.

A traveler in the next generation, Pausanias, echoes Plutarch's mention of the pneuma rising in water. Pausanias wrote that he saw on the slope above the temple a spring called Kassotis, which he had heard plunged underground and then emerged again in the adyton, where its waters made the women prophetic.

Plutarch and other sources indicate that during normal sessions the woman who served as Pythia was in a mild trance. She was able to sit upright on the tripod and might spend a considerable amount of time there (although when the line of consultants was long, a second and even a third Pythia might have to relieve her). She could hear the questions and gave intelligible answers. During the oracular sessions, the Pythia spoke in an altered voice and tended to chant her responses, indulging in wordplay and puns. Afterward, according to Plutarch, she was like a runner after a race or a dancer after an ecstatic dance.

The article then goes on to describe how the theory that vapors emitted from the ground was discredited around 1900. But now, thanks to the work of these authors, this theory has been confirmed!

July 24, 2007

My conference in Delphi over, we took a 3-hour taxi ride to Olympia, site of the original Olympic games. Here Lisa is meeting with some members of the Center for Hellenic Studies, including her old Greek teacher Gregory Nagy. They're working with two classics scholars Lisa met in Shanghai — Yang Huang and Zhang Wei — to set up ways for students in Shanghai to pursue Hellenic studies. Lisa works on comparing classical Greek and Chinese culture, so this is very exciting to her.

As for me, I'm just playing the tourist and taking advantage of the Hotel Europa's wireless internet to catch up on my diary, my blog, and some math papers.

July 25, 2007

It's really hot here in Greece — 45 Celsius, or 113 Fahrenheit. Global warming proceeds apace. To add to the misery, there are lots of fires set by arsonists. In Greece they do this as part of a trick to acquire land for real estate development, with the connivance of corrupt local officials.

July 26, 2007

We saw the Temple of Zeus at Olympia! But first, Gregory Nagy gave us a guided tour of the museum.

Yang Huang, Gregory Nagy and Zhang Wei

Olympia is a site with many historical layers. Burnt offerings can be found dating back to the 10th century BC. Tradition dates the first Olympic games to 776 BC. It became a place where Greeks from many cities would meet.

I hadn't known that gryphons were an important symbol of royalty in archaic Greece, going back to 700 BC. They're nasty-looking things — a combination of a lion and an eagle, king of the beasts and the birds. There are *lots* of bronze casts of gryphon heads at Olympia:

They're clearly designed to scare, symbols of the *rapacious, predatory* nature of the king.

The Temple of Zeus at Olympia was built in the middle of the 5th century BC. It contained an enormous ivory and gold statue of Zeus sculpted by Pheidas, which was one of the Seven Wonders of the World.

I have a fondness for Phidias because the Golden Ratio was named φ ("phi") after him. He designed the Parthenon, and some claim he packed it with Golden Ratio rectangles to make it as beautiful as possible. However, the number $(\sqrt{5} + 1)/2$ was only named "the Golden Ratio" around 1826, and only named "phi" in 1914. You can read week203 for the full story. It's not clear Phidias really had much to do with phi. But it's still fun stuff. So, I was pleased to see a cup in the museum with an inscription on the bottom claiming that it belongs to Phidias!

Even bigger buildings were constructed during the Hellenistic period, as well as a long race track. The Romans repaired some buildings including the Temple of Zeus when they took over. But, the site was heavily damaged by earthquakes in the 3rd century AD, and by now none of the original temple still stands:

That standing pillar is a later addition.

However, the Olympic games were still held until 393 BC, when the Christian emperor Theodosius I forbid them. So, yet another institution lasting over a millennium!

July 27, 2007

Lisa's meeting a resounding success, we took a 4-hour bus ride from Olympia to Athens, arriving around 3 pm. The plan was to leave for London the next morning, so we spent a night at the Divani Palace Acropolis Hotel. This was a couple blocks south of the Acropolis, not really in the Plaka area, but close.

We braved insanely hot weather to climb up to the Acropolis. Here's a brief summary, in the wiseguy style of Wired magazine.

Parthenon — tired.

Erechtheion — wired!

Caryatids

July 28, 2007

We flew from blistering hot, sunny Athens to chilly, rainy London, and found our way to 46 Azof St. in Greenwich, arriving exhausted around midnight after fighting through concert crowds at the Millennium Dome to catch a bus.

For my August 2007 diary, go here.

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home

For my July 2007 diary, go here.

Diary - August 2007

John Baez

August 1, 2007

There's a really thought-provoking new article by Freeman Dyson!

- Freeman Dyson, Our biotech future, *New York Review of Books* **54**, July 19, 2007.

Briefly, his idea is that biotechnology will inevitably be taken up by hobbyists just as computers were. Just as the 1950's image of a huge computer attended by lab technicians fell when personal computers took over, the image of biotech will change when ordinary folks — the same sort of people who breed cats, dogs, and fish now — start breeding new species.

He makes a distinction between "grey technology" based on physics and chemistry, and "green technology" based on biology. He thinks the last few thousand years will be seen as a relatively brief era during which grey technology was the cutting-edge thing. Before that, green technology — agriculture and animal husbandry " reigned supreme. Tampering with genomes was the route to progress. And now green technology is beginning to retake its central role.

He notes that his definition of "green" to include any technology based on biology differs from that of most "greens".

He notes the dangers and responsibilities of biotechnology, but he doesn't flinch from them:

> After we have explored this route to the end, when we have created new forests of black-leaved plants that can use sunlight ten times more efficiently than natural plants, we shall be confronted by a new set of environmental problems. Who shall be allowed to grow the black-leaved plants? Will black-leaved plants remain an artificially maintained cultivar, or will they invade and permanently change the natural ecology? What shall we do with the silicon trash that these plants leave behind them? Shall we be able to design a whole ecology of silicon-eating microbes and fungi and earthworms to keep the black-leaved plants in balance with the rest of nature and to recycle their silicon? The twenty-first century will bring us powerful new tools of genetic engineering with which to manipulate our farms and forests. With the new tools will come new questions and new responsibilities.

He optimistically thinks that in the end, biotechnology could spell an end to rural poverty, and a decline in the relative importance of cities. More plausibly (to me), he notes it could usher in a vast growth of biodiversity, as new species fill unforeseen niches.

Lots of ideas per square inch here! They're not all developed thoroughly, and some could be tragically wrong, but we need to start thinking about this stuff.

A fun piece on the adaptability of humans, but not enough detail for my taste:

- Christopher Joyce, Human history shows a gift for adaptability, *Morning Edition*, NPR, July 30, 2007.

What's the evidence linking specific developments in human culture to shifts in climate? I'd like to know more.

August 2, 2007

Today the Russians planted a flag on the Arctic seabed, trying to claim a large area including the North Pole. The act of planting a flag has had no legal status for many decades.

Thom Yorke of Radiohead had this to say about their song Like Spinning Plates:

> I focus on the most imminent ecological issues. You know, there are so many scenarios on the horizon at the moment that will result in mass suffering. For the most part in the West we worship a certain type of economics, which is like worshipping a false god. It's a theory about economics which will collapse, and the sooner people realize that, the quicker they will be able to understand how we should be engaging with the world around us. To me, it's like spinning plates: I'm not sure how long we can keep this trick going.

The last couple days I've been holed up at 46 Azof St. in Greenwich, finishing up my Abel symposium talk.

It took me a while to enjoy them here coming straight from the glories of Greece, but the docklands of Greenwich have a gritty charm:

Once this part of the Thames was bustling with activity and infested with crime. It's very romantic, at least in retrospect.

August 3, 2007

From *The Wasteland* by T. S. Eliot:

The river sweats
oil and tar
the barges drift
with the turning tide
red sails
wide
to leeward, swing on the
heavy spar
down Greenwich Reach
past the Isle of Dogs.

Here's view along Greenwich Reach, on the south shore of the Thames:

In front you see three rusty boats against an anonymous metal building.

In the middle background, the brownish cylinders poking up are grain silos owned by the Belgian wheat-starch and health foods company Amylum. They emit a peculiar malty smell, a bit like a brewery. When the wind is right, the scent blows all the way to our house.

Slightly to the left, also in the background, you'll see a light-colored dome with mast-like protrusions. This is the Millennium Dome, located atop the North Greenwich tube station. Built by the British government, this was a money-losing white elephant until it was privatized, redeveloped and (for some unfathomable reason) called the The O_2. Now they hold concerts there, which completely overwhelm the local buses when the crowds come out. It looks incongruous, as if a confused alien starship had landed amid the docklands.

From the London Thames Gateway Forum:

> Established in the 1700s, the industrial area on the east side of the Greenwich peninsula expanded down river during the 1800s. However, the flood-prone north remained undeveloped marsh until the industrial development of the late 19th century when, with good access to the river for importing and exporting goods, it became a thriving home to rope making, cable making, and the manufacture of soap, linoleum, gas and other industries. A site where a gunpowder store once stood was acquired in 1829 by the Enderby family, tanners from Bermondsey who later made money from a white lead manufacturing process and then married into the whaling trade. On this site they built Enderby's Hemp Rope Works, with a ropewalk and a factory making sails and cordage. In the 1830s they built Enderby House on the riverside. In the 1850s the site was bought by Glass Elliot, a pioneering company in the new submarine cable industry, and here the first cables to span the Atlantic were made. Submarine cables were made and cable-laying ships moored at Enderby's Wharf until 1975, and the site is still used today by Alcatel Submarine Networks which continues to manufacture international cable.

August 4, 2007

I should admit that I'm having fun tweaking my photos of Greenwich to give them a romantic melancholy. The above picture started out looking like this:

Why play up the melancholy atmosphere? Marshes and docks have that quality to start with, and the place names around here bring it out: the Isle of Dogs, Mudchute, Bugsby's Marshes, and so on. It's not just me:

> When G.R. Sims was researching his book *Off The Track in London*, in 1911, one hidden corner he visited was the Isle of Dogs — and the author didn't like what he saw. "Long, dreary roads and desolate patches of black earth. In the centre lies desolation land, a vast expanse of dismal waste ground with a grim fringe of black wharves and towering chimneys, belching volumes of smoke into a lowering sky, spanned by the soot-dripping arches of the railway. Across the waste comes a lonely little lad, who wheels his sister in a perambulator roughly constructed out of a sugar box. They are the only human beings in sight".

But, I must admit I'm in the midst of reading this book:

- Orhan Pamuk, *Istanbul: Memories and the City*, Alfred A. Knopf, New York, 2005

which is a rhapsodic account of the *hüzün* — a Turkish kind of melancholy — inherent in Istanbul, and especially the docks and riverboats of the Bosphorus.

August 5, 2007

Lisa and I went to Oslo, where I attended the Abel Symposium and she talked to her colleague Christoph Harbsmeier. Harbsmeier is developing a really cool database of Chinese texts complete with word-by-word syntactic and rhetorical analyses, called the Thesaurus Linguae Sericae.

On the 8th I gave a talk on higher gauge theory and elliptic cohomology. I wrote up my impressions of this conference in week255 of This Week's Finds.

As for Oslo, it was so bloody expensive that any other impression was more or less overwhelmed — especially since my bank card expired and I was left struggling for cash.

A fellow from Stockholm said Swedes are to Norway as Mexicans are to the US: a third of the folks working at in restaurant and bars in Oslo are from Sweden. It's the wage differential (or maybe the exchange rate) that draws them. I asked about the underlying cause, and he just said there were a lot of rich people in Norway. I wonder if it's really that simple.

August 10, 2007

Back from Oslo!

After some serious egging-on by Bruce Bartlett, Blake Stacey has launched a prototype math journal wiki, which he tentatively named MathSciJournalWiki. It's all part of the general revulsion against cloaking by academic publishers — the latest of many sneaky tricks they've been pulling.

August 12, 2007

Watching *Zorro* got me all excited about the revolutionary potential of this math journal wiki. The next day I wrote:

> I had a bit of inspiration last night while watching the movie *Zorro*. Until the end, when it degenerates into a nasty all-out brawl punctuated by massive explosions, this movie is pretty inspirational. You get the feeling that the downtrodden poor *can indeed* triumph over the corrupt scheming rich — and do it with panache and a sense of humor, while doing backflips and dodging bullets.
>
> Yeah, it's a bit hokey, but I decided the MathSciJournalWiki needs some of this idealistic flair to attract young mathematicians, awaken their sense of fair play, and incite them to rebel against the existing journal system, where the fat cats earn all the money while we do all the work.
>
> For this, a name like 'MathSciJournalWiki' just won't do! It's too bland.
>
> Neither will 'Math Journal Watch', which I'd modeled after 'Human Rights Watch'. Keeping an eye on the bad guys is a worthwhile endeavor, but it's fundamentally pessimistic — it suggests we'll be doing this forever.
>
> Also, including the word 'Wiki' should be unnecessary. We can have a descriptive subtitle saying something like 'A wiki for open-access scholarly communication in math and physics' —or something like that. The name of the site should *inspire!* It should be quick and catchy. Someday putting 'Wiki' in the title of a wiki will seem like putting 'Book' in the title of a book.
>
> So: we need a name that's inspiring and instantly recognizable by mathematicians and physicists (at least).
>
> I asked my wife about this, because she's good at coming up with titles, and after some discussion she suggested: ***Eureka!***
>
> Archimedes is an inspiring figure for mathematicians and physicists, and scientists generally. He helped the city of Syracuse battle an encroaching empire. The word 'eureka', meaning 'I found it', suggests victory and triumph — but of a pure and noble sort.
>
> The one catch, of course, is that Syracuse didn't win against the Roman Empire, and Archimedes was killed despite orders that he be spared. But even this works to our advantage, in a way. We can adorn our website with a picture of Archimedes drawing mathematical figures while a Roman soldier stands over him, breastplate adorned by the Elsevier logo.
>
> 
>
> Here's a bit of the story, as told by Plutarch. To set the stage: the Roman consul Marcellus decided to take Syracuse by siege...
>
> > When, therefore, the Romans assaulted the walls in two places at once, fear and consternation stupefied the Syracusans, believing that nothing was able to resist that violence and those forces. But when Archimedes began to ply his engines, he at once shot against the land forces

all sorts of missile weapons, and immense masses of stone that came down with incredible noise and violence; against which no man could stand; for they knocked down those upon whom they fell in heaps, breaking all their ranks and files. In the meantime huge poles thrust out from the walls over the ships sunk some by the great weights which they let down from on high upon them; others they lifted up into the air by an iron hand or beak like a crane's beak and, when they had drawn them up by the prow, and set them on end upon the poop, they plunged them to the bottom of the sea; or else the ships, drawn by engines within, and whirled about, were dashed against steep rocks that stood jutting out under the walls, with great destruction of the soldiers that were aboard them. A ship was frequently lifted up to a great height in the air (a dreadful thing to behold), and was rolled to and fro, and kept swinging, until the mariners were all thrown out, when at length it was dashed against the rocks, or let fall. At the engine that Marcellus brought upon the bridge of ships, which was called Sambuca, from some resemblance it had to an instrument of music, while it was as yet approaching the wall, there was discharged a piece of rock of ten talents weight, then a second and a third, which, striking upon it with immense force and a noise like thunder, broke all its foundation to pieces, shook out all its fastenings, and completely dislodged it from the bridge.

So Marcellus, doubtful what counsel to pursue, drew off his ships to a safer distance, and sounded a retreat to his forces on land. They then took a resolution of coming up under the walls, if it were possible, in the night; thinking that as Archimedes used ropes stretched at length in playing his engines, the soldiers would now be under the shot, and the darts would, for want of sufficient distance to throw them, fly over their heads without effect. But he, it appeared, had long before framed for such occasions engines accommodated to any distance, and shorter weapons; and had made numerous small openings in the walls, through which, with engines of a shorter range, unexpected blows were inflicted on the assailants. Thus, when they who thought to deceive the defenders came close up to the walls, instantly a shower of darts and other missile weapons was again cast upon them. And when stones came tumbling down perpendicularly upon their heads, and, as it were, the whole wall shot out arrows at them, they retired. And now, again, as they were going off, arrows and darts of a longer range inflicted a great slaughter among them, and their ships were driven one against another; while they themselves were not able to retaliate in any way. For Archimedes had provided and fixed most of his engines immediately under the wall; whence the Romans, seeing that indefinite mischief overwhelmed them from no visible means, began to think they were fighting with the gods.

Yet Marcellus escaped unhurt, and deriding his own artificers and engineers, "What," said he, "must we give up fighting with this geometrical Briareus, who plays pitch-and-toss with our ships, and, with the multitude of darts which he showers at a single moment upon us, really outdoes the hundred-handed giants of mythology?"

And, doubtless, the rest of the Syracusans were but the body of Archimedes' designs, one soul moving and governing all; for, laying aside all other arms, with this alone they infested the Romans and protected themselves. In fine, when such terror had seized upon the Romans that, if they did but see a little rope or a piece of wood from the wall, instantly crying out, that there it was again, Archimedes was about to let fly some engine at them, they turned their backs and fled, Marcellus desisted from conflicts and assaults, putting all his hope in a long siege.

Yet Archimedes possessed so high a spirit, so profound a soul, and such treasures of scientific knowledge, that though these inventions had now obtained him the renown of more than human sagacity, he yet would not deign to leave behind him any commentary or writing on such subjects; but, repudiating as sordid and ignoble the whole trade of engineering, and every sort of art that lends itself to mere use and profit, he placed his whole affection and ambition in those purer speculations where there can be no reference to the vulgar needs of life; studies, the superiority of which to all others is unquestioned, and in which the only doubt can be whether the beauty and grandeur of the subjects examined, of the precision and cogency of the methods

> and means of proof, most deserve our admiration. It is not possible to find in all geometry more difficult and intricate questions, or more simple and lucid explanations. Some ascribe this to his natural genius; while others think that incredible effort and toil produced these, to all appearances, easy and unlabored results. No amount of investigation of yours would succeed in attaining the proof, and yet, once seen, you immediately believe you would have discovered it; by so smooth and so rapid a path he leads you to the conclusion required.

We later settled on the name "Eureka! Science Journal Watch", which can be shortened to Eureka! when there's no danger of mixing it up with the vacuum cleaner company or the math magazine.

August 13, 2007

After failing to see any around 11 pm last night, I woke up and saw a Perseid meteor at around 4:30 am. Nice!

August 14, 2007

Todd Trimble passed on this animation of Bach's Toccata and Fugue in D minor:

It gives you a good visual sense of the "architectural" quality of Bach's music. It was made by a guy named Stephen Malinowski, who is apparently a buddy of Donald Knuth. You can see more of this sort of thing on his website.

But right now I'm grooving to this album, which is a catchy blend of flamenco, rumba and rap:

- Ojos de Brujo, *Barí*.

The band is from Barcelona — a place I'll be visiting next summer!

August 15, 2007

Yesterday Lisa and I had dinner with Andreas Doering and his wife. Andreas lives here in Greenwich; he's working with Chris Isham at Imperial College on applying topos theory to physics. Today Andreas and I are going up to visit Chris at his home and talk about physics.

August 16, 2007

Wikipedia is becoming ever more popular. Look who's been editing it lately! Two of many examples:

- An ExxonMobil employee whitewashed the entry on the Exxon Valdez oil spill, replacing a thorough accounting of the impact to various species with this: "Peer-reviewed studies ... have confirmed that there has been no long-term severe impact to the Prince William Sound ecosystem. Thousands of species ... were never affected by the spill in the first place... six of the largest salmon harvests in history were recorded in the decade immediately following the spill."
- Barbara Alton, executive assistant to Episcopal Bishop Charles Bennison, deleted information concerning a cover-up of child sexual abuse, allegations that the Bishop misappropriated $11.6 million in diocesan trust funds, and evidence of other scandals involving the Bishop. Alton claims she was ordered to delete the information by Presiding Bishop Katherine Jefferts Schori.

The good news: now it's easy to spot these changes, thanks to a Caltech grad student named Virgil Griffith, who created a handy-dandy wikiscanner. It's also easy to see a list of mischief-makes, thanks to Wired magazine.

It would be easy to spot new additions to Wikipedia using colored text. I'm not sure what to do about deletions.

On another note: listen to Dick Cheney's surprisingly accurate predictions of what would happen in Iraq:

August 26, 2007

I'm back from Vienna, where I went a conference on Lie algebroids and Poisson sigma models at the Erwin Schrödinger Institute. I learned a lot there, and wrote up a *little* of this in week256 of This Week's Finds. I had a lot of good conversations with Urs Schreiber. I think I understand his "tangent category" construction a bit better now, and we had a good time at the Café Einstein, puzzling out the relation between deformation quantization of Poisson manifolds and 2d TQFTs.

August 27, 2007

Just a month ago I visited the Temple of Zeus at Olympia, and its wonderful museum full of antiquities. This week, the museum just barely survived a bout of wildfires that have swept through Greece, a consequence of the drought that's

lasted since April, the amazing heat wave that's lasted for a month by now, humidities of 10-15%, and perhaps some arson. I found this story rather moving:

- Greek villagers do battle with blazes, *Morning Edition*, NPR, August 27, 2007.

It's a lesson in impermanence: things that have lasted for millennia could still be wiped out any day now. You can't always wait and be sure to see something later.

On a lesser scale: each time I've visited Greenwich, I've been simultaneously tempted but scared by the chalkboards advertising eel pies at Goddard's Pie House, a little shop in the busy heart of the town:

It turns out Goddard's is one of the most famous examples of a "pie and mash shop". "Pie and mash" means a minced beef pie and mashed potatoes. Like jellied eels and eel pie, pie and mash began as a lower-class food in the East End of London. Eel were popular because they were one of the few species that could thrive in the polluted waters of the Thames! Pie and mash was popular because it was made from scraps.

Goddard's website puts it a bit more romantically:

> One of the major influences over the food traditions in London was the river Thames. It provided fish, both fresh and salt water, meat, vegetables and fruit were transported from around Britain, and spices and exotic foods from all over the world. The importance of the trading ships and the great markets like Billingsgate, Spitalfield and Smithfield can be seen in the names of roads in the East End, such as Bread Street, Milk Street and Fish Street.
>
> Perhaps the most famous London dish is the Cockney speciality, jellied eels, caught locally and further out in the Thames Estuary. Made by boiling the eels with plenty of herbs and allowing small pieces to cool and form their own jelly (or by adding a helping portion of using gelatine). The taste is similar to that of pickled herring, but the softer texture can put people off.
>
> The other great working class tradition is pie and mash. Historically, the pies were made from scraps of beef and vegetables, leftovers or from the local markets, under a pastry crust. The mashed potatoes were liberally covered in parsley gravy or "liquor".

This time, after eating plenty of tasty eel in Shanghai, I was finally up for the challenge. So, Lisa and I looked around, trying to remember where the place was... but to no avail!

It turns out that this shop, founded way back in 1890, closed on November 12, 2006. The owners could no longer resist the lure of a big offer to buy the property. In its place is just another anonymous chain store.

On the day Goddard's closed, the line stretched all the way to the Cutty Sark! Here's an picture of the shop before it was renovated:

Luckily for me, the pie 'n' mash business is not dying, I can find eel pie somewhere if I put my mind to it — for example, at G. Kelly's, established in 1937. According to their website, the pie shops replaced an earlier tradition — the "pie men":

> In 1851 the social historian, Henry Mayhew, decided to record the occupations of London's poor. This was published as "Mayhew's London". Among the many activities he noted were that of the "street pie men" and "the street-sellers of pea-soup and hot eels". The pie men sold meat, eel or fruit pies and would travel around the streets and visit taverns, summer fairs and the races. The eel sellers traded differently having stalls and stands in the street, many around Old Street. Around this time however, Mayhew writes that both the street pie men and the eel sellers. trade went into a decline. This was attributed to the establishment of the new penny-pie shops. Within a few years the street sellers had almost disappeared.

I could also go to M. Manze's shops, which claim to be the oldest pie shops in London. They date back to 1902 — but now you can order your eel pies from them online!

In fact, eels have recently become fashionable in England, so I don't need to worry that the tradition of eel pie will die from lack of interest. The real threat to this tradition lies elsewhere. The population of eel in European waters has declined by as much as 99% since the 1970s!

Last year, eel were declared an endangered species. According to *The Guardian*:

> Although they have never recovered the popularity they had at the end of the Second World War, when there were as many as 100 eel-and-pie shops in London alone, tourism has ensured the survival of dozens of pie-and-mash shops and jellied eel stalls in the capital's East End. A bowl of jellied eels from a stall costs about £1.50; a supermarket sells the same amount for about £2.20. Eels are also appearing on the menus of leading restaurants.
>
> Peter Gordon of The Providores, a central London restaurant that serves smoked eel, said: "Eel is extremely popular, especially with younger clients."
>
> Rick Poole, who runs three pie-and-mash shops in south London, said: "We still sell all the eels we can get hold of. They are still very popular with young people as well as the older generation. We wouldn't want to see any drop in supply."
>
> The slump in stocks of the European eel has been one of the most severe and puzzling in any fish species, say conservationists.
>
> They are thought to spawn only in the Sargasso Sea, an area of the Atlantic Ocean, and their larvae are carried by the Gulf Stream back to European shores. Young eels - or elvers - then enter rivers and lakes in

> Europe, before returning to the Sargasso when they are fully mature.
>
> The decline has been blamed on over-fishing, changes in ocean circulation, pollution, dams, power stations and weirs on rivers, and even the presence in the water of chemicals used to make non-stick frying pans.
>
> The decision to list eels as endangered was made in The Hague last week. Meanwhile, at a meeting in Brussels, the European Union agreed to implement plans that will require 40 per cent of adult eels to be allowed to return to the Sargasso Sea to breed and for up to 60 per cent of baby eels caught to be retained for restocking.
>
> The biggest commercial wild eel fishery in Europe is on Lough Neagh, in Northern Ireland, a £4 million-a-year operation that employs about 350 fishermen. It produces about 700 tons of eel a year, 100 tons for sale in the UK.

August 30, 2007

The last entry was suffused with the melancholy of things ending. Lest you think I've become an nostalgic old sourpuss, I should let you know what I've been doing the last couple of days: working on a new wiki, and composing electronic music on my laptop using free software!

This is great fun, and it shows that for every good old thing that's fading away, some good new thing is coming in. Whether things are mainly getting better or getting worse seems to depend a lot on how you focus your attention.

My wife Lisa just finished her book *Divining Cultures*, which compares fortune-telling practices in China and Greece. So, she was naturally attracted to this book of poetry:

- James Harpur, *Oracle Bones*, Anvil Press Poetry Ltd, London, 2001.

which has a lot of poetry related to divination, and was partially inspired by *Divination and Oracles*, a book written by Lisa's friends Michael Loewe and Carmen Blacker.

Here's a poem from *Oracle Bones*. It was written in Latin by Ausonius sometime in the 4th century AD, and translated into English by Harpur:

To His Wife

Let us live, dear wife, as we have lived
And call each other by those names that lingered
On our lips the first night of our love.
As years add wrinkles to our aging skin
I hope to God the day does not arrive
When I forget you are my sweet young thing
Or you no longer see me as your suitor.
Though you outlive the prophetess of Cumae
And I surpass the age of old King Nestor
This ripe longevity we shall deny:
Instead of ticking off the days of life
We'll count the joys they bring, my dearest wife

In volume 1 of Hugh Evelyn-White's *Ausonius, With an English Translation*, available at the Internet Archive, we read the following remarks dissing poor old Ausonius:

> The same defects, narrowness in outlook and egoism, make sterile even those poems which commemorate keener sorrows than a man of seventy might be expected to feel at the death of his father at the ripe age of

> ninety: a favourite grandson is accidentally killed, and the cry is not "O the pity of it" but "Alas, all my hopes are upset" (Parent, xi. 13). This is common, very common, human nature, but it is not great poetry. And again, grief for the loss of his wife (Parent, ix.), deeply felt as it was and much as its expression may command our pity, is too self-centred to engage entire respect. It is in the verses To his Wife (Epigr. xl.) alone that an entirely natural and universal expression of human feeling is to be found; and even here the pedant must needs drag in the stiff lay-figures of Nestor with his "triple span" and Deiphobe of Cumae to chill the atmosphere of brave optimism and tenderness.

Heh. Why the author of these griping lines bothered to compile a whole book of Ausonius' poetry is beyond me! It's a curious assumption, that a good poet should only express sentiments that "engage entire respect". As for me, I can forgive a pedantic reference or two in an otherwise charming poem. It may not be great poetry, but there's something very human about it.

For my September 2007 diary, go here.

Instead of ticking off the days of life
We'll count the joys they bring - Ausonius

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home

For my August 2007 diary, go here.

Diary - September 2007

John Baez

September 3, 2007

A correspondent sent me a link to this movie:

- Cal Earth, Pegasus Cal Earth Project (in Nepal).


Cal Earth teaches people simple ways to make beautiful, cheap, practical, safe housing out of dirt, sandbags and a bit of stucco. I've visited their place near Riverside, and it's really quite inspiring.

September 4, 2007

Some environmentalists are saying the fires in Greece (see my August 27th entry) are an effect of global warming and a harbinger of desertification to come:

- Silvia Poggoli, Blazes in Greece a wake-up call for climate change, All Things Considered, NPR, September 4, 2007.

Today I went to University College London and gave a talk on 2-Hilbert spaces at the Analysis and Probability Seminar, where I'd been invited by my friend Minhyong Kim. Among the small audience was Ray Streater, coauthor with Arthur Wightman of *PCT, Spin, Statistics and All That*. Like almost every mathematician who has seriously tried to understand quantum field theory, I learned a lot from this book. So, it was fun meeting Streater, talking with him at dinner — and finding out that he'd once been made an honorary colonel of the US Army to get a free plane trip to the Rochester Conference!

He also described Geoffrey Chew's Rochester conference talk on the analytic S-matrix, given at the height of the bootstrap theory fad. Wightman asked Chew: why assume from the start that the S-matrix was analytic? Why not try to derive it from simpler principles? Chew replied that "everything in physics is smooth". Wightman asked about smooth functions that aren't analytic. Chew thought a moment and replied that there weren't any.

(Now all mathematicians reading this are chortling in amusement at Chew's folly, while everyone else is scratching their head. The first point is that Wightman succeeded in deriving the analyticity of the S-matrix from simpler principles. The second point is that any good mathematician — but not necessarily every physicist, like Chew — will know examples of smooth functions that aren't analytic.)

Streater is retired, but he has just come out with a new book called *Lost Causes in and beyond Physics*. You can see some of his lost causes online. I don't mind him calling octonions a lost cause, despite my fondness for them. But, I wish he'd spell them right!

September 5, 2007

Here's an interesting article on Titan Rain, a series of attacks on US government computers which appear to be Chinese in origin:

- Nathan Thornburgh, The invasion of the Chinese cyberspies (and the man who tried to stop them), *Time*, August 29, 2005.

I only heard about this recently, after newspapers here in England reported more recent Chinese attacks on British government computers including those in the Foreign Office:

- Richard Norton-Taylor, Titan Rain - how Chinese hackers targeted Whitehall, *The Guardian*, September 5, 2007.

The big story, though, happened this April, when Russia launched a crippling cyber-attack against Estonia in retaliation for the relocation of the Bronze Soldier of Tallinn:

- Joshua Davis, Hackers take down the most wired country in Europe, *Wired*, August 21, 2007.

Quoting a bit:

> The minister of defense checked the Web page again — still nothing. He stared at the error message: For some reason, the site for Estonia's leading newspaper, the Postimees, wasn't responding. Jaak Aaviksoo attempted to pull up the sites of a couple of other papers. They were all down. The former director of the University of Tartu Institute of Experimental Physics and Technology had been the Estonian defense minister for only four weeks. He hadn't even changed the art on the walls.
>
> An aide rushed in with a report. It wasn't just the newspapers. The leading bank was under siege. Government communications were going down. An enemy had invaded and was assaulting dozens of targets.
>
> Outside, everything was quiet. The border guards had reported no incursions, and Estonian airspace had not been violated. The aide explained what was going on: They were under attack by a rogue computer network.

September 7, 2007

Tie a camera a balloon, set it to take a picture every minute, and use a Byonics MicroTrak 300 APRS Tracker to send the pictures back. Let it float up until the balloon pops. Results:

- South Alberta Balloon Launch Experiment #3

It reached about 35,000 meters - the middle stratosphere. If you check out that link, make sure you scroll down enough to see the whole sequence of shots!

Or, if you prefer some math, watch a sphere turn inside out.

On a lark, Nadja Kutz came by to talk a bit. She reads the n-Category Café and has been visiting London lately; I guess she read that I was in Greenwich. She used to work on completely integrable systems. Now she and her husband do netart. They have an online gallery.

September 8, 2007

I discovered today that I'd lost my wallet, perhaps the day before yesterday. I lost my credit card, bank card, driver's license, a horde of lesser cards, about 80 pounds and about 300 euros. Why hadn't I put those euros somewhere else? I'd been so proud of saving them from my stay in Vienna. And I'd just had a new bank card fedexed from the US (the old one had expired). How could I such an *idiot* to lose my *wallet?* Am I going senile *this fast?*

Many rounds of self-castigation...

Luckily I have some old traveller's checks, and with the help of Lisa I'll surely survive my last couple weeks abroad. A new credit card should arrive here in 5 business days.

September 9, 2007

Today I'm taking a train up to Sheffield to attend the 22nd British Topology Meeting. It starts tomorrow, and then I'll give my talk on higher gauge theory and the string group. But tonight, with any luck, I'll meet Bruce Bartlett, Eugenia Cheng, Tom Leinster and Simon Willerton — friends who work on n-categories and related stuff. The plan is to meet at the Fox and Duck and then have dinner at Café Thyme.

The widespread production of plastic is new enough that we haven't seen all the side-effects yet. You've probably read about sea turtles choking on plastic junk, but that could be the tip of the iceberg. Alan Weisman has written a book which — perhaps in some fit of wishful thinking, I don't know — imagines what the future of the Earth might be like without humans:

- Nobody home: earth without man would recover, review of *The World Without Us* by Alan Weisman, NPR, September 7, 2007.

Here's something I hadn't heard about before:

> Thompson's team realized that slow mechanical action — waves and tides that grind against shorelines, turning rocks into beaches — were now doing the same to plastics. The largest, most conspicuous items bobbing in the surf were slowly getting smaller. At the same time, there was no sign that any of the plastic was biodegrading, even when reduced to tiny fragments.
>
> "We imagined it was being ground down smaller and smaller, into a kind of powder. And we realized that smaller and smaller could lead to bigger and bigger problems."
>
> He knew the terrible tales of sea otters choking on polyethylene rings from beer six-packs; of swans and gulls strangled by nylon nets and fishing lines; of a green sea turtle in Hawaii dead with a pocket comb, a foot of nylon rope, and a toy truck wheel lodged in its gut. His personal worst was a study on fulmar carcasses washed ashore on North Sea coastlines. Ninety-five percent had plastic in their stomachs — an average of 44 pieces per bird. A proportional amount in a human being would weigh nearly five pounds.
>
> There was no way of knowing if the plastic had killed them, although it was a safe bet that, in many, chunks of indigestible plastic had blocked their intestines. Thompson reasoned that if larger plastic pieces were breaking down into smaller particles, smaller organisms would likely be consuming them. He devised an aquarium experiment, using bottom-feeding lugworms that live on organic sediments, barnacles that filter organic matter suspended in water, and sand fleas that eat beach detritus. In the experiment, plastic particles and fibers were provided in proportionately bite-size quantities. Each creature promptly ingested them.

When the particles lodged in their intestines, the resulting constipation was terminal. If they were small enough, they passed through the invertebrates' digestive tracts and emerged, seemingly harmlessly, out the other end. Did that mean that plastics were so stable that they weren't toxic? At what point would they start to naturally break down — and when they did, would they release some fearful chemicals that would endanger organisms sometime far in the future?

Richard Thompson didn't know. Nobody did, because plastics haven't been around long enough for us to know how long they'll last or what happens to them. His team had identified nine different kinds in the sea so far, varieties of acrylic, nylon, polyester, polyethylene, polypropylene, and polyvinyl chloride. All he knew was that soon everything alive would be eating them.

"When they get as small as powder, even zooplankton will swallow them."

Two sources of tiny plastic particles hadn't before occurred to Thompson. Plastic bags clog everything from sewer drains to the gullets of sea turtles who mistake them for jellyfish. Increasingly, purportedly biodegradable versions were available. Thompson's team tried them. Most turned out to be just a mixture of cellulose and polymers. After the cellulose starch broke down, thousands of clear, nearly invisible plastic particles remained.

Some bags were advertised to degrade in compost piles as heat generated by decaying organic garbage rises past 100°F. "Maybe they do. But that doesn't happen on a beach, or in salt water." He'd learned that after they tied plastic produce bags to moorings in Plymouth Harbor. "A year later you could still carry groceries in them."

Even more exasperating was what his Ph.D. student Mark Browne discovered while shopping in a pharmacy. Browne pulls open the top drawer of a laboratory cabinet. Inside is a feminine cornucopia of beauty aids: shower massage creams, body scrubs, and hand cleaners. Several are by boutique labels: Neova Body Smoother, SkinCeuticals Body Polish, and DDF Strawberry Almond Body Polish. Others are international name brands: Pond's Fresh Start, a tube of Colgate Icy Blast toothpaste, Neutrogena, Clearasil. Some are available in the United States, others only in the United Kingdom. But all have one thing in common.

"Exfoliants: little granules that massage you as you bathe." He selects a peach-colored tube of St. Ives Apricot Scrub; its label reads, 100% natural exfoliants. "This stuff is okay. The granules are actually chunks of ground-up jojoba seeds and walnut shells." Other natural brands use grape seeds, apricot hulls, coarse sugar, or sea salt. "The rest of them," he says, with a sweep of his hand, "have all gone to plastic."

On each, listed among the ingredients are "micro-fine polyethylene granules," or "polyethylene micro-spheres," or "polyethylene beads." Or just polyethylene.

"Can you believe it?" Richard Thompson demands of no one in particular, loud enough that faces bent over microscopes rise to look at him. "They're selling plastic meant to go right down the drain, into the sewers, into the rivers, right into the ocean. Bite-size pieces of plastic to be swallowed by little sea creatures."

I'm not convinced that tiny plastic granules will kill off the little sea creatures of the world — these guys already have to contend with silt. Are tiny granules of plastic worse than tiny granules of silica?

September 12, 2007

I just got back from Sheffield. I had a lot of great conversations with Eugenia Cheng (starting on the train), Bruce Bartlett, Simon Willerton, and others. And, I found my wallet! It was in a pair of pants I brought along. I felt silly but mainly relieved.

Speaking of *The World Without Us*, some people are dreaming about restoring the ecosystem of North America to the

way it was in the good old days: before people arrived.

Back then, there were many large mammals. I discussed them here last December. In the elephant department we had the American mastodon, the woolly mammoth, and Jefferson's mammoth. We also had giant beavers, giant ground sloths, the dire wolf, the giant short-faced bear, the Mexican horse, the western camel, and more.

All these North American "megafauna" went extinct shortly after people — the Clovis culture — crossed the Bering strait around 11,500 BC. According to the Pleistocene overkill hypothesis, the sudden arrival of skilled hunters spelled doom for these animals. Regardless of what killed them off, the American wilderness must have been reeling in shock ever since. Big herbivores and top predators have a huge effect on the rest of the environment.

But, there are some who dream of reintroducing *substitutes* for these extinct beasts! One of them is C. Josh Donlan, a biologist at Cornell University:

- Josh Donlan *et al*, Re-wilding North America, *Nature*, Commentary, August 17, 2005.

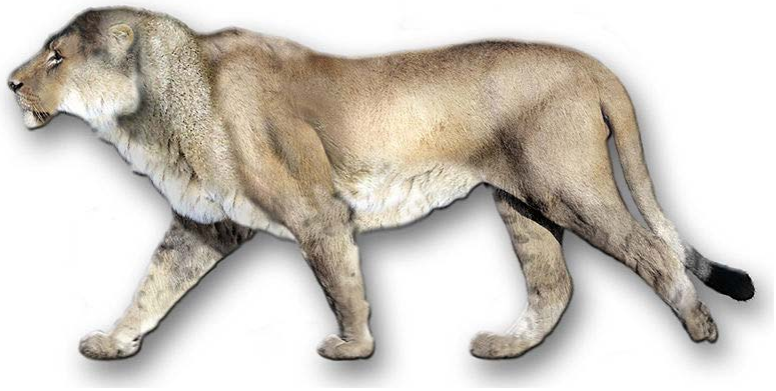
A little quote:

> We foresee several phases to Pleistocene rewilding, some of which are already under way. The 50-kg Bolson tortoise (*Gopherus flavomarginatus*) was widely distributed across the Chihuahuan desert until the Late Pleistocene. Today it survives only in a small part of northern Mexico and is critically endangered. A number of appropriate sites exist for reintroduction, including Big Bend National Park, Texas. And repatriation of captive Bolson tortoises to a private ranch in New Mexico is currently under study. Restoring North America's largest surviving temperate terrestrial reptile to its prehistoric range could bring ecological, evolutionary, economic and cultural benefits, with no apparent costs.
>
> Likewise, horses and camels originated in North America, and many species were present in the Late Pleistocene. Feral horses (*Equus caballus*) and asses (*E. asinus*), widely viewed as pests in the United States, are plausible proxies for extinct American species. Also, given that most of the surviving Eurasian and African species are now critically endangered, establishing Asian asses (*E. hemionus*) and Przewalski's horse (*E. przewalskii*) in North America might help prevent the extinction of these endangered species and would restore equid species to their evolutionary homeland.
>
> Similarly, Bactrian camels (*Camelus bactrianus*) in North America could provide a modern proxy for *Camelops*, a late Pleistocene camelid. Wild Bactrian camels are on the verge of extinction, currently

restricted to the Gobi desert. Domesticated or captive camels might benefit arid North American ecosystems by browsing on woody plants that today often dominate southwestern US landscapes. With proper management, camels could provide economic benefits as well. The overall benefits and disadvantages of horses and camels as proxies will depend on local contexts, and possibly on the presence of appropriate predators.

The second, more controversial phase of Pleistocene re-wilding could also begin immediately, with the maintenance of small numbers of African cheetahs (*Acinonyx jubatus*), Asian (*Elephas maximus*) and African (*Loxodonta africana*) elephants, and lions (*Panthera leo*) on private property. Many of these animals are already in captivity in the United States, and the primary challenge will be to provide them with naturalistic settings, including large protected areas of appropriate habitat and, in the case of carnivores, live prey.

Lions? Yes! Besides the sabertooth, its smaller relative the scimitar cat, and the American cheetah, North America played host to a species of lion: *Panthera leo atrox*. It probably evolved from cave lions that entered Alaska from Siberia during the second to last ice age. Here's what we think it looked like:



Of course, American ranchers are already complaining mightily about the reintroduction of wolves and bears! They'd probably like lions and elephants even less. And it's not just ranchers who don't want lions in their neighborhood — so Donlan's proposal has raised hackles in many quarters. Read the story here:

- Will Stolzenburg, Where the wild things were, *Conservation in Practice*, January-March 2006 (Vol. 7, No. 1).

But, the re-wilders have a long, slow 50-year plan in mind. With the depletion of the Ogalalla aquifer:

large areas of the Great Plains may become hard to inhabit. The permanent drought people are predicting will only intensify this trend. So, some people are already dreaming of turning them into parks. Then some lions might not be so bad!

Donlan *et al* put it this way:

> The third stage in our vision for Pleistocene re-wilding would entail one or more 'ecological history parks', covering vast areas of economically depressed parts of the Great Plains. As is the case today in Africa, perimeter fencing would limit the movements of otherwise freeliving ungulates, elephants and large carnivores, while surrounding towns would benefit economically from management and tourism-related jobs. A system of similar reserves across several continents offers the best hope for longterm survival of large mammals.

The importance of reintroducing big predators is clear from the case of the wolf. Stolzenburg writes:

> The megafauna's most shining endorsement is now on public display in the dramatic greening of Yellowstone National Park under the reinstated reign of the gray wolf. For 70 years following the wolf's extermination from the park, Yellowstone's oases of aspens, cottonwoods, and willows had been browsed to stubs by the world's largest herd of elk. Within five years of the wolves. return in 1995, the elk were running scared and willows were sprouting three meters high. With the willows' return, the beaver followed — from one colony before wolf reintroduction to ten colonies at last count. With the new beaver ponds have come more fish and with the streamside groves more songbirds. The list of beneficiaries goes on, from ravens and grizzlies fattening on wolf leftovers to the encouraging number of surviving pronghorn fawns now that the lurking coyotes have been scattered by territorial wolves.

Other magazines have picked up on this "re-wilding" business:

- C. Josh Donlan, Lions and cheetahs and elephants, oh my!, *Slate*, Thursday, August 18, 2005.
- Jens-Christian Svenning, Bringing back Europe's prehistoric beasts, slide show, *Scientific American*, May 31, 2007.

From the latter:

> A few years ago, a group of scientists conceived a "re-wilding" plan aimed at restoring North America's lost Pleistocene ecosystems. The purpose: to restore lost ecological processes and evolutionary potential as well as provide a safe haven for megafauna barely surviving in conflict-ridden, unstable or densely populated regions elsewhere. Since that time, much of the discussion about re-wilding has remained focused on North America. Meanwhile, other candidates for re-wilding have been largely overlooked, although there is a major effort underwayin Siberia to preserve and extend Pleistocene-like grasslands at northern latitudes as well as initiatives in Europe, the continent that may hold the greatest promise for bringing the Pleistocene back to life.
>
> In many ways, Europe is a more obvious candidate for re-wilding than North America. The reason: a large portion of species lost in the Americas do not have any close living relatives. Europe has also seen its share of extinctions, including the scimitar cat, cave bear, woolly mammoth, woolly rhinoceros, steppe rhinoceros and giant deer, but many of Europe's lost species still survive or have close wild or domestic relatives elsewhere in the world. Europe also has a historical advantage: The disappearance of its megafauna to a large extent occurred more recently than in North America, with many species persisting well into the Holocene.
>
> Europe has already succeeded in reintroducing some previously extinct species. The bison, which was extinct in the wild in the early 20th century, has now been reestablished in scattered populations across eastern Europe. Small populations of musk ox that lived in Europe in cold climates until the late glacial period have been successfully reintroduced in Scandinavia's mountains. The fallow deer, the closest relative of the now extinct giant deer, survived marginally into Europe's Holocene, but persisted in Asia Minor. After several millennia of reintroductions, the animal now prospers in most European countries. The successful re-wilding of these species bodes well for larger scale projects.
>
> But re-wilding initiatives in Europe must also include reinvigoration of megafauna populations already there that have suffered severe range constriction. Among them: the wolf, brown bear, lynx and moose. Scientists should also consider reintroducing 11 additional megafauna species: the Asiatic lion, leopard, spotted hyena, dhole, horse, cattle, Asiatic wild ass, Asiatic elephant, hippopotamus, water buffalo and hairy rhinoceros.

For more, I'll need to read this book:

- Paul S. Martin, *Twilight of the Mammoths: Ice Age Extinctions and the Rewilding of America*, University of California Press, 2005.

September 13, 2007

Wendell Berry has made an interesting and — not surprisingly — rather harsh reply to Freeman Dyson's article on the future of biotech. And in another reply to Dyson, a grad student at CUNY, James Hermann, pointed out one of those spooky blends of electronics and biotech that we'll certainly be seeing more of:

- Feng Zhang *et al*, Multimodal fast optical interrogation of neural circuitry, *Nature* **446**, 633-639.
- Michael Häusser and Spencer L. Smith, Neuroscience: controlling neural circuits with light, *Nature* **446**, 617-619.

The article is pretty technical, but Häusser and Smith's summary is less so. Very roughly: by taking two genes from single-celled organisms like algae and putting them in simple animals like *C. elegans*, Zhang and his coauthors have developed a way to use *light* for precise, millisecond control of neural circuits. Blue light turns the neurons on. Yellow light turns them off.

September 17, 2007

We're back home! The garden looks in good shape, unlike last yeard — thanks in large part to the ministrations of our gardener, Robert Rodriguez. Time to get organized and get ready for classes, which start on the 27th.

September 28, 2007

Prospects for restoring American wildlife to its Pleistocene state just got better:

- DNA extracted from woolly mammoth hair, *EurekAlert*, September 27, 2007.

A team of scientists led by Stephan C. Schuster and Webb Miller have managed to sequence all the mitochondrial DNA of some woolly mammoths. Mitochondria are little power supply gizmos in your cells that probably descend from symbiotic bacteria. You inherit mitochondrial DNA only from your mother: it's not the same as the DNA in the cell nucleus, which is what people more commonly talk about.

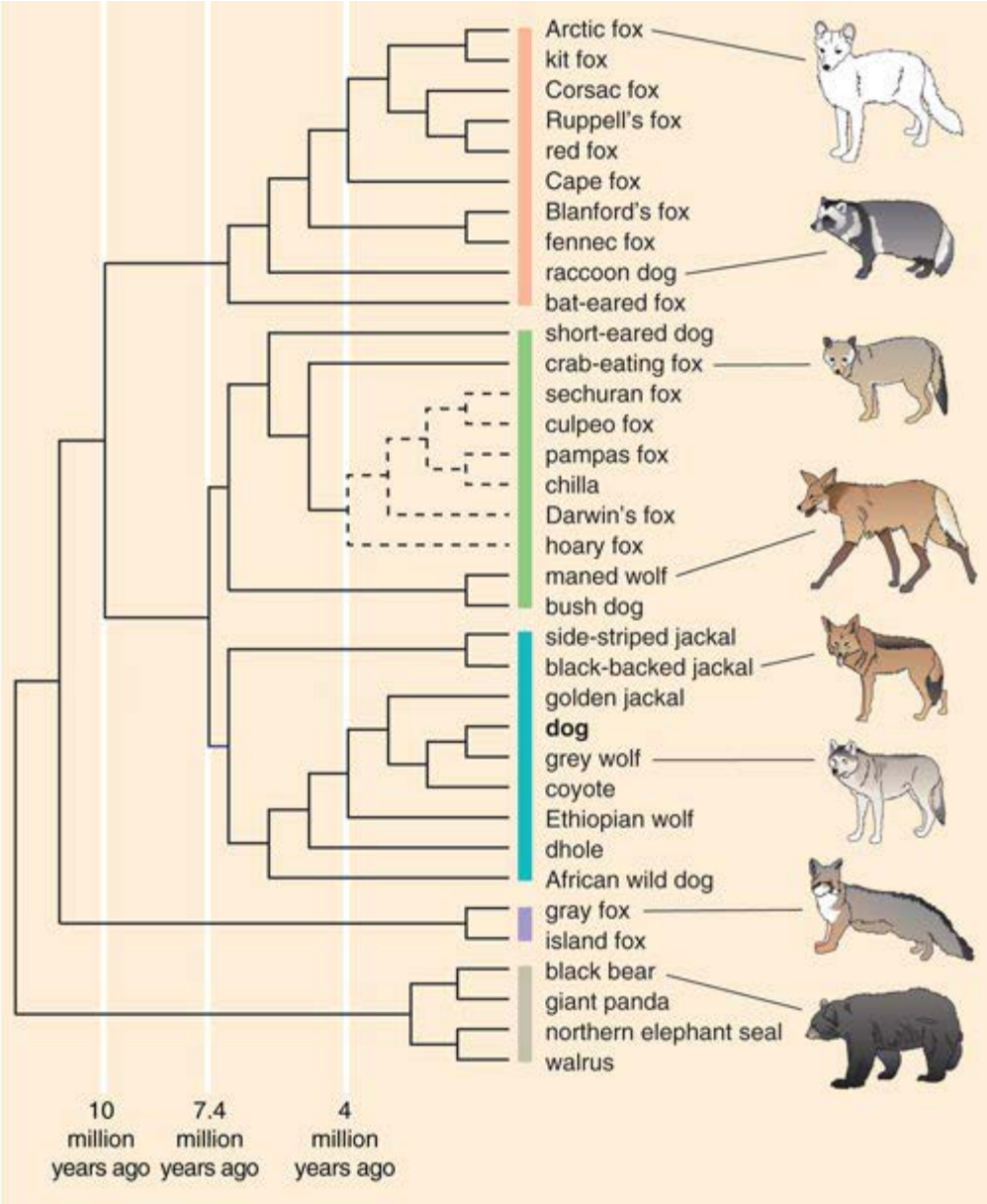
Back in 2005, members of a team led by Schuster and Miller were able to isolate and sequence 13 million base pairs of the nuclear DNA from a mammoth that had been frozen for 28,000 years. It'll probably be quite a while before we're in a position to clone mammoths, but people are definitely thinking about it.

Schuster and Miller have also sequenced a bunch of Neanderthal DNA, but there doesn't seem to be much interest in cloning Neanderthals yet.

On a related note, Elaine Ostrander has recently studied the DNA of lots of dogs and cats:

- Elaine A. Ostrander, Genetics and the shape of dogs, *American Scientist*, September-October 2007.

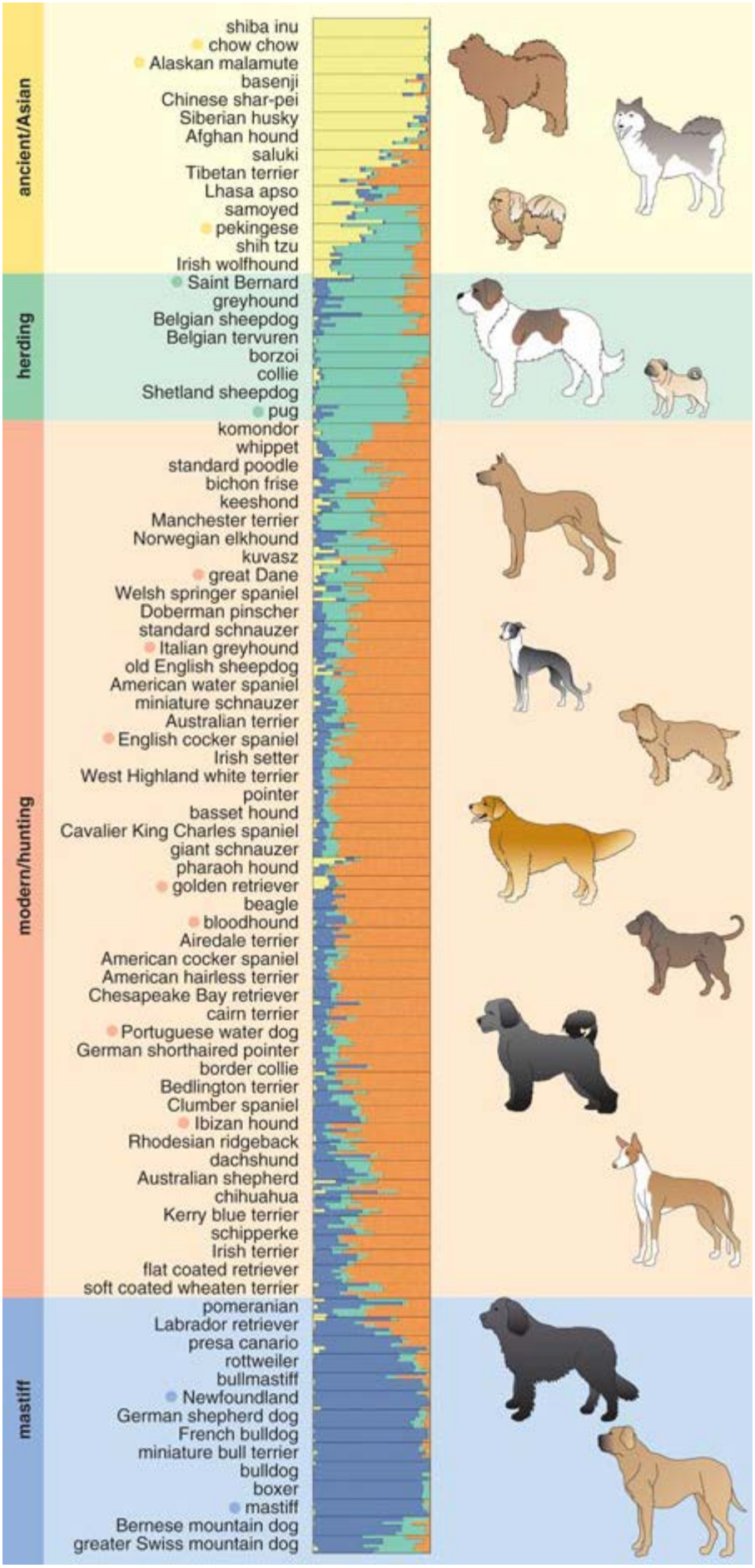
Dogs are now considered a subspecies of the gray wolf, which in turn is one of many closely related species of canids:



Wolf remains have been found in association with hominid remains as far back as 400,000 years ago. The precise time at which some wolves became domesticated "dogs" will probably be argued forever. Some people claim that it happened roughly around the end of the Pleistocene, between 17,000 and 10,000 years ago. I'm not sure what the evidence is, or even what *definition* of a dog is being used in these debates. Dogs can and still do interbreed with wolves and other canids, after all. One interesting possibility is that a canid counts as domestic when it will eat in the presence of humans.

Personally, not being at all expert on this subject, I suspect a much earlier date for domestication. There's some evidence that points to a time around 100,000 to 130,000 years ago.

Anyway, the above article by Ostrander argues that there are four general kinds of dogs, genetically speaking:



It's easy for me to imagine wolves being domesticated as soon as hominids started using fire to cook meat. The use of

fire dates back to around 1.4 million years ago, long before *Homo neanderthalensis* showed up. Cats, on the other hand, seem to have befriended us only when the rise of agriculture led to stores of grain, which attracted rats! The earliest known evidence of domestic cats seems to be a grave excavated in Cyprus in 2004, which contained skeletons, laid close to one another, of both a human and a cat. This grave is estimated to be 9500 years old.

Cats may have only been domesticated a few times: a recent genetic analysis of almost 1,000 domestic cats and their wild progenitors has revealed that today's dometic cats descended from a few that lived in the Middle East around 9,000 years ago:

- Carlos A. Driscoll *et al*, The near eastern origin of cat domestication, *Science* **317** (2007), 519-523.

All this stuff became more vivid for me when, shortly before I left England, Julia Strauss got a new cat:

Julia is the woman who kindly let Lisa and me stay in her house in Greenwich this summer. She's quite a cat fancier, so she drove all the way to Wales with Lisa to pick up a very special kitty, a Bengal named Seren. The fascinating thing about Bengals is that they arise from crossing ordinary domestic cats with the leopard cat, *Prionailurus bengalensis* — a small wild cat found in southeast Asia.

It takes some work to make these hybrids tame, but this particular one was *very* tame. I'm afraid it's absurdly cute, too:

For my October 2007 diary, go here.

Will you settle for an American wilderness emptier than it was just 100 centuries ago? - C. Josh Donlan

baez@math.removethis.ucr.andthis.edu

home

For my September 2007 diary, go here.

Diary - October 2007

John Baez

October 1, 2007

On September 9th I wrote about the bad effects of plastic trash. Here's another story on that:

- Elizabeth Shorgren, Remote waters offer no refuge from plastic trash, *All Things Considered*, National Public Radio, October 1, 2007.

October 2, 2007

Today I flew to the Deep Beauty conference at Princeton. In the Denver airport, I bought a *National Geographic* magazine. It was quite good, better than in the old days. I enjoyed the short article about a new species of clouded leopard discovered in Borneo. Online, I can only find an earlier article on the same subject:

- Ted Chamberlain, Photo in the news: new leopard species announced, *National Geographic*, March 2007.

People believe there are 5,000 to 18,000 of these Bornean clouded leopards, many in a mountainous rain forest called the Heart of Borneo. Despite their name and appearance, they are not closely related to true leopards. They live in trees and are very agile: they can descend tree trunks head-first, and even climb while hanging upside-down from a branch! They probably hunt by dropping down on their prey, but this has not been seen: they're quite elusive.

Except for bats, new mammal species are hard to find nowadays. But the Bornean clouded leopard is not a new find! It was first noted by Western zoologists in 1823. At the time it was considered a separate species, *Neofelis diardi*. It was later reclassified as a subspecies of the clouded leopard *Neofelis nebulosa*, which is found in southern China, the eastern Himalayas, north-east India and south-east Asia. However, in December 2006, genetic analyses convinced scientists that the Bornean clouded leopard is actually a separate species. You can tell the mainland clouded leopard looks different:

But looks don't prove much. Genes matter more, and a molecular clock estimate says that the Bornean clouded leopards separated from their mainland kin 1.4 million years ago, after they used a land bridge to reach Borneo and Sumatra. Now they're different enough to be a separate species.

Someday, I hope not too late, people will regard each Bornean clouded leopard as a work of art more precious than any masterpiece by Monet or da Vinci. Beautiful and more irreplaceable than any mere work of man, it has been honed through eons of natural selection, almost perfectly adapted to its environment — until we showed up. Now all the rules have changed. Now it survives only with our forbearance.

The World-Wide Wildlife Federation is trying to save 220,000 square kilometers of the Heart of Borneo. I support them, and I hope you do too.

If you're not in love with the Bornean clouded leopard yet, watch this:

I don't know if the clouded leopards are related to the Asian leopard cat.

Here's another article I enjoyed:

- Peter Gwin, The Strait of Malacca: dark passage — pirates haunt it; sailors fear it; global trade depends on it, *National Geographic*, October 2007.

Since we visited Singapore and Malacca in the summer of 2005, and Lisa has gotten job feelers from the National University of Singapore, it's not just a love of exoticism that makes me interested in the pirates that ply their trade in the Strait of Malacca. I'm not sure I'd want to take a cruise near Singapore, given the high rate of piracy nearby! Check out the International Maritime Bureau maps showing pirate attacks worldwide — you'll see a lot concentrated around Malaysia and Indonesia. The *National Geographic* also had a good article on the comparative merits of different biofuels:

- Joek K. Bourne, Jr., Green dreams: making fuel from crops could be good for the planet — after a breakthrough or two, *National Geographic*, October 2007.

Click on the boxes here to compare biofuels. Or if you just want the executive summary:

- Ethanol from corn sucks. But that's what the US is subsidizing, thanks to the muscle of big agribusiness.
- Biodiesel is better.
- Sugar-cane ethanol is even better, as long as you don't tear down rainforests to grow it. That's what Brazil is doing.
  (See my June 15, 2005 entry for more.)
- Making ethanol from cellulose or biodiesel from algae could be even better — but these technologies are still under development.

But the best article of all was this:

- Bill McKibben, Carbon's new math: to deal with global warming, the first step is to do the numbers, *National Geographic*, October 2007.

The really cool part is a chart that Robert Socolow and Stephen Pacala made up in this paper:

- Stephen Pacala and Robert Socolow, Stabilization wedges: solving the climate problem for the next 50 years using current technologies, *Science* **305** (2004), 968-972.

It lists 15 measures, each of which could reduce carbon emissions by 1 billion tons per year by 2057. Here's an executive summary of what they claim:

- If we adopt 12 of these measures, we could lower our carbon emissions from the current figure of 8 billion tons per year to 4 billion tons per year by 2057. This might mean 450 parts per million of CO_2 in the atmosphere by this time, and a global temperature rise of 2° C (or 3.6° F). With this, we could still expect coastal flooding that affects millions of people per year. Cereal crop yields will tend to decrease in low latitudes. And up to 30% of species might face the risk of extinction, with most coral reefs being bleached. But this is the "good" scenario.

- If adopt only 8 of the measures, we could hold our carbon emissions constant at the current figure of 8 billion tons

per year. This might mean 525 ppm of CO_2 in the atmosphere, and a global temperature rise of 3° C (or 5.4° F). With this, we can expect the widespread death of coral reefs. We can also expect the bad consequences listed above, and: 30% of coastal wetlands being lost, with most ecosystems becoming carbon sources as permafrost thaws and vegetation burns or rots.

- If we adopt none of the measures, we can expect carbon emissions to double by 2057, to 16 billion tons per year. This might mean 800 ppm of CO_2 in the atmosphere, and a global temperature rise of 5° C (or 9° F). With this, we can expect that more than 40% of species will face extinction. We can also expect the bad consequences listed above, and cereal crop yields decreasing in some mid- to high-latitude regions.

Here are the 15 measures, which Pacala and Socolow call "wedges":

Energy Efficiency and Conservation	Economy-wide carbon-intensity reduction (emissions/$GDP)	Increase reduction by additional 0.15% per year (e.g., increase U.S. goal of reduction of 1.96% per year to 2.11% per year)	Can be tuned by carbon policy
	1. Efficient vehicles	Increase fuel economy for 2 billion cars from 30 to 60 mpg	Car size, power
	2. Reduced use of vehicles	Decrease car travel for 2 billion 30-mpg cars from 10,000 to 5,000 miles per year	Urban design, mass transit, telecommuting
	3. Efficient buildings	Cut carbon emissions by one-fourth in buildings and appliances projected for 2054	Weak incentives
	4. Efficient baseload coal plants	Produce twice today's coal power output at 60% instead of 40% efficiency (compared with 32% today)	Advanced high-temperature materials
Fuel shift	5. Gas baseload power for coal baseload power	Replace 1400 GW 50%-efficient coal plants with gas plants (4 times the current production of gas-based power)	Competing demands for natural gas
CO_2 Capture and Storage (CCS)	6. Capture CO_2 at baseload power plant	Introduce CCS at 800 GW coal or 1600 GW natural gas (compared with 1060 GW coal in 1999)	Technology already in use for H_2 production
	7. Capture CO_2 at H_2 plant	Introduce CCS at plants producing 250 MtH_2/year from coal or 500 MtH_2/year from natural gas (compared with 40 MtH_2/year today from all sources)	H_2 safety, infrastructure
	8. Capture CO_2 at coal-to-synfuels plant	Introduce CCS at synfuels plants producing 30 million barrels per day from coal (200 times Sasol), if half of feedstock carbon is available for capture	Increased CO_2 emissions, if synfuels are produced *without* CCS
	Geological storage	Create 3500 Sleipners	Durable storage, successful permitting
Nuclear Fission	9. Nuclear power for coal power	Add 700 GW (twice the current capacity)	Nuclear proliferation, terrorism, waste
Renewable Electricity and Fuels	10. Wind power for coal power	Add 2 million 1-MW-peak windmills (50 times the current capacity) "occupying" 30×10^5 ha, on land or off shore	Multiple uses of land because windmills are widely spaced
	11. PV power for coal power	Add 2000 GW-peak PV (700 times the current capacity) on 2×10^5 ha	PV production cost
	12. Wind H_2 in fuel-cell car for gasoline in hybrid	Add 4 million 1-MW-peak windmills (100 times the current capacity)	H_2 safety, infrastructure
	13. Biomass fuel for fossil fuel	Add 100 times the current Brazil or U.S. ethanol production, with the use of 250×10^6 ha (1/6 of world cropland)	Biodiversity, competing land use
Forests and Agricultural Soils	14. Reduced deforestation, plus reforestation, afforestation and new plantations.	Decrease tropical deforestation to zero instead of 0.5 GtC/year, and establish 300 Mha of new tree plantations (twice the current rate)	Land demands of agriculture, benefits to biodiversity from reduced deforestation
	15. Conservation tillage	Apply to all cropland (10 times the current usage)	Reversibility, verification

I should do my part for wedge 2 and stop flying to so many conferences.

Of course I'll also vote against Bush in the next election — or at least whomever he supports.

October 7, 2007

I'm back from the conference Deep Beauty: Mathematical Innovation and the Search for an Underlying Intelligibility of the Quantum World, organized by Hans Halvorson of the Princeton University philosophy department.

Here are some of the participants at von Neumann's grave, in a picture taken by Jamie Vicary — who therefore remained invisible himself, alas:

From left to right: Simon Kochen, Jeffrey Bub, Bob Coecke, Peter Woit, John Baez, Mike Stay, Andreas Döring, Camm Maguire and Chris Heunen.

The honor of being the "keynote speaker" (woo-hoo!) was almost completely balanced by the inconvenience of it all. First of all, the conference took place for two days in the middle of the week: the first full week of class here at UCR. Second, the trip there was a nightmare.

On Tuesday morning I caught a shuttle to Ontario airport at 5:15 am. My 8 am flight with United was cancelled, so I wound up sitting in the airport until 11:40 am, flying to Denver, sitting around for a couple of hours, and arriving at Newark airport after midnight. I made it to the Nassau Inn at 1:30 am and went to bed around 2. I got up at 8:30, slurped down some coffee and inhaled a bagel, and gave my talk on Spans in Quantum Theory at 9:30.

I hate giving talks when sleep-deprived or jet-lagged. I can still fight my way through them, but the fine-tuned sense of "nailing it" — of saying everything the best way, with drama and a sense of humor — is gone. Luckily, this time, despite the punishing trip, I was feeling quite peppy when I gave my talk, perhaps because I'd slept a lot on the plane. So, I nailed it, finished early, and enjoyed a nice long question-and-answer period afterwards. Later that day I sort of crashed.

The conference was funded by the Templeton Foundation. It was one of a series of conferences at Princeton this week, whose ostensible purpose was to honor the 75th anniversary of von Neumann's book *The Mathematical Foundations of*

Quantum Mechanics, but were also timed around a Templeton Foundation board meeting at held at Princeton. The Templeton Foundation is controversial among scientists for its support of religion and especially its funding of the the Discovery Institute, which promotes "intelligent design". However, in my indirect dealings with them — both at this conference and in my work for the Templeton-funded Foundational Questions Institute — I've never heard anyone even mention religion.

I hope to write more about this conference in This Week's Finds.

October 8, 2007

Today Thomas Riepe passed on an interesting article about a World Bank study on the "intangible capital" that citizens of rich countries have access to:

- Ronald Bailey, The secrets of intangible wealth, *Reason Magazine*, October 5, 2007.

Bailey asks:

> When a Mexican, or for that matter, a South Asian or African, walks across our border, they gain immediate access to intangible capital worth $418,000 per person. Who wouldn't walk across the border in such circumstances?

The World Bank study is here:

- *Where is the Wealth of Nations?*, The World Bank, Washington, D.C., 2006.

October 9, 2007

At the end of my June 28th diary entry I mentioned how Craig Venter's team had succeeded in giving a bacterium a complete genome transplant. I said "Of course this is 'cheating' in at least two senses: it uses an already functioning cell, and it uses the genome of an existing bacterium. The fun will start when they put in a novel, human-crafted genome."

The fun is starting! Mike Stay points out this article:

- Ed Pilkington, I am creating artificial life, declares US gene pioneer, *The Guardian*, October 6, 2007.

The key part:

> The Guardian can reveal that a team of 20 top scientists assembled by Mr Venter, led by the Nobel laureate Hamilton Smith, has already constructed a synthetic chromosome, a feat of virtuoso bio-engineering never previously achieved. Using lab-made chemicals, they have painstakingly stitched together a chromosome that is 381 genes long and contains 580,000 base pairs of genetic code.
>
> The DNA sequence is based on the bacterium *Mycoplasma genitalium* which the team pared down to the bare essentials needed to support life, removing a fifth of its genetic make-up. The wholly synthetically reconstructed chromosome, which the team have christened *Mycoplasma laboratorium*, has been watermarked with inks for easy recognition.
>
> It is then transplanted into a living bacterial cell and in the final stage of the process it is expected to take control of the cell and in effect become a new life form. The team of scientists has already successfully transplanted the genome of one type of bacterium into the cell of another, effectively changing the cell's species. Mr Venter said he was "100% confident" the same technique would work for the artificially created chromosome.

Of course the new chromosome has not been designed *ab initio*, but it's very sensible to start by modifying an existing

chromosome. Let's see if they're right about it having all the "bare essentials needed to support life". They may have left something out. People may be just figuring out why we have an appendix, for example.

October 10, 2007

I bumped into a poem by Rumi that sent chills up my spine:

If you want what visible reality
can give, you are an employee.

If you want the unseen world,
you are not living your truth.

Both wishes are foolish,
but you'll be forgiven for forgetting
that what you really want is
love's confusing joy.

These starlings also send chills up my spine — though only metaphorically speaking:

And, the new Radiohead album is out: *In Rainbows*. You've probably heard about it, since everyone is talking about it — but some of you, my friends, are far removed from the whirl of pop culture, so I thought I should mention it.

It's caused a big stir, since it's available online for a price you get to choose yourself, plus a $1 service fee. Right now their website is so busy I can't get through. They're not saints. They're doing it for good economics reasons: and they'll make a lot of money off this, as well as creating a lot of good publicity, which will help them when signing their next contract with a record company (if they choose to do that). But, I like the idea a lot.

October 11, 2007

I'm not sure I believe this story Mike Stay pointed me towards. It reminds me of variou episodes of unreliable Russian and Soviet science — like polywater, Kirlian photography and those Soviet military projects to harness paranormal abilities. But it'll be really cool if it's true:

> Heidi Ledford, Hungry fungi chomp on radiation *Nature*, May 23, 2007.

I assume you know about the Chernobyl disaster. This article says Ekaterina Dadachova and Arturo Casadevall of the Albert Einstein College of Medicine have found two species of fungi in the entombed Chernobyl reactor — *Cryptococcus neoformans* and *Wangiella dermatitidis* — that contain lots of melanin. Melanin is a name for a variety of chemicals, including those that give you a tan: they protect against ultraviolet light. However, Casadevall and Dadachova claim these fungi use melanin to obtain energy from gamma rays, much as plants obtain energy from light using chlorophyll!

The actual paper is here:

- Ekaterina Dadachova *et al*, Ionizing radiation changes the electronic properties of melanin and enhances the growth of melanized fungi, *PLoS One*.

As far as I'm concerned, the key finding is this:

> Melanized *Wangiella dermatitidis* and *Cryptococcus neoformans* cells exposed to ionizing radiation approximately 500 times higher than background grew significantly faster as indicated by higher CFUs, more dry weight biomass and 3-fold greater incorporation of 14C-acetate than non-irradiated melanized cells or irradiated albino mutants. In addition, radiation enhanced the growth of melanized *Cladosporium sphaerospermum* cells under limited nutrients conditions.

They're getting energy from radiation! Hmm — could it be not the gamma rays themselves that do the job, but instead lower-energy radiation (X-rays or ultraviolet) produced by or accompanying the gamma rays?

Let's see. They zapped the fungi with radiation from a caesium-137 source, which puts out 662 keV gamma rays. That's a wavelength of only 2 picometers, while hard X-rays go down to 10 picometers. So, these are honest gamma rays. People even use them to sterilize things! But, I don't know what such gamma rays do when they hit the culture or container the fungi are in. Maybe they produce lower-energy radiation.

They also tried infrared, visible light, and ultraviolet, and they all helped the fungi grow about equally well! So, maybe melanin gets easily ionized by all sorts of radiation — I don't know the physics of melanin.

Lisa went to Shanghai tonight... she'll be gone for about a week.

October 13, 2007

Did you hear about the meteorite that landed near a small town in Peru on September 15th? The reports are quite confusing and contradictory. People saw something fall from the sky, ran over and found big hole full of water.

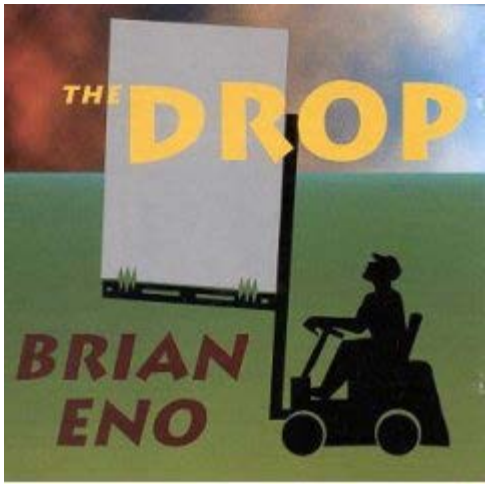
Some say the water was boiling at first. Some say the cause was a meteorite, while others say it was an American satellite or just a pre-existing lake. Some say that hundreds fell ill from strange fumes, possibly from arsenic in the water. Others say this was a case of mass hysteria, or that only a few people got sick.

An early BBC report was pretty dismissive:

- Scores ill in Peru 'meteor crash', *BBC News*, September 19, 2007.

However, later reports seem to confirm that a meteorite indeed hit the earth — a rocky meteorite called a chondrite, in fact. You can see a video of the scene.

(I thank James Dolan for telling me about this meteorite. I didn't hear about it at the time.)



It took me a long time to love Brian Eno's album *The Drop*. I just realized I actually do.

Eno is always pushing the limits of music. Unfortunately this means that by the time you've learned to enjoy one thing he does, he's off doing something else. On *The Drop* he forsook all the rich, subtle textures some of his music was known for. In 1997, he went to live in St. Petersburg for a year and made music in his apartment. He strippped the

technology down to some cheap, almost cheesy-sounding synthesizers and drum machines. And, he played some weird melodies that don't quite sound like anything you've ever heard — a bit jazzy, but definitely not jazz, a bit repetitive and minimalist, but not in any style we're accustomed to. He called it "unwanted jazz", or "sour piano". When I first heard this album it seemed like a cheap imitation of the Eno I'd come to expect. But by now, I know what he's up to.

The reviews on Amazon nicely capture his fan's reactions, which were my reactions too. Hans Stoeve writes:

> He who expects never receives. This old saying has been haunting me for awhile now and I can't help but think this is appropriate for this release. I have listened to *The Drop* quite a number of times now, and I'm left with an empty feeling when I hear it. Now don't get me wrong. Eno is THE reason why I am on the air, but maybe it's a good thing to look at your old ghosts from time to time and admit that either your tastes have changed in a big way over the years (which they certainly have), or Eno simply hasn't come up with anything new that is worth while. What I hear are fragments of Eno's past, fragments that include *Neroli* and memories of *Spinner* and *Shutov Assembly* also. As well as *Low* and *Heroes*. This is almost an attempt at some sort of jazz, but it's a sort of jazz you can't quite pinpoint and consequently you're left feeling confused. Maybe this is the purpose of this recording. Eno has for a long time been at the forefront of modern music. The man is a pioneer and a genius in my book and listening to this record raises many questions for me like: what is the purpose behind this? Where is Eno heading? Is he quietly having a laugh at us for taking it all so seriously?

Jesse Melat writes:

> With all his astounding, influential and historic albums that the man has released, it's a mystery as to how this came about in his body of work. Or is it? *The Drop* is unique in the musical territory it charts; there isn't anything on Earth that sounds quite like it, but it just seems... dumb in some places. "Belgian Drop" really *does* sound like an amateur noodling with a Casio.

These reactions are perfectly valid, but they haven't worked their way through to the deeper layers of the music, and they seem to have forgotten that Eno's gift was always for making music that sounds bad at first but great *eventually* — music that breaks rules, but follows new rules that you have to discover. So, his old stuff always sounds better than his new stuff... but not because he's getting worse.

I think Kenneth Burstall come closer to what I'm trying to say here:

> at first listening a nasty and very small CD. it seems to have no relation to any of enos previous work and gives the impression that he had a really bad headache during recording and decided to transmit it. by laser. directly to you. that's why i like it - in this country (the uk) eno is fast becoming a national treasure (consultant to big projects, talker about future things etc). it's nice to be reminded that he's essentially an anarchist and he will bite you if you get too close. spiky, unsettled music. you may not like it, but it likes you in a concerned but faintly sinister way. now stop crying.

Right now Eno has an art exhibition near San Francisco, called 77 Million Paintings. I should have gone up to see it, but I'm too lazy. And, someday it may appear on my TV.

October 15, 2007

It rained the night before last! And today it was foggy, moistening the plants! If you don't live around here, you don't know how big a deal this is. The southwest US is in an 8-year drought, and southern California has been very dry this year. We get water from northern California and from the Colorado River, and both these sources are planning to cut back how much they supply us, by 25% or so. The state government is struggling to build new dams or other ways of storing water, but the Democrats and Republicans have competing plans, and the legislature is in gridlock:

- California grapples with water shortage, *Morning Edition*, National Public Radio, October 15th, 2007.

The little rain we just had won't help much. But, it's nice to see. And it's very nice to be able to turn off the sprinkler system in our garden for two days in a row!

The garden is beautiful these days — I'll have to take some photos. I just had some soup made from an enormous kale plant we harvested.

October 17, 2007

Clearing through old papers I found scrawled notes on a dream I had years ago; I can't remember when. I used to write down my dreams a lot when I was in college and grad school; gradually I slacked off, but this one comes from much later.

> Riding through bog on horseback we spot two parrots ahead avoiding us. Someone running with us decides to chase it down. He can run superhumanly fast and keep up with a gallop. The parrot keeps flying ahead, looking back, pausing. "If we tire it and chase it down we can make it grant us a wish." We chase it until it tires and falls from the sky into a pond. The man lunges after and grabs it.
>
> Then the parrot's husband appears to defend its mate! It dives at me and threatens to peck and bite me. I decide to catch it, so I resist its attacks and tire it until exhausted it gives up and I catch it. Then we are to extract a wish.
>
> We go to the parrot's home and they are people, beautiful people, and there is a third beautiful woman. I realize we have done something terribly wrong and we will be cursed by the parrots for what we have done, and I tell everyone in the party to apologize. Even this will not be enough, so I tell everyone to give the parrots a gift of what they hold most dear.
>
> Everyone does and then I realize I must too. I take a brooch of stones strung together by beads, and take it apart, to remove the center stone, a gift from Lisa, which I hold most dear. As I do beads and stones fall to the ground, and they are precious but I can't trifle to try to save all of them. I give the stone to the parrots, and then kneel sadly to gather the stones and beads and string them together. Everyone watches me and tries to help me find a new way, a new pattern, but without the center stone it is a bit pathetic. Someone in my party says that it looks much worse without the stone Lisa gave me and I say "Of course, you fool! That's the whole point!"
>
> I am very regretful and I realize the only way I'll ever profit form this is that maybe if there is ever a forest fire the birds, who have heard of us from the parrots, will bear me aloft and save me.
>
> Or (I picture this) when Lisa and I have a child, and there is a forest fire, and the child is lost, and we cannot save it, the owls will fly away with it and save it and leave it in a secret place by the coast. Lisa and I will despair and look everywhere (with little hope) for the child, and then find it and know the owls have saved it.

October 18, 2007

Todd Trimble pointed me to a interesting book:

- Eric Tamm, Robert Fripp.

I've been a fan of Robert Fripp's guitar work ever since I heard *Exposure* back in high school.

I found the most illuminating section of this book to be chapter 10, on Tamm's experieces in the guitar school Fripp founded. A quote:

> Fripp told the story of his dozing in a friend's Chelsea loft in the early 1980s. He leapt from the sofa with a

> sudden realization. "Music stands at the door and knocks," he said. "One day we hear it faintly, but by the time we get through all the junk on our floor, it is gone. So we clean up the mess. Next time, we answer the door and meet it, but the house has such a stench that it goes away. Finally we set our house in order, because..." and here Fripp did one of his long pauses, turned his eyes down to the mid-foreground, and grew visibly grave and saddened ... "because we just couldn't bear for it to go away and not return," these last words pronounced in a quiet, slightly wavering voice. It took him a few minutes to recover from the thought; he appeared disoriented and shaken.

For music, substitute whatever your true calling may be.

October 20, 2007

A peaceful, slightly lonely weekend without Lisa, who'll return (imshallah) from Shanghai very late tomorrow night. I went to the gym today for the first time in *way* too long, and feel much better for it. Then I continued trying to finish my paper A prehistory of n-categorical physics, for the conference proceedings I'm editing with Peter May. I'm having a lot of trouble trying to pack all my thoughts on this subject into one place — or figure out which thoughts to put in, and which to leave out.

So, it's been tough weekend, though very peaceful. In the afternoon I goofed off a bit composing some electronic music, which didn't turn out well — perhaps because music doesn't want to be used as a form of procrastination.

I also wrote a reply to Sean Carroll's challenge for people to say what "God" means. Normally I avoid public pronouncements on religion, since they tend to be tacky. But I think this challenge misses the point in a fundamental way: it pushes the whole discussion down to a debased level (which of course is the level where most public discussions of religion reside). And, I felt an urge to say why... which I will probably regret tomorrow. But here's what I wrote, mildly edited:

> "God" means many things to many people. But to me — just me — "god" is a desperate attempt to take the awesome inexhaustible mystery of the universe — the fact that *the deeper you go in any direction, the more you find* — the blinding beauty and heart-rending tragedy of it all — and package it into a kind of "thing".
>
> In my work I often experience this sense of awesomeness, of depths that pass beyond my understanding. In fact, that's what I live for. But I don't find it helpful to package it into a "thing". After all, this strange "thing" can't be a normal sort of thing in the universe, so it's easy to conclude it's either in some other universe (say, "heaven"), or doesn't exist at all, or exists in some very tricky sense. But all these alternatives are just distractions, as far as I'm concerned.
>
> So for me, saying that god "does not exist" is just as silly as saying that god "does exist". They both take me further from the mystery of the universe into the realm of petty squabbles.
>
> But, if we imagine that certain — not all — people talking about "god" are actually trying to convey an experience of the hair-raising awesomeness of reality, its shattering majesty, some things they say might make more sense. To take a few examples just from Christian theology:
>
> *No one has seen or can see God.* (John 1.18)
>
> *He lives in unapproachable light.* (1 Timothy 6:16)
>
> *The true knowledge and vision of God consists in this: in seeing that He is invisible, because what we seek lies beyond all knowledge, being wholly separated by the darkness of incomprehensibility.* (Gregory of Nyssa)
>
> *God is infinite and incomprehensible and all that is comprehensible about Him is His infinity and incomprehensibility.* (John of Damascus)

These examples were all lifted from an Orthodox website on apophatic theology, known more generally (among Christians anyway) as negative theology. Negative theology is a pretty good way to convey the mystical experience that underlies some of the less rotten aspects of religion — though keeping cool and not talking about it at all may be wiser. "Whereof one cannot speak, thereof one must be silent."

I chose Christian examples because the Anglocentric "culture wars" Carroll's blog are engaged in involve Christianity more strongly than other religions: they're largely a political battle between secular humanists and fundamentalist Christians in the United States (though Dawkins is British). But, I have no special affinity to Christianity, and if I were just looking for "negative theology" quotes, it'd be easier to find them elsewhere, often in traditions where "theology" is not even a concept. For example:

The way that can be trodden is not the enduring and unchanging way.
The name that can be named is not the enduring and unchanging name.
- Tao Te Ching

Santa Ana winds are blowing into town tonight. The broom hanging on the wall outside keeps knocking...

October 21, 2007

The Santa Ana winds are still blowing, and fires are spreading throughout Southern California. The year-long drought, the worst in recorded history, has dried all the brush to make perfect kindling. Now we have winds blowing at speeds exceeding 80 kilometers per hour (50 mph).

The biggest fires are west of us, near the coast:

Ventura County fires as seen from the towns of Piru and Lake Piru –
photo by Karen Loberg, Associated Press

Malibu, California – photo by Stephen Osman, LA Times

So far there are no fires here in Riverside County, and the skies looked blue today except for windblown dust near the horizon. But, there are now three fires in neighboring San Bernardino County. Quoting the *Riverside Press-Enterprise*:

> The largest was 300 acres near Interstate 15 in Fontana. One vacant home was destroyed and 500 homeowners were told they should evacuate. The second blaze had burned about 30 acres near the junction of Interstate 15 and 215 in Devore. Five to 10 homes were threatened. Another fire had chewed through 35 acres south of the highway junction and winds were blowing between 50 mph and 80 mph, officials said.

Our house has a pretty good bunch of iceplant on the hill behind it, which is designed to protect us when the dry parkland in back catches on fire. But, we've got a wooden trellis out back. So, I'm always on the alert when these Santa Ana winds come — and especially this year, with everything bone-dry.

I'm happy that the world *in general* is getting wetter as global warming proceeds. This won't cheer up residents of Bangladesh. I'm just happy because *around here*, it's not true — so I sometimes get the horrible feeling the whole world is drying out, burning up and turning into a desert. The American southwest is getting drier... but in general, more warmth means more water vapor, so more rain.

> **Fire's Fury Unlikely to Wane as Dangerous Conditions Intensify**
>
> Mark Muckenfuss
> Riverside Press Enterprise, October 21, 2007
>
> [...]
>
> In fact, of the top 10 largest fires in California's recorded history, seven have taken place in the past 20 years. The most recent was this summer's Zaca Fire (240,000 acres) east of Santa Barbara.
>
> **Contributing to Troubles**
>
> Experts say several factors are involved. Decades of fire suppression have left forests overgrown. In earlier times, such growth would have been limited by periodic low-grade fires. In recent years, efforts have been made to reduce the excess vegetation by letting remote fires burn and conducting controlled burns, but

neither strategy is practical in Southern California's densely populated mountains.

Climate change has increased the length of the fire season, drying fuels out earlier, keeping them dry for longer and leading to fires of greater intensity. The periodic drought cycle in which the region finds itself has exacerbated those conditions, as has a bark beetle infestation that's killed millions of trees.

With increasing numbers of homes bordering wildland areas, when a fire does break out, more resources are focused on saving structures, making it harder to contain other areas of the fire.

There is some disagreement as to the degree of importance of these factors, but most experts agree that each plays a part.

Richard Minnich is an earth sciences professor at UCR. He says environmental factors are much more important than the efforts of firefighters. "We're good at putting out little fires," Minnich says. "Once a fire is large, all that knowledge has trivial influence. We have no ability to control large fires any more than we can control earthquakes."

It wasn't until a cold front moved in during the fires of 2003, bringing rain and snow, that firefighters were able to contain the blazes.

Battling Big Blazes

Minnich says few gains have been made in fighting large wildland fires. "In practice, I don't see any difference between now and 1950," he says, "except that you have bigger and bigger planes and the fires are getting bigger." The problem he says, is the forest, which was once able to regulate itself, has an overabundance of vegetation.

"There is some historical evidence to support that Southern California used to look like what we see presently in Baja (California)," says Minnich. There, the chaparral environment supports fewer and more widely spaced trees.

Because of periodic natural fires, he says, the terrain is a checkerboard of areas with varying degrees of vegetation. When a fire does start in an area with sufficient fuel, he says, it usually burns itself out once it reaches an area with less vegetation. This can take awhile. Historic data indicates that before the 20th century, fires in Southern California would sometimes burn for months before extinguishing themselves, Minnich says. Back then, when there were few homes in the foothills and mountains, such fires weren't a problem. But the San Bernardino National Forest is now home to 100,000 residents and is the country's most densely populated forest. The presence of so many homes has necessitated policies of fire suppression. Populated areas limit the ability of fire managers to conduct controlled burns that would thin heavy fuels and, when fires do erupt, protecting those homes presents firefighters with greater challenges.

People, and the way they have changed the local landscape, are the greatest factor in bigger fires, says Stephen Pyne, a professor of American studies at Arizona State University and an expert in fire history. "I think there is a tendency to attribute to global warming the increase in fires," Pyne says. "It is a precondition, but it is not enough to explain it.

"We know that we broke the cycle of (natural) fires by introducing livestock and by removing American Indians who, the evidence suggests, burned very widely," he adds.

Recent removal of more than 1 million trees killed by a bark beetle infestation in the San Bernardino mountains have helped thin the vegetation. But Minnich says it is not nearly enough. "The people in Lake Arrowhead and Idyllwild need to start thinning seriously," he says. "They need saw mills in both places." Lumber processing facilities are operating in the forest, but they primarily deal with trees killed by the bark beetle. Minnich believes commercial lumber mills are needed to turn live trees into lumber.

Some experts argue that climate change is the primary driver in the phenomenon of larger fires.

Connie Millar studies climate and ecology for the U.S. Forest Service. "I think the underlying feeling within the firefighting community (is) the growing realization of the increasing role of climate," Millar says.

Climate Shifts

A study published last year in Science magazine connected earlier snowmelt and the later onset of winter weather to an increase in the size and intensity of fires. "It was finally the coming out of the closet, as it were," says Millar. Before the study, she says, "The agency had been more in the mode of assuming land-use changes were the primary (factor)."

Tony Westerling, professor of environmental policy at UC Merced, co-authored the study with Tom Swetnam, a watershed management professor at the University of Arizona. Swetnam is scheduled to appear tonight in a "60 Minutes" story on global warming on CBS.

The two scientists looked at historical data on fires and climate. They defined two periods, 1970-1986 and 1987-2003, and found the number of fires in the second period was four times what it was in the first and a six-fold increase in the number of acres burned. The researchers also found that since 1986, the length of the active fire season — when fires are actually — increased by 78 days.

Now it's 9:25 pm and there about 13 fires in Southern California. A nasty one is overrunning the city of Irvine, on the coast:

A new one just started up in Ontario, about 50 kilometers from my house over in San Bernardino county.

I'm hoping the high winds don't stop Lisa's flight from landing in Los Angeles airport — she's supposed to arrive there around 9:50 pm.

9:30 pm. Yay! Lisa called; her plane has landed.

In the town of Canyon Country there's a fire 5000 hectares in area (12,500 acres), and wind-blown embers are flying up to 3 kilometers. The winds are picking up, and they'll blow even faster tomorrow — with gusts up to 130-145 kilometers per hour (80-90 mph)!

Luckily, from all these fires, only one person has died so far.

October 22, 2007

It smells smoky outside, and I can see the haze. The wind died down overnight, but now it's picking up a bit.

You can see a map of the fires here.

None around here yet, luckily.

Firefighters trapped on a hill in the Santiago fire in Orange County –
photo by Karen Tapia-Anderson, LA Times

October 23, 2007

It's not windy here in Riverside, and there are no fires. The air is a bit smoky, but that's the only sign of the huge battles going on nearby.

Firefighters on the run in Castaic –
photo by Al Seib, LA Times

Couple surveying the remains of their house, destroyed by the Santiago fire –
photo by Allen Schaben, LA Times

October 24, 2007

As winds lessen throughout Southern California, firefighters may start to get the upper hand. The worst is probably over now. But, the Santiago fire (in Orange County, near the coast) and the fire near Lake Arrowhead (up in the mountains north of us) remain out of control.

The fires have been worst down in San Diego, where the Witch Fire has forced evacuations of almost a million people.

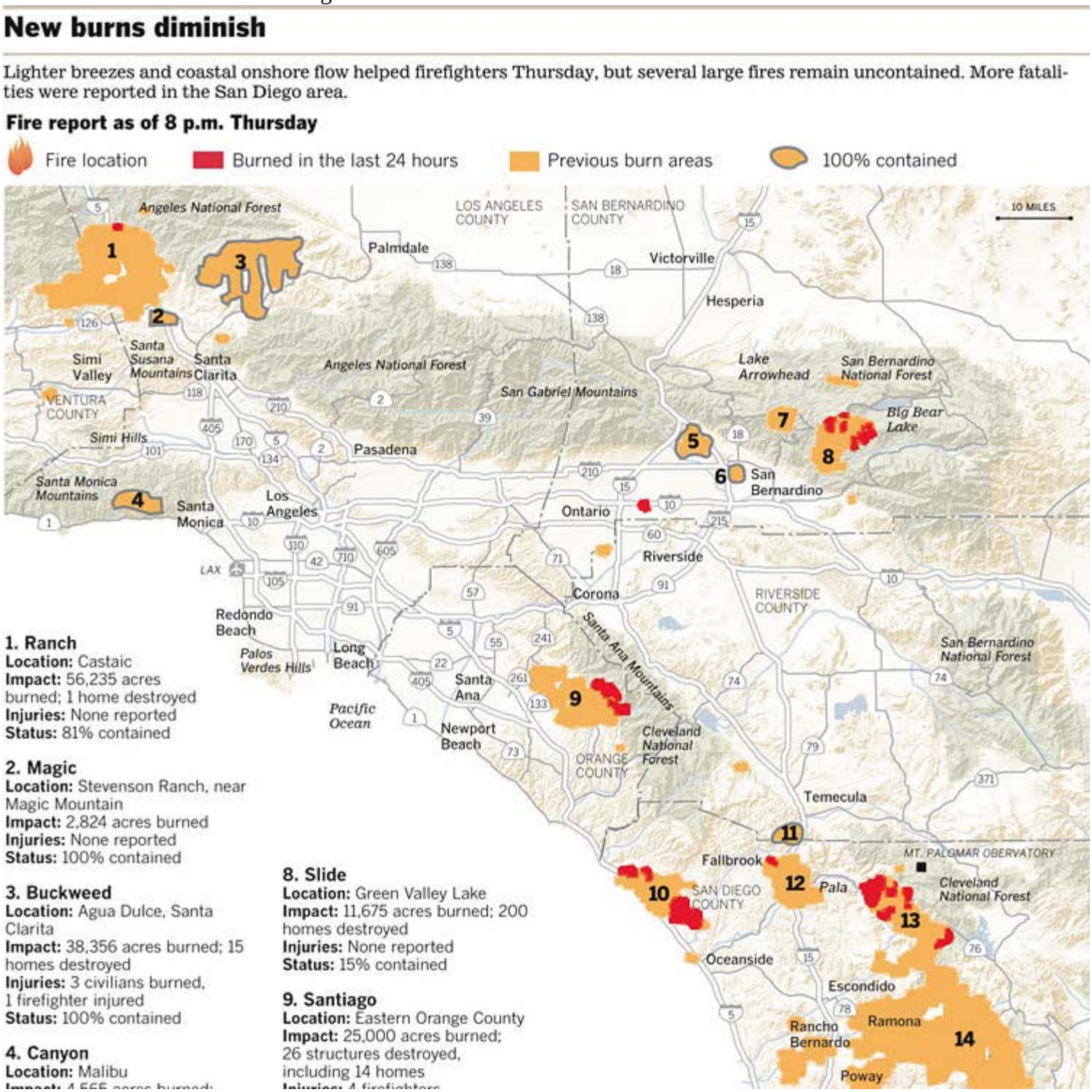
Amazingly, there have been no fires here in Riverside County. It wasn't windy at all yesterday. Now the breeze is picking up. I smell smoke, but the sky is mostly blue.

On a wholly different note: a while back Lisa spoke to the Rene Lysloff, who runs the gamelan here at UCR. I've been doing some electronic music lately. He suggested the WinChime program for making random wind chime music, and the Ableton Live and Sound Forge software for serious recording. I'll have to check these out...

Guess what's the biggest segment of the Italian economy.

October 25, 2007

Here's the situation as of this evening:



Impact: 4,565 acres burned; 6 homes, 1 commercial structure and 1 church destroyed; 9 homes damaged
Injuries: 3 firefighters
Status: 100% contained

5. Martin Ranch
Location: Near San Bernardino
Impact: 140 acres burned
Injuries: None reported
Status: 100% contained

6. Cajon
Location: Devore
Impact: 250 acres burned
Injuries: None reported
Status: 100% contained

7. Grass Valley
Location: Near Lake Arrowhead
Impact: 1,100 acres burned; 113 homes destroyed
Injuries: None reported
Status: 70% contained

Injuries: 4 firefighters
Status: 30% contained

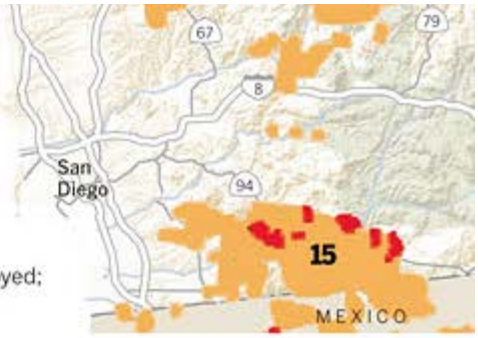
10. Ammo/Horno
Location: Camp Pendleton Marine Base
Impact: 15,000 acres burned; evacuations ordered
Injuries: None reported
Status: 50% contained

11. Rosa
Location: Temecula
Impact: 411 acres burned
Injuries: None reported
Status: 100% contained

12. Rice
Location: Near Fallbrook
Impact: 9,000 acres burned; 206 homes destroyed; 35,000 households evacuated
Injuries: 1 firefighter
Status: 40% contained

13. Poomacha/Mt. Palomar
Location: Northeastern San Diego County
Impact: 38,500 acres burned; 60 homes destroyed; communities along California 76 evacuated
Injuries: 12 firefighters
Status: 30% contained

14. Witch
Location: Poway
Impact: 197,990 acres burned; 1,266 structures destroyed, including 1,061 homes;
Injuries: 2 civilians dead, 22 firefighters injured
Status: 30% contained



15. Harris
Location: Southern San Diego County
Impact: 84,000 acres burned; 97 homes destroyed; 1,500 homes threatened; 4,500 evacuated
Injuries: 5 dead, 33 injured, including 12 firefighters
Status: 20% contained

Sources: Google Earth, various fire agencies. Graphics reporting by JULIE SHEER, RONG-GONG LIN II, ANDREW BLANKSTEIN AND RUBAINA AZHAR

Los Angeles Times

October 27, 2007

We had David and Michelle Scharffenberg over for dinner. They live up near Lake Arrowhead, between two of the big fires, and that whole area has been evacuated, with police preventing people from driving back up. Their two cats, Noggin and Newton, are stuck up there.

Amazingly, it *rained* a little this evening! Not much, just a drizzle, but it's a great change. On the other hand, the "onshore flow" (wind coming from the sea) is blowing smoke back here, and the Santiago fire is burning right up to the Riverside county line, so the air is much more polluted here now.

October 29, 2007

Yesterday was hot and dry, but today it's cloudy again with a chance of *rain*.

For my November 2007 diary, go here.

In the end, global warming presents the greatest test we humans have yet faced.... It's our coming-of-age moment, and there are no certainties or guarantees. Only a window of possibility, closing fast but still ajar to let in some hope. - Bill McKibben

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home

For my October 2007 diary, go here.

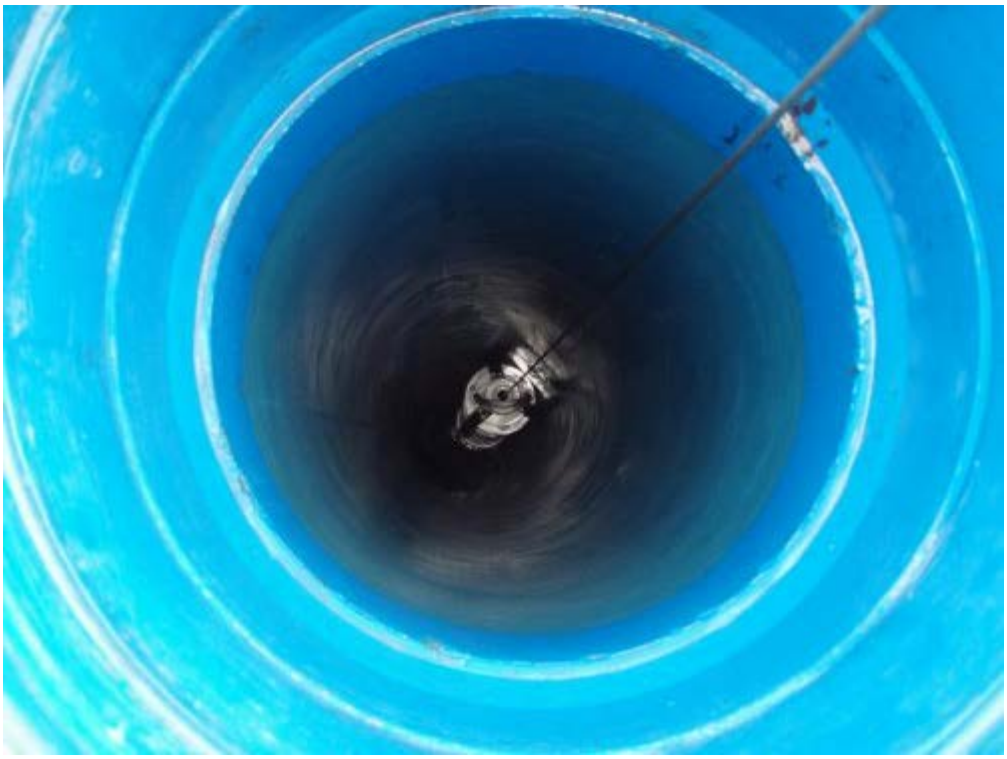
Diary - November 2007

John Baez

November 4, 2007

A cool story — downright chilly, in fact:

- David Talbot, Measuring the polar meltdown, *Technology Review*, November/December 2007, pp. 54-59.



Next summer, at a base in northern Greenland, scientists hope to drill an ice core 2500 deep, all the way down to the bedrock. This base is called NEEM, short for "north Greenland Eemian" — and near the bedrock, they hope to find a 120-meter-thick layer of ice from the Eemian interglacial. This was the warm period right before the last ice age, between 130,000 and 115,000 years ago. During the Eemian, Greenland was between 7 and 8 °C warmer than now, and sea levels were 3-5 meters higher.

This may shed light on our present plight. Right now, Greenland is melting a lot faster than had been expected, thanks in part to streams flowing through cracks in the ice. In Helmheim, on the east coast, the glacier flow has sped up 60% from 2000 to 2005. A bit further north, in Kangerdlugssuaq, it's tripled in speed during that time. Over on the west, it's doubled in speed from 1996 to 2005. The melting of Greenland is now causing sea levels worldwide to rise more than half a millimeter per year. We can expect that rate to keep increasing.

This year's IPCC (International Panel on Climate Change) report predicts that the sea level will rise between 18 and 59 centimeters this century. But, they couldn't provide an upper bound. Eric Rignot of NASA believes that with the accelerating flow of glaciers in Greenland and Antarctica, we should expect over a meter of sea level rise by the century's end.

November 5, 2007

Last Wednesday I spent a night at my folks' house in Great Falls, Virginia. Then I drove down to Harrisonburg and gave two talks at James Madison University in Harrisonburg — one on global warming and one on where we stand in fundamental physics. On Friday I drove back to my folk's place.

It was fun driving from Great Falls to Harrisonburg and back — out from the suburbs, into the countryside, past the Shenandoah River, through the rolling foothills of the ancient, weathered Appalachians, into autumn woodlands. I'd never driven around this part of Virginia on my own, though my parents had taken me to some of these places when I was a kid: Luray Caverns, Skyline Drive...

Besides reminding me of my childhood, the trip reminded me of drives from Boston to Bard College in New York, where Lisa used to teach. Driving west along I66 is like driving west along the Massachusetts Turnpike, out of the city into ever more rural landscapes, with Washington DC replacing Boston. Driving south along highway 81 to James Madison University is like driving south along the Taconic to Bard. The same themes transposed to a southern key! It was like one of those dreams where you find a door you'd somehow never noticed, open it, and discover a hidden suite of rooms that eerily resembles the house where you grew up.

My father is now in a nursing home. He went there last month after suffering severe leg pains and spending some time in a hospital. We all visited him on Sunday — my mom, my sister and I. He spends most of his time in a wheelchair, though he can stand up with work, and his physical therapist is trying to get him back into using a walker. He's afraid of falling, which he has done several times. He has a heart defibrillator, and the doctor says it's saved his life several times. His memory is getting bad. My mother has done lot of work to make the insurance company pay for his stay at the nursing home. He'll probably spend the rest of his life there; they'll pay for two years of this. He is 86 years old.

It's all very sad.

He was in good humor when we visited him. I brought him a recorder — unfortunately a tenor, instead of a soprano — and also some jazz tapes. He listens to "Hot Jazz Saturday Night" once a week, and also other radio shows. He reads lots of magazines. He has a roommate who speaks Spanish, so he gets to practice his Spanish a bit.

But, it's still sad.

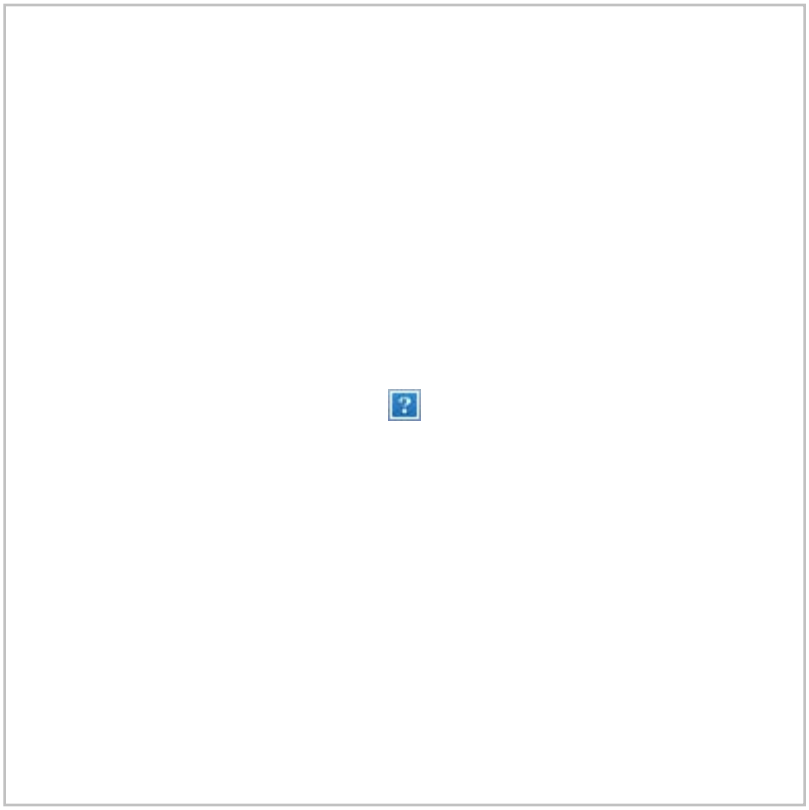
It must be terrible to lose a parent when you're young. But there's a subtler sort of bad feeling that comes from watching my parents age when I'm already middle-aged myself. (I'm 46: is that middle-aged?) In addition to worrying about them, I start noticing signs of my own decay that I might otherwise ignore. My memory, eyesight and hearing are gradually getting worse. I'm getting a bit more creaky and cranky. Sometimes I fail to understand — or maybe *refuse to understand* — what Lisa is saying, in a way that reminds me of the stubborn slowness of the elderly. Having kids is probably a good distraction from all this stuff: even though you're going downhill and getting dumber, your kids are growing up and getting smarter, which is nice. For some reason I've never heard anyone come out and *say* this is why they want kids. Some people admit this is why they want *grandchildren*.

November 6, 2007

My mom subscribes to Saudi Aramco World, a free magazine that's full of interesting articles about Arab and Islamic culture. As long as you bear in mind that it's funded by petrodollars and subtly pushes the Saudi agenda, there's a lot to be learned from this mag.

"Zillij" are the Islamic tile patterns you see in the Alhambra and elsewhere. I wrote about them in week247 after I heard that Islamic tilings with 5-fold symmetry are the earliest examples of man-made quasicrystals, long predating the work of Penrose. It's nice to see that this art is alive and well in Fez:

- Louis Werner, Zillij in Fez, *Saudi Aramco World*, May/June 2001, 18-31. Version with more photos available at *Ceramics Today*.



Zillij with 10-fold symmetry.
Photo by Peter Sanders/Saudi Aramco World/PADIA

Here's a quote:

> Today, private patronage is still the key to sustaining labor-intensive *zillij*, which—though an unusually expensive art form—is considered indispensable by Moroccans of all social and economic stations. Benslimane's clients range from Shaykh Zayed bin Sultan Al Nahyan, president of the United Arab Emirates, who owns several houses in Morocco, to businessmen and countless others of more ordinary means. New homeowners on even the most limited budgets often yearn for a traditional Moroccan reception room, or salon, which means *zillij* halfway up walls whose upper portions are finished by elaborately carved stucco and topped with an inlaid wooden ceiling—and if they can't afford all of it at once, it is commissioned piecemeal, over years.
>
> A typical job for a *zlayji* starts with a call from an architect whose client has asked for a mosaic panel measuring, let us say, two meters (78") square, to decorate a new home's salon. Any traditional design and color scheme are possible, but the space and its proportions impose certain overall constraints: A 50-point star, for example, needs room for its 24- and 12-point satellite stars, a common Islamic pattern that Burkhardt called "a shimmering planetarium, in which each line starts from a center and leads to a center."
>
> An encyclopedia could not contain the full array of complex, often individually varied patterns and the individually shaped, hand-cut tesserae, or *furmah*, found in *zillij* work. Star-based patterns are identified by their number of points—*'itnashari* for 12, *'ishrini* for 20, *arba' wa 'ishrini* for 24 and so on, but they are not necessarily named with exactitude. The so-called *khamsini*, for 50 points, and *mi'ini*, for 100, actually consist of 48 and 96 points respectively, because geometry requires that the number of points of any star in this sequence be divisible by six. (There are also sequences based on five and on eight.)
>
> Within a single star pattern, variations abound—by the mix of colors, the size of the *furmah*, and the complexity and size of interspacing elements such as strapping, braids, or "lanterns." And then there are all the non-star patterns—honeycombs, webs, steps and shoulders, and checkerboards. The Alhambra's interlocking *zillij* patterns were reportedly a source of inspiration for the tessellations of modern Dutch artist M.C. Escher.

Saudi Aramco World also lists some albums I might like, including:

- Tinariwen, *Amassakoul*. Electric guitar blues from Tuareg nomads from Mali who grew up in the 1980s in Libyan refugee camps. I've heard this album and like it; I need to get it.

- Yousra Dhahbi, *Rhapsody for Lute*. One of the few female oud virtuosos.

- Oriental Music Ensemble, *Emm el Khilkhal*. Four teachers from Palestine's National Conservatory of Music playing instrumental work from famous composers like Muhammad Abdul Wahab and the Rahbani Brothers (neither of which I know). Check out some samples.

November 7, 2007

I've always completely distrusted Pervez Musharraf, ever since he first took power in that coup back in 1999. His latest crackdown yet again makes his true colors clear. But he's doing a great job of maintaining US support by keeping us scared of what Islamic fundamentalists would do if he lost power. Meanwhile, Osama bin Laden lives happily on the Pakistan/Afghanistan border without ever getting caught. If he were caught, and the Taliban in Afghanistan defeated, the US wouldn't need Musharraf. So, he has to act like he's doing something to fight those guys, while not actually doing much — except whatever it takes to stay in power.

See my September 22, 2006 entry for more on Musharraf.

By the way: did you notice when the Israelis bombed that nuclear reactor in Syria on September 6th? The news was strangely quiet about it until much later, when some photos came out. You can read a lot of details over at GlobalSecurity.org — always a good place for news about shadowy military activity.

November 9, 2007

I sometimes think that many animals will keep from going extinct only if people can figure out a way to *own* them while keeping them in their native habitats... sort of like long-distance pets. The ultimate status symbol. Crass? Sure, but ownership has a wonderful way of bringing out our protective instincts.

I just got a booklet from the Worldwide Wildlife Fund that almost makes it seem this dream has come true. You can find a comparable thing online. It says:

To start your animal adoption, click on any of the animal pictures below.

Polar bears are the most popular — you can pay either $100, $50, or $25 to adopt one, depending on how much stuff you want to get in the mail. Next in popularity are those cute little meerkats, then pandas, then snow leopards, tigers, vampire bats (!?), and so on. Stingrays are near the bottom.

I think this shows the glimmerings of a great idea — but the problem is, the adoptions are purely notional. When you adopt a polar bear, there's not actually a specific polar bear that becomes "yours". The money is probably spent to do something good, but you don't get to see precisely how. You certainly don't get letters in the mail saying how your polar bear is doing, or photos, or a webpage where you can track its motions with a radio-transmitting collar. Only when something like that happens will adopting wild animals *really* catch on!

But when it does, you'll see people willing to fight for the survival of "their" animals... just like they do for pets now. I bet I would. And I'm not even completely crazy, like some people.

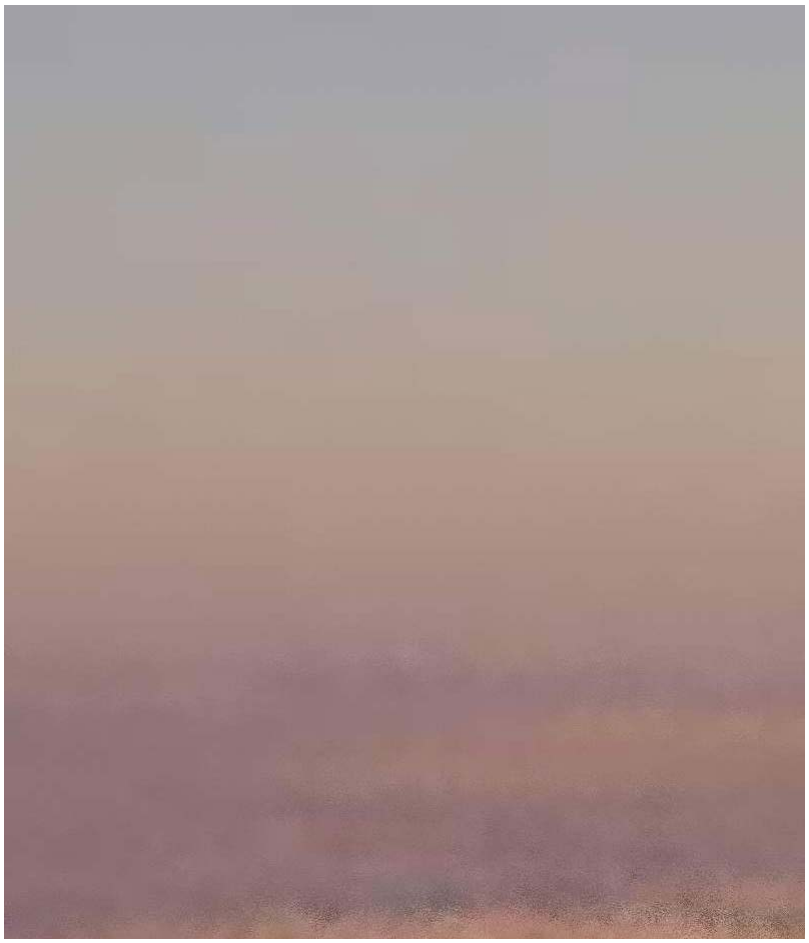
What happens when my adopted polar bear eats your adopted seal? Will you sue me? Let's cross that bridge when we come to it.

November 10, 2007

I should have been finishing my paper on the prehistory of n-categorical physics; I should have been writing a mission statement for *Eureka!*; I should have been working on my "Rosetta stone" paper with Mike Stay, about the relation between logic, proof theory, tangles and quantum theory.

I should have been doing a million things, but after Lisa and I did our weekly grocery shopping, I spent the day polishing three pieces of ambient music with a "glacial" theme: Kangerdlugssuaq, Sermersuaq, and pujuq kanirnartuq. The weird titles are an invitation for the listener to do some web browsing. The minimalist, cold sound of the pieces may seem threatening or downright annoying to most people, but I find it soothing.

I guess my soul just demanded it. I'm feeling a bit burnt out, sick of writing papers. It's very refreshing to lose myself in sound, and also a bit of visual art:



Unfortunately I wound up feeling guilty about the work that's piling up. That infuriates me. It makes me want to retire! But I just need to get my life in balance.

Part of my inspiration for this music is Thomas Köner's *Permafrost*, which I was able to obtain thanks to help from Jeffrey Morton. Jeff says my glacial music also reminds him of *A Peripheral Blur* by Plotkin & Spybey, and a number of things by Robin Storrey, a.k.a. Rapoon (a.k.a. Zoviet France). I'll have to check these out.

November 11, 2007

Someday I'll read this book:

- Colin Thurbon, *Shadow of the Silk Road*, HarperCollins, 2007.

The author, a crusty British explorer, walks along the old Silk Road. Some folks in small towns in Kyrgyzstan, Usbekistan and Tajikistan look back wistfully on the Soviet era, the rosiness of nostalgia mixing with the real pain surrounding the collapse of an empire. Meanwhile, China spreads its power.

Some of the most astounding food I've ever had was in a hotel in Malacca. Hotel food is usually to be avoided, but we couldn't find a restaurant... and it turned out *this* hotel food was magnificent. Nonya cuisine: a blend of Chinese techniques with Malaysian ingredients. I'd never experienced it before — it's *great*.

This article reminds me of that experience:

- Eric Hansen, The Nonya cuisine of Malaysia, *Saudi Aramco World*, September/October 2003, pp. 32-39.

A quote:

> Key ingredients include coconut milk, galangal (a subtle, mustard-scented rhizome similar to ginger), candlenuts as both a flavoring and a thickening agent, laksa leaf, pandan leaves (*Pandanus amaryllifolius*, or screwpine), belachan, tamarind juice, lemongrass, torch-ginger bud (*Etlingera elatior*), jicama, fragrant kaffir lime leaf (*Citrus hystrix*), rice or egg noodles and cincaluk — a powerfully flavored, sour and salty shrimp-based condiment that is typically mixed with lime juice, chiles and shallots and eaten with rice, fried fish and other side dishes. Even for Malaysians and some nonyas, cincaluk is an acquired taste.

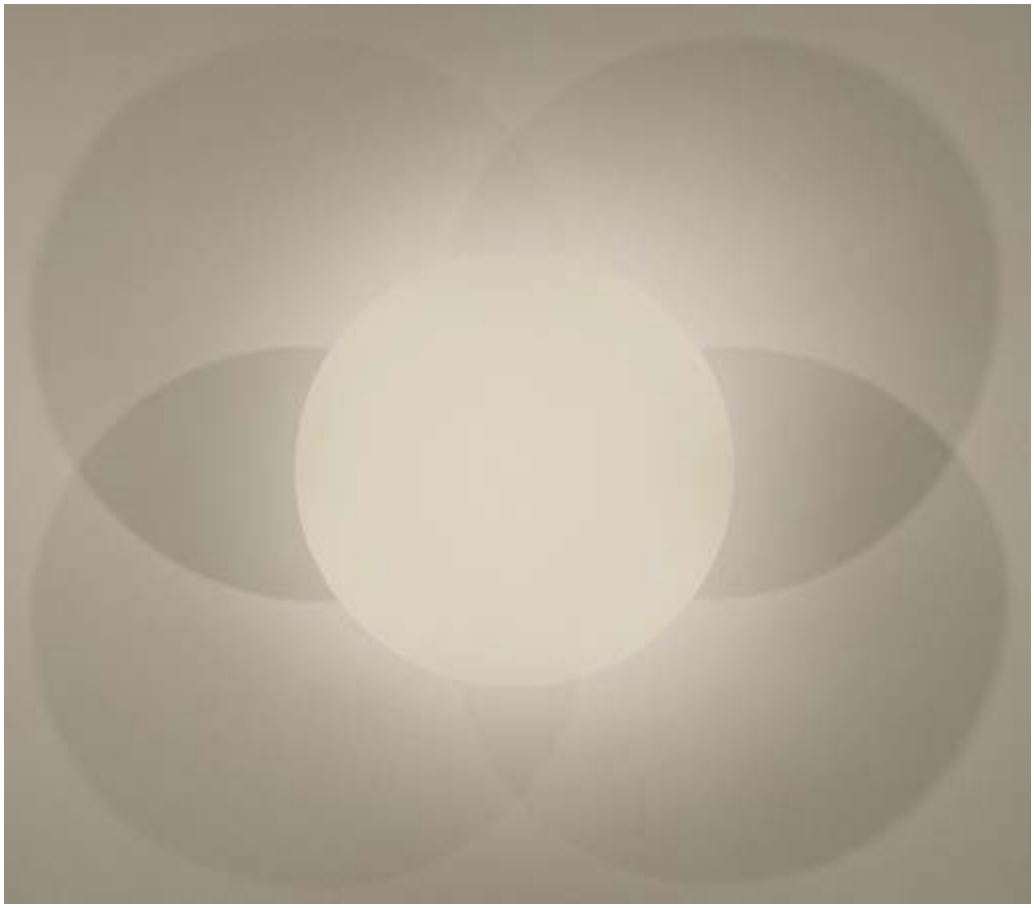
November 12, 2007

Good news! I've known Steve Wolfram for a long time, since my friend Bruce Smith used to work on optimizing the code of Mathematica. A while back I contacted him to see if I could create some music using his WolframTones cellular automaton program, modify it using my home studio, and make it freely available on my website. He liked the idea.

Last week a lawyer working for him got in touch with me, and today I got a draft of a contract that would allow this. It still needs some polishing: it doesn't clearly allow me to distribute this music on internet radio stations — or real radio stations, for that matter — and it holds me liable if other people violate the terms of the agreement, which could be a real nightmare. But, I think there's a real will to get something that'll work.

November 14, 2007

Robert Irwin is having a show at the Museum of Contemporary Art San Diego — a retrospective. Here's a piece of his at the Museum of Modern Art in New York:



The photograph doesn't do justice to the work, which is 3-dimensional. Our eyes struggle to understand what it really is:

> This untitled work is a convex, spray-painted disk held a foot or so out from the wall by a central post. Its subtle, tactile surface modulates delicately from center to edge, and it is softly lit from four angles, creating

> a cloverleaf pattern of shadow. The white center of the disk can seem to lie level with the white wall, so that the eye spends time trying to understand what it sees — what is nearer and what is farther, what is solid and what is immaterial light, or even light's absence.

I think it's hard to do really good visual art these days. At least, it's hard for me to find new visual art (painting, sculpture, installations) that moves me anywhere nearly as much as new music can. It's somehow hard to take into account everything about where we stand today when creating a work of visual art. I respect Irwin because he's thought hard about what art really is, and this informs his work.

Some quotes:

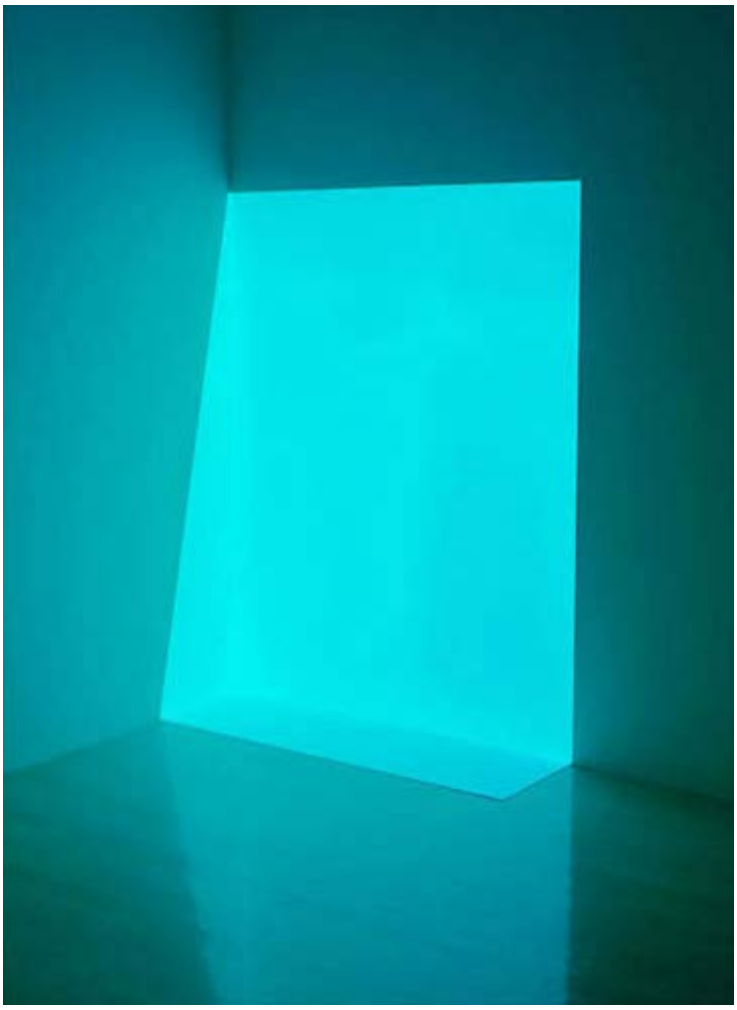
> To be an artist is not a matter of making paintings or objects at all. What we are really dealing with is our state of consciousness and the shape of our perception.

> Light has good physical properties for the question . . . of the substance of existence.... One of the things that I like about light especially is the degree of its actual physical energy and the minimalness of the identity: as bit information, it has almost none, and yet it has a very, very elaborate, very compound physicality to it. It is a terrific medium for the problem right now.

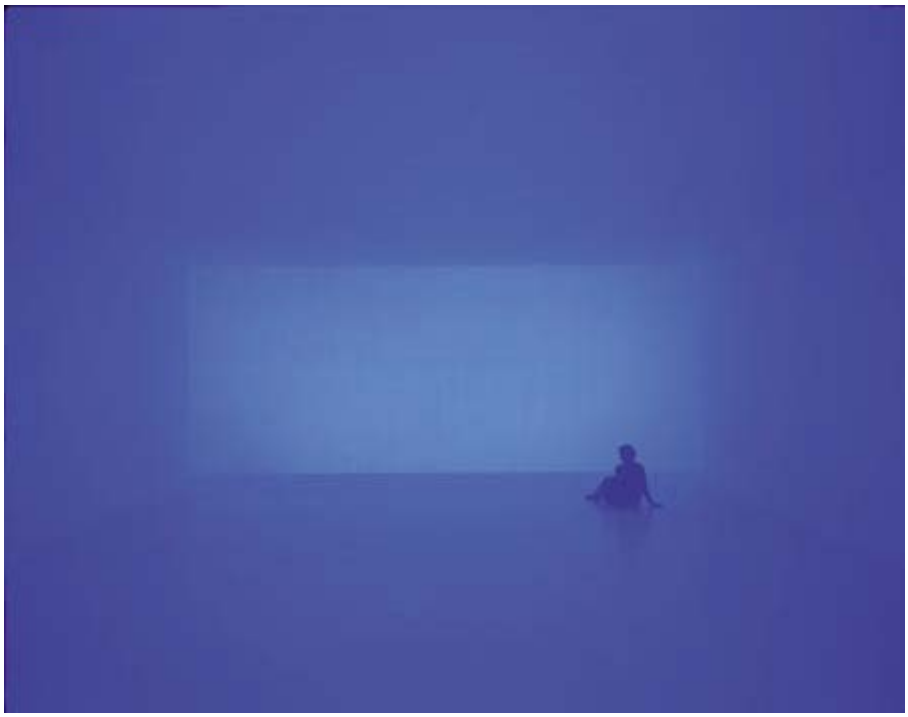
However, I'll need to see this show to see if I really *enjoy* his work in large doses. Some of the things he's done seem a bit clunky to me. Having great ideas about art isn't the same as making great art. It is, in fact, a different art.

The less an artwork has, the more everything about it matters. There are some wonderful old paintings full of gods, goddess, philosophers, soldiers tramping around, etcetera. These are fairly forgiving if you decide to stick a faun or a mermaid in the corner. But the above work by Irwin, called "Who's afraid of red, yellow and blue", is simply six 16×22-foot laquered aluminum panels. I haven't seen the real thing. Apparently the reflections of one panel on another create a subtle hall-of-mirrors effect. If I go to San Diego, I'll see what it's like. But in this picture the wooden floor, the complicated struts on the ceiling, and the doorway at right seem terribly distracting and unaesthetic. When there's very little to see, everything needs to be perfect.

There's another artist whose work explores similar themes, whose work I *really* want to see: James Turrell. Somehow his work always makes me happy, even just seeing pictures of it:



I don't want to just see pictures of it. I want to *walk into it and sit down* — that's how a lot of his pieces work:



It's minimalist, but luscious. As with a good piece of ambient music, or a good swimming pool, you can immerse yourself in it, stop thinking in words for a while, and just give yourself over to sensation.

You can read more about James Turell here:

- James Turell, Public Broadcasting System.

I especially want to experience his Ganzfeld works like Atlan:

> Surprising in its simplicity, "Atlan" is a work that plays on viewers' sense perceptions. Entering a dimly lit room, viewers find what seems to be a deep blue rectangle or monochrome painting on the far wall. As one's eyes adjust to the darkened room, the blue appears to swell in color. Compelling for the way in which the color is evenly and luminously distributed, the viewer is drawn closer to the work for a detailed inspection. Inviting exploration, a surprise is in store for anyone who dares to reach out and touch the work. What at first appears to be a solid rectangle or drawing on the wall is actually an open window onto an empty, light-filled room. It is difficult to discern the volume of the second space, and viewers often reach through the window in an attempt to touch the opposite wall. This window in the wall is like a portal onto another world, providing a view of a limitless space like the ocean or a starless sky.

From *The Times*:

> Turrell's ethereal installations involve light in all its mystical manifestations. Sometimes indoor installations create an illusion of infinite, diffused light. Sometimes they make something which appears almost tangible, but which, when you reach out to touch, is only a space. Once he was sued by a woman who fell over in a gallery. He had created a blue wall, she complained, but when she leaned against it, it wasn't there; it was made of light.

If you can get ahold of this article about Turrell, read it:

- Calvin Tomkins, Profile: Flying into the Light, *The New Yorker* (January 13, 2003), 62-71.

November 22, 2007

Suzhou is a city in China famous for its gardens dating back to the Ming Dynasty. I visited some of these gardens on August 19th and 21st the summer before last, and I fell in love with this sort of garden. Now, craftsmen from Suzhou are building a Ming-style garden in the Huntington Botanical Gardens near Los Angeles:

Annie Wells, Los Angeles Times

> **Artisans Re-create a Classical Chinese Oasis**

Bettijane Levine
Los Angeles Times, November 22, 2007

While giving thanks today for all that's near and dear, it might not hurt to offer gratitude for folks you may never meet: workmen from China who have toiled for six months in San Marino, applying skills passed down through generations and not taught at any schools.

Their creation — the Garden of Flowing Fragrance — is springing up like some fantasy film set at the Huntington Library, Art Collections, and Botanical Gardens. But it is authentic in all respects. Its design re-creates botanical havens built by scholars who were the social elite during the Ming Dynasty, when the art of classical gardens reached its zenith in the city of Suzhou. When the new garden opens in February, visitors will find handmade bricks, tiles and wood structures, all with elaborate decorative details, all crafted by artisans brought here by the Huntington because their skills are as ancient and rare as the garden design itself. Like its predecessors, the garden sits within undulating white walls, its 1½ -acre lake dotted with hand-carved stone bridges, swooping-roofed pavilions and pebbled paths.

To execute this art, pavers sift through little pails of stones, placing them one by one to form floral patterns that make up the meandering walkways and plazas. They work deftly, finding the right size and shape, gently hammering each into place with a mallet.

Annie Wells, Los Angeles Times

Stonemasons who specialize in calligraphy etch ancient characters into the spongy, hole-riddled limestone rock, 850 tons of which were imported from the Suzhou area. Not calligraphers themselves, these men are experts at transferring the masterful inscriptions of artists from paper onto stone. Each carving will tell visitors the name of the pavilion in which they're standing or will describe the poetry of the view.

The lake is encircled by massive chunks of rock, positioned there by specialists from Suzhou. These men also placed the 8-to-14-foot rocks that serve as sculptures, the kind of natural specimens valued in China since the Ming era for the grace and beauty of their shapes.

Woodwork specialists install the burnished panels of ginkgo and fir, carved or etched with patterns and classical themes passed down through centuries.

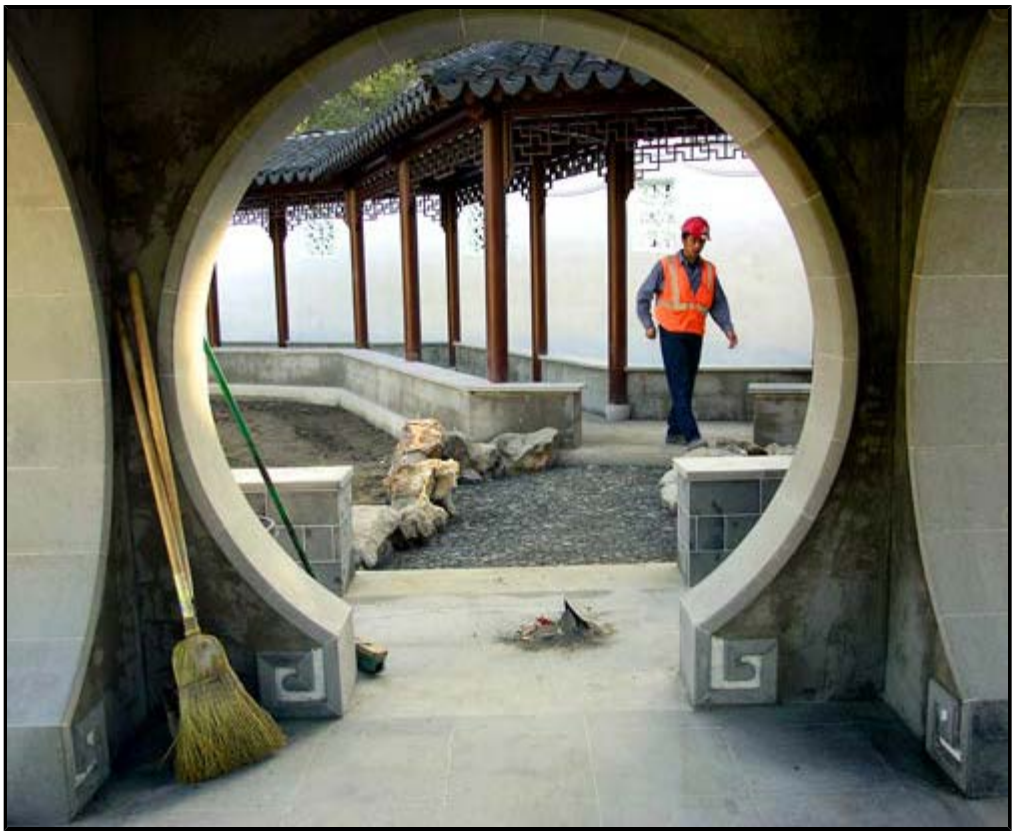
In the double-roofed, hexagonal Three Friends Pavilion, the ginkgo ceiling bears images of the three friends of winter — pine, bamboo and plum blossom — all of which remain hearty through the cold months. Wood

carved into a traditional lattice-like pattern called "broken ice" is set like a delicate frozen curtain.

Tile specialists put finishing touches on pavilion roofs made exactly as they were 500 years ago. Clay is hand-fitted into molds and then fired with rice straw in brick kilns for at least 40 days. The resulting roof tiles are then placed — sideways instead of flat, and tightly overlapping — according to custom that has survived the ages. Every tile has been imprinted by hand with a chrysanthemum.

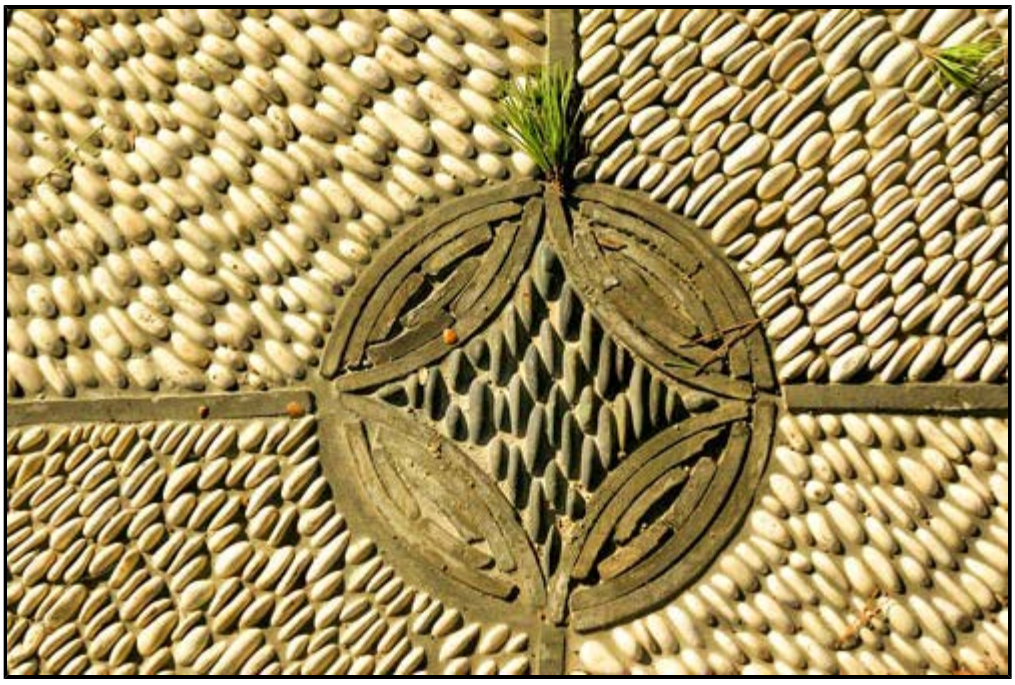
It brings back good memories just looking at it!

This is a moon gate, looking out on a walkway that follows feng shui principles. The zig-zags are designed to fool demons, who can only move in straight lines.



Annie Wells, Los Angeles Times

I'm especially fond of the mosaics which you can see being hammered into place, stone by stone, in the photo above. The result looks like this:



Annie Wells, Los Angeles Times

For comparison, here's some stonework I photographed in the Yu Yuan garden in Shanghai on August 4, 2006:

Today Chris Lee came over for Thanksgiving dinner: we had roast duck with olive sauce, sage dressing, sweet potatos and a nice bottle of wine. By the end of the night, he'd convinced me that I would have more fun and get more math done if I wrote fewer papers and relied more on my samizdat methods of spreading information: This Week's Finds, the *n*-Category Café, and videos. Indeed right now my main agony is the stack of papers I'm scheduled to write, which makes me feel guilty for spending time thinking about new ideas or talking with James Dolan. Maybe I should just tell some people *sorry, I'm not going to write that paper*.

Before Chris came, Lisa and I read some poems from Cid Corman's 2-volume magnum opus, *Of*. I'd read it once before and found it brilliant. This time, just quickly dipping in here and there, I was a bit disappointed. Maybe the effect is

cumulative?

But there are certainly a bunch I like, including some that nicely fit the "minimalist" theme of this month's diary:

The appearance of
snow. It is as if
everything I

had thought possible
suddenly occurred
and nothing happened.

Some of his final poems are available online. For example:

A LIVING

You are here
to die and

that's what you
are doing.

November 23, 2007

This beautiful insect is a tarantula hawk:

Here Lisa caught it resting on the agave behind our house. The first time we saw one of these, it was struggling to carry a paralyzed tarantula to a safe location where it could lay its eggs in the poor beast.

November 25, 2007

As you can tell, I've been thinking about minimalist art. On the 14th I mentioned the Robert Irwin show down in San Diego, which I plan to see over the winter break. Today he was interviewed by the *Los Angeles Times*. Here are a couple interesting things he said:

> **On breaking the frame**
>
> "At one point, I looked around and I realized that there are no frames in the world. That's not how we see at all. We're like in an envelope, stuff happening on every dimension — visual, auditory, tactile, smell. Our dialogue with the frame is part of a highly stylized, learned logic. It's a way we've learned to see, but it's not how we actually see. In terms of how human beings see and understand and order the world for themselves, it seemed we had to address that. I had to paint a painting that broke the frame. That's what the disks were. Once you break the frame, all of a sudden you are in space. You're dealing with energy as opposed to matter. [The disks] really do get lost. They become light and space."
>
> **On Modern art, abstraction and why the new isn't easy**
>
> "Most of our ideas are homogeneous. We maintain the basic structures, the basic ideas, the basic concepts. We build on them. But once in a while, something comes along that actually challenges those most basic assumptions. Modern art is doing that, or has done that. People used to ask abstractionists, 'What is it?' That's a literate question that says, 'Take this, in front of me, and let me understand it, not by participat ing in it directly, but by referencing it in the world.'
>
> "And [the abstractionists] would say, 'It is.' That's a whole different way of looking at the thing. It's not about something, it is something. When you make that kind of shift, it throws people off. It challenges the basic structures we've built. So people have a great degree of difficulty, because that's asking too much, in a way, to give up this structure and cut yourself loose, to float in this other realm. It's going to take a long time to see if we really want to play the game in this new realm.
>
> "The history of Modern art, in my mind, is at least a couple hundred years old. It will be another couple hundred years before we're going to know if it works and what kind of idea it is. I pursue it because my questions feel right, they hold water and I like the beauty of it."

I like the honesty of admitting that "Modern art" is something that may or may not really work in the long term.

November 29, 2007

Have you heard about the world's biggest bug?

Technically it's a sea scorpion, or eurypterid. I loved such things (and had nightmares about them) when I was a kid.

November 30, 2007

It's raining! *Really* raining, not just a drizzle. You readers who don't live in the desert, who aren't suffering through a long drought and fires, who don't have a garden, may not know how exciting this is.

YAY! IT'S RAINING!

Here's a fun news story:

- Man arrested at bank, with fake $1M dollar bill, *Morning Edition*, National Public Radio, November 30, 2007.

In fact, all bills larger than 100 dollars were made illegal by Nixon. For more see my Sept. 30, 2006 diary entry on large-denomination bills, and the Wikipedia entries on large-denomination bills and fake bills.

A rainy day is good for doing housecleaning. So, today I'll finally post links to some things Thomas Riepe has been telling me about for many months. I guess I'll concentrate on ecological news.

I've written about the Permian extinction elsewhere. Here's some news about it:

- What we can learn from the biggest extinction in the history of the Earth, *EurekAlert*, August 8, 2007.

A quote:

> Approximately 250 million years ago, vast numbers of species disappeared from Earth. This mass-extinction event may hold clues to current global carbon cycle changes, according to Jonathan Payne, assistant professor of geological and environmental sciences. Payne, a paleobiologist who joined the Stanford faculty in 2005, studies the Permian-Triassic extinction and the following 4 million years of instability in the global carbon cycle. In the July issue of the Geological Society of America Bulletin, Payne presented evidence that a massive, rapid release of carbon may have triggered this extinction.
>
> "People point to the fossil record as a place where we can learn about how our actions today may affect the future course of evolution," Payne said. "That's certainly true: The deep geologic record provides context

for modern events. We may miss very important processes or underestimate the magnitude of changes in the future by using only the past couple thousand years as a baseline."

[...]

In 1991, scientists reported that the largest known volcanic event in the past 600 million years occurred at the same time as the end-Permian extinction. Magma extruded through coal-rich regions of the Earth's crust and blanketed a region the size of the continental United States with basalt to a depth of up to 6 kilometers. The eruptions that formed the Siberian Traps not only threw ash, debris and toxic gases into the atmosphere but also may have heated the coal and released vast quantities of carbon dioxide and methane into the atmosphere.

Rapid release of these greenhouse gases would have caused the oceans first to become acidic and then to become supersaturated with calcium carbonate. In the July Bulletin, Payne presents evidence that underwater limestone beds around the world eroded at the time of the end-Permian extinction. This finding, coupled with geochemical evidence for changes in the relative abundances of carbon isotopes, strongly suggests an acidic marine environment at the time of the extinction. The rock layers immediately covering this eroded surface include carbonate crystal fans, which indicate oceans supersaturated with calcium carbonate.

"This end-Permian extinction is beginning to look a whole lot like the world we live in right now," Payne said. "The good news, if there is good news, is that we have not yet released as much carbon into the atmosphere as would be hypothesized for the end-Permian extinction. Whether or not we get there depends largely on future policy decisions and what happens over the next couple of centuries."

[...]

Coral Reefs

Payne plans to learn more about the causes and consequences of this massive extinction event this summer. Three students left Aug. 1 to join him in southern China for four weeks of field studies.

If volcanic activity released sufficient quantities of carbon into the air within less than 100,000 years, the Earth would have transiently cooled and then experienced a prolonged period of global warming, Payne said. This summer, Ellen Schaal, a graduate student in the Department of Geological and Earth Sciences, will use one geochemical index to try to understand how climate did change during the end-Permian period.

Two other students will examine coral reef structures. The Great Bank of Guizhou contains the fossilized reefs from just before and just after this extinction event. Undergraduate Mindi Summers hopes to describe the ecological structure of coral reefs just before the extinction, and graduate student Brian Kelley will study the development and diversification of reefs after the global carbon cycle began to stabilize.

Reef communities are a sort of canary in the mineshaft, Payne explained. Today, coral reef health is considered a measure of environmental stability. When stressed by environmental conditions, the algae that inhabit the reef leave, and the reef loses color-and one reason why algae might leave is temperature. For example, when ocean temperatures rise during El Niño years, corals bleach. This type of immediate response to environmental change is hard to track in the geologic record.

More on coral reefs:

- TAU professor finds global warming is melting soft coral reefs, Tel Aviv University website, October 18, 2007.
- John F. Bruno and Elizabeth R. Selig, Regional decline of coral cover in the Indo-Pacific: timing, extent, and subregional comparisons, *PLoS one,* 2007.

A quote from the latter paper:

> The results of our analysis of 6001 quantitative reef surveys indicate that the degree, geographic extent, and duration of the Indo-Pacific coral decline have been significantly underestimated. Many coral reef scientists know of exceptions to the general pattern of reef degradation: there are currently many, perhaps hundreds or even thousands of high coral cover (i.e., >60%) reefs in the Indo-Pacific and Caribbean that resemble the presumed historical coral baseline. But our results indicate that such observations are anomalies and currently represent less than 2% of reefs in the Indo-Pacific. This study also highlights the urgent need for conservation policies to restore coral reefs and the ecosystem services they provide, estimated to be worth $23,100-$270,000 per square kilometer each year. Halting and reversing coral loss will require actions across a range of scales including local restoration and conservation of herbivores that facilitate coral recruitment and the reduction of fishing practices that directly kill corals, the implementation of regional land use practices that reduce sedimentation and nutrient pollution, and the institution of global policies to reduce anthropogenic ocean warming and acidification.

See my August 1, 2006 entry for more on the state of our oceans, coral bleaching, and the like.

From water, let's move on to dirt:

- David R. Montgomery, *Dirt: the Erosion of Civilizations*, U. C. Press, 2007.

A blurb from the U. C. Press website:

> Dirt, soil, call it what you want — it's everywhere we go. It is the root of our existence, supporting our feet, our farms, our cities. This fascinating yet disquieting book finds, however, that we are running out of dirt, and it's no laughing matter. An engaging natural and cultural history of soil that sweeps from ancient civilizations to modern times, *Dirt: The Erosion of Civilizations* explores the compelling idea that we are — and have long been — using up Earth's soil. Once bare of protective vegetation and exposed to wind and rain, cultivated soils erode bit by bit, slowly enough to be ignored in a single lifetime but fast enough over centuries to limit the lifespan of civilizations. A rich mix of history, archaeology and geology, *Dirt* traces the role of soil use and abuse in the history of Mesopotamia, Ancient Greece, the Roman Empire, China, European colonialism, Central America, and the American push westward. We see how soil has shaped us and we have shaped soil — as society after society has risen, prospered, and plowed through a natural endowment of fertile dirt. David R. Montgomery sees in the recent rise of organic and no-till farming the hope for a new agricultural revolution that might help us avoid the fate of previous civilizations.

As you probably know, a lot of Iraq is desert. This wasn't true several thousand years ago: it's the result of human activity. Here's a little tale about that, by Rania Masri:

> The first procurement and subsequent deforestation originates from the site where civilization first emerged, the Fertile Crescent. I would like to share with you an episode from the Epic of Gilgamesh known as the Forest Journey. Through this story lies the understanding of ecological processes and the consequences of human action.
>
> Approximately 4700 years ago in Uruk, a city-kingdom in southern Mesopotamia, Uruk's ruler Gilgamesh sought to ensure his immortality through the material greatness of his city. He wanted large amounts of timber to accomplish his plans, and he set his sight on the cedars of Lebanon. Extending before Gilgamesh lay an area of land so large its exact size was not known. An almost unbroken forest flourished near southern Mesopotamia, in the hills and mountains surrounding the Fertile Crescent. The forest was so dense that the suns light barely penetrated through its foliage.
>
> The chief Sumerian deity Enlil protected these glorious forests by entrusting the ferocious demigod Humbaba to protect the interests of nature against the desires of civilization. Enlil understood the unlimited appetite of civilization, and predicted that once humans would enter the fo rest, they would remove all the gods beautiful garden of trees; they would destroy the divine beauty where the cedars raise aloft their

luxuriance.

After a moment of enjoying the glory and awe of the magnificent, virgin cedar forest, Gilgamesh and his lumberjack companions began destroying the "abode of the gods". They cut the cedars, chopped their branches and trunks into transportable sizes. A fight erupted between the intruders and the mighty forest demigod... the greed of civilization won; the forest's guardian lost his head; and the cedars wailed with fear now that Gilgamesh was master of the forest. The trees were correct to cry, for the men stripped the mountains of their cover, leaving bare rock. When Enlil, who forever must watch over the well-being of the earth, learned of the destruction of the cedar forest, he sent down a series of ecological curses on the offenders: May the food you eat be eaten by fire; may the water you drink be drunk by fire.

So ended the tale, lamenting the soon-to-be sorry state of southern Mesopotamia...and the many other civilizations bent on destroying their forests.

The direction we're moving in seems almost hopeless sometimes. But, people are really starting to take global warming and other massive changes seriously — even the relatively benighted citizens of the USA. In 2006, California passed the Global Warming Solutions Act, which requires that greenhouse gas emissions be reduced to 1990 levels by 2020, and to *80% below this level* by 2050. The California Air Resources Board just figured out how much greenhouse gases were actually emitted in 2006 — a small first step, but a mammoth calculation in its own right. The answer: the equivalent of 427 million metric tons of carbon dioxide!

And there are a lot of good people trying to get us out of the mess we're making. For example, Thomas Riepe pointed me towards the website of Graciela Chichilnisky. Her first paper was on pure math: group actions on spin manifolds, to be precise. But, she quickly moved on to more useful things, like the mathematics of sustainable development, the impact of the "knowledge revolution", and the meaning of property rights in a human-dominated Earth. She's now a professor of economics and statistics at Columbia University. She's just one of many...

So, I wouldn't say things are hopeless. It's a complex struggle with a highly uncertain outcome.

For my December 2007 diary, go here.

The curving edges of the inset and its background match perfectly. From that center, the pattern expands infinitely to cover the wall or, potentially, the universe. - Louis Werner, Zillij in Fez

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home

For my November 2007 diary, go here.

Diary - December 2007

John Baez

December 7, 2007

Another winter storm is blustering through Southern California, bringing a bit more much-needed rain. Not as much as last time — not here, anyway. But, it's still nice.

Here's the view from our guest bedroom window — raindrops on the papyrus plant:

December 9, 2007

That storm brought quite a bit of rain: it lasted a day longer than predicted.

December 11, 2007

I've gotten curious about the Madrean sky islands on the border between the US and Mexico. These "sky islands" are about 42 mountainous regions surrounded by the the dry grasslands and shrub of the Chihuahuan and Sonoran deserts. They serve as the homes for isolated ecosystems, much like islands in the oceans. I first read about them here:

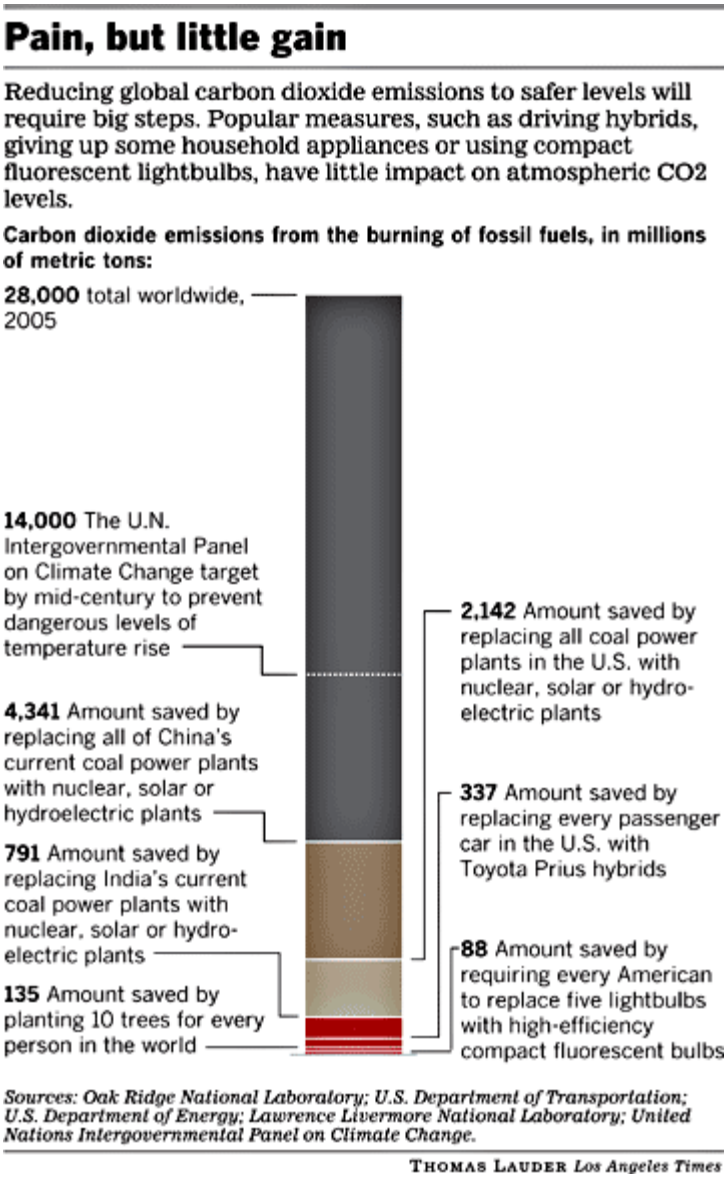
- Joe Nick Patoski, Border crossing: securing a hidden wilderness on the Texas-Mexico border, *Nature Conservancy*, Winter 2007.

Also check out the interactive map created by the Sky Island Alliance.

December 13, 2007

The UN's Intergovernmental Panel on Climate Change is meeting in Bali. Now the meeting is running into overtime. Al Gore spoke to the gathering, saying "My own country, the United States, is principally responsible for obstructing progress here in Bali".

This graph illustrates the huge challenges involved:



However, it's more depressing than absolutely necessary! There are better ways to tackle the problem of greenhouse gases. For example, see the carbon wedges of Pacala and Socolow, described in my October 2nd diary entry.

December 15, 2007

I avoid talking about major news stories on this diary. Major news stories are, by definition, the stuff you're likely to have already heard.

But, it's not often that international negotiations in a struggle to save our planet nearly collapse, run 20 hours overtime — and only end when the representative of the world's most powerful country is pressured by boos from the audience into signing a deal!

After a wrenchingly emotional drama, a climate agreement was signed in Bali: the Bali Roadmap. Listen to the story here:

- Richard Harris, Climate roadmap emerges from grueling Bali talks, *Climate Connections: Solutions*, National Public Radio, December 15, 2007.

How the U.S. Caved at Bali

Brian Walsh
Time, December 15, 2007

[...]

The two-week-long negotiations, meant to craft the beginnings of a new global effort on climate change, had already gone into overtime when diplomats emerged from behind closed doors at 2 AM Saturday morning, claiming that a compromise deal between the EU, the U.S. and the major developing nations had been reached. Delegates from some 190 nations reconvened several hours later for what should have been a final approval session.

But delegates from India and China unexpectedly objected to aspects of the text, including the degree of technical assistance poor nations would receive from the rich for low-carbon development. The impasse . the latest in several tortured days of negotiations — led Rachlat Witolear, the chair of the conference, to twice suspend the open session for further behind the scenes meetings, leading to a real fear that diplomats might leave the island without a final agreement.

It was only with the help of UN Secretary-General Ban Ki Moon, who made an emergency stop in Bali, that negotiations got kick started. The South Korean, in office for less than a year, is known as diplomatic even by UN standards, but he arrived without mincing words. "Frankly, I am disappointed at the lack of progress," said Ban to a packed audience. "Seize the moment, this moment, for the good of all humanity."

With that, Ban left the chamber to a standing ovation. Witolear reopened talks, and a representative from China turned to speak. His anger audible, he asked why the UN secretariat overseeing the meeting had earlier restarted the session while negotiators were still meeting away from the conference hall — essentially accusing the officials of acting unfairly towards the developing nations. For Yvo de Boer, the executive secretary of the United Nations Framework on Climate Change (UNFCCC) and the summit's guide, it was too much. Visibly exhausted by all-night negotiations, the Dutchman appeared to momentarily break down and fled the session, leaving a stunned audience in his wake.

But the real drama was to come. After India reiterated its objection — and was essentially supported by the European Union — the lead American negotiator Paula Dobiansky turned to speak, and announced that the U.S. would not accept India's changes, which sought to lighten the expectations from developing countries. (The UN negotiating process requires total consensus.) Boos rained on the U.S. delegation from NGO observers and even the press gallery, breaking the last remaining appearance of diplomatic placidity.

It's hardly the first time the U.S. has been jeered at a UN event, but what happened next was unique. Nation after developing nation rose to criticize the U.S. in language more often reserved for a political debate than a UN conference. A representative from tiny Papua New Guinea — one of many small island states most immediately threatened by climate change — recalled the old Lee Iacocca line about leading, following or getting out of the way. "If the U.S. will not lead, get out of the way," he said, to gallery cheers. "Please get out of the way."

More importantly, with the exception of a confused statement from Japan, not one of the allies that had generally stood with the U.S. the past two weeks — Australia, Russia, Canada — rose in its defense. The near-total isolation of the U.S. on climate change — which had been building since its rejection of the Kyoto Protocol nearly a decade ago — was now obvious, apparently even to the U.S. Dobiansky turned to speak. "We've listened very closely to many of our colleagues here during these two weeks, but especially to what has been said in this hall today," she said. "We will go forward and join consensus." Boos turned to

> cheers, and the deal was essentially sealed.
>
> For the exhausted delegates — not to mention the journalists and environmentalists who had stayed through the night and the day following the negotiations — the simple elation at having reached an agreement was palpable. "In 20 years of doing this, I've never seen anything like this," marveled Alden Meyer, director of strategy and policy for the Union of Concerned Scientists (UCS).

You can watch videos of some of this:

- Ban Ki Moon urges action on climate change, YouTube, December 12, 2007.
- Yvo de Boer, concern over the pace of negotiations, YouTube, December 13, 2007.
- Al Gore's speech, YouTube, December 14, 2007.
- Yvo de Boer, closing press briefing, YouTube, December 15, 2007.

This blog gives a nice insider's view of the meeting in Bali:

- Union of Concerned Scientists, Bali Bulletin.

The actual accomplishments are mixed. Some very bad news: the European Union lost its bid to institute specific targets for cutting the emission of greenhouse gases. Some good news: unlike the Kyoto Protocol, the Bali Roadmap recognizes the importance of forests, and tropical nations may eventually be rewarded for not cutting down their forests.

December 18, 2007

Wanna see what DNA actually does? Check out these cool movies, brought to my attention by Mike Stay:

- WEHI-TV, DNA molecular animation.

The coolest part, starting around 1:45, shows how DNA replicates:

This is a replisome in action! That's the piece of molecular machinery our cells use to duplicate their DNA. The speed of the process is realistic for actual human cells, in which the DNA replicates at a speed of 20-50 bases per second. The bacterial replisome works 10 times faster!

Some details were omitted to make the movie easier to understand. But, what you see is quite close to reality. Two tau subunits (shown in light blue here) connect the DNA helicase (dark blue) to a clamp loader (grey fingers). Each tau

subunit also connects to one of the two DNA polymerase enzymes (purple). The other two proteins you see DNA clamps (green) and DNA primase (yellow-green), which adds RNA primers (yellow) to the single-strand DNA as it emerges from the helicase.

For more information and other views of the same scene, try the WEHI-TV webpage.

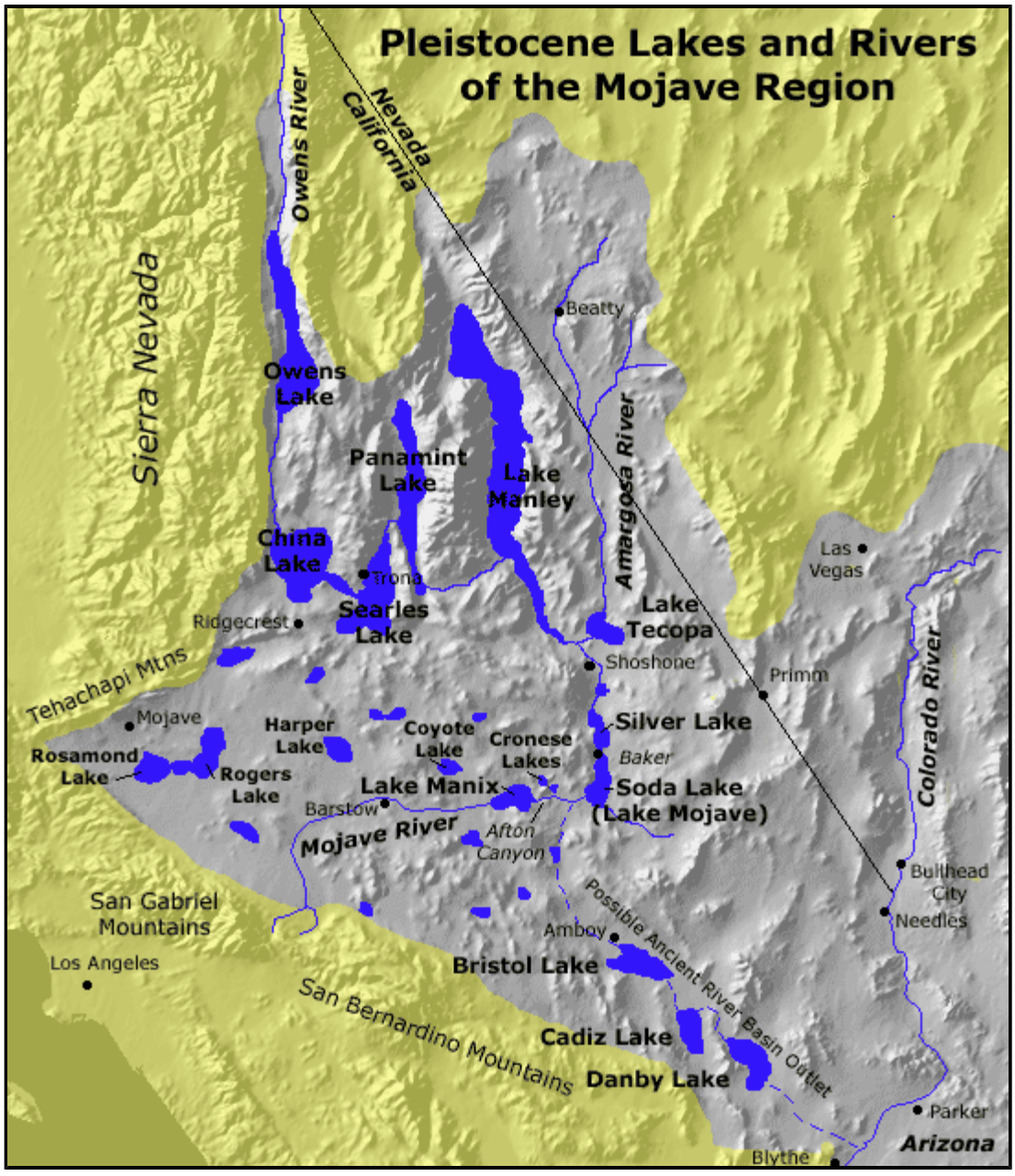
December 19, 2007

Drive a few hours north of Riverside and you'll reach one of the hottest, driest, harshest spots in the United States: Death Valley. Here temperatures soar above 49°C in the summer. It's also the lowest place in the Western Hemisphere: 86 meters below sea level at the bottom.

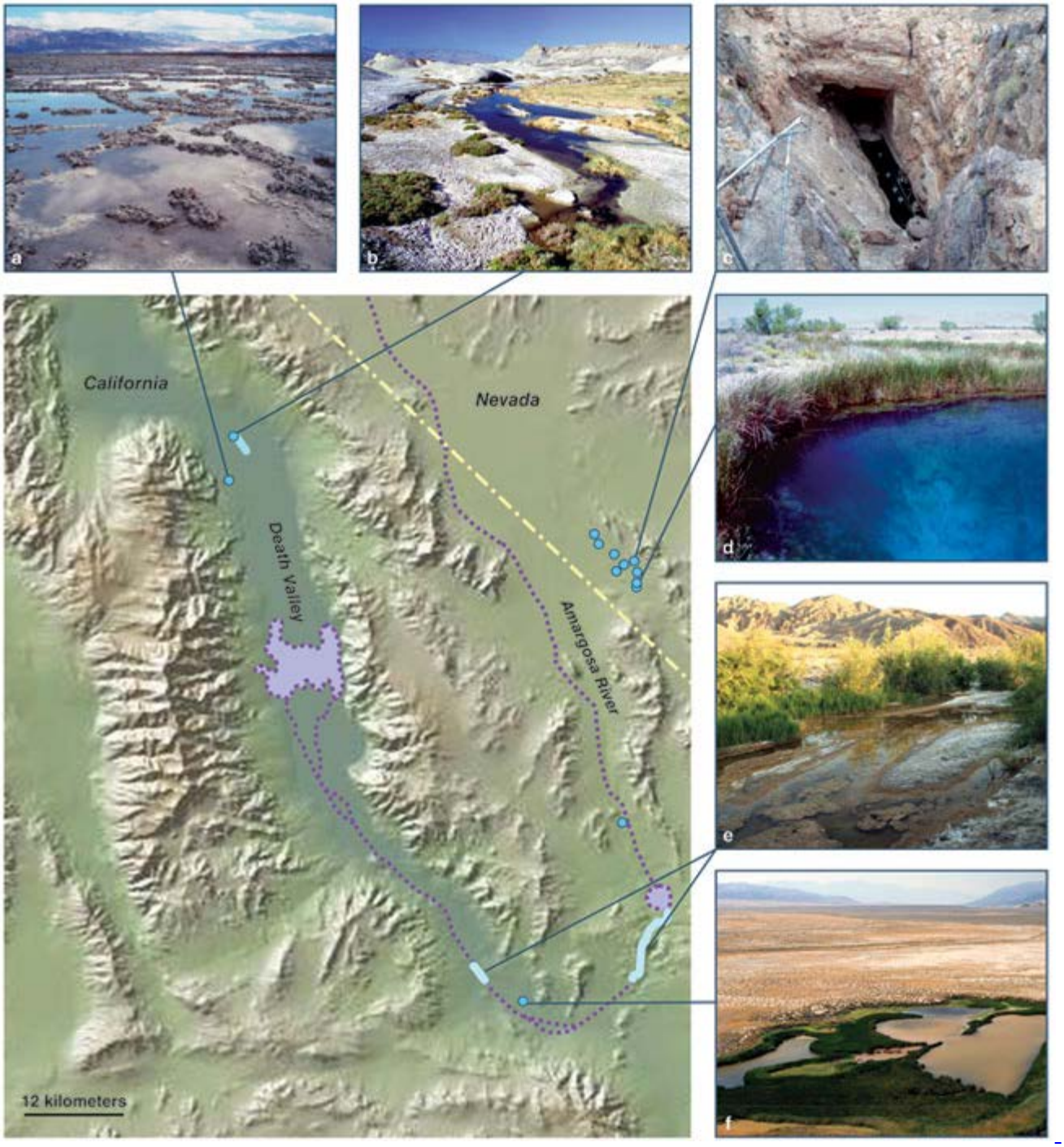
And, it's home to some of the world's toughest, most adaptable *fish!*

- Sean C. Lema, The phenotypic plasticity of Death Valley's pupfish, *American Scientist*, January-February 2008.

During the Pleistocene, Death Valley was filled by a huge lake, called Lake Manly:



Fish called "pupfish" entered from the Colorado River. But as the last ice age ended and the region warmed up and dried out, the lake split into many smaller lakes and marshes. Now the lake in Death Valley returns only when it rains — for example, during the huge rains of 2005. A few permanent ponds are fed by an underground aquifer, whose dwindling supplies of water are left over from the ice age. The pupfish struggle to survive, but separated in tiny habitats with different conditions, they have split into seven different species:



Photographs by Sean C. Lema; map by Barbara Aulicino and Stephanie Freese.

Two salt-tolerant species of pupfish live in Cottonball Marsh (a) and Salt Creek (b). A tiny water-filled cavern, Devil's Hole (c), holds its own species of pupfish. This is one of the rarest species known, with only 36 adults as of April 2006. The Warm Spring pupfish lives nearby. Another species lives in Big Spring (d). The Amargosa River pupfish lives at two locations along the Amargosa River (e), an intermittent stream starting in Nevada, which is dry except in a few places most of the year. Yet another species lives in Saratoga Springs and Saratoga Marsh (f).

The adaptations of these various species are fascinating. But what's still more fascinating is their enormous "phenotypic

plasticity": the way their bodies and habits change depending on their habitat, *regardless of their genome*. For example, the Devils Hole pupfish is only 20 millimeters in length. Since they were so rare, people transplanted some to other locations. But then, after only 5 years, these pupfish grew much larger than the original breed! Sean Lema and collaborators did experiments proving that this was not due to natural selection or genetic drift. It's due to phenotypic plasticity.

Shades of Lamarck! See my June 28th diary entry for more on how the central dogma of molecular biology is turning out to be an oversimplification.

I like science best when it surprises me. Biology does that a lot now, maybe more than physics. And it's explained very well in *American Scientist*.

December 20, 2007

More rain! Not much, but enough to count for something.

December 21, 2007

California and 16 other states are trying to boost fuel efficiency standards to combat global warming. To do this, they needed a waiver from the Environmental Protection Agency. Such waivers are routine. But, headed by the Bush appointee Stephen Johnson, the EPA *refused to even hear their case*, saying that carbon dioxide was not a pollutant. The states sued the EPA, took it all the way up to the Supreme Court — and the Supreme Court ruled that the EPA had to consider the states' case.

Johnson promised to do that, and on December 19th he gave his decision:

Screw you! You can't fight global warming!

Two days later, the slimy details are leaking out. Turns out Johnson acted *against the recommendations of all his staff* — and possibly influenced by vice-president Cheney, who met with executives of Ford and Chrysler last month:

> **EPA Chief is Said to Have Ignored Staff**
>
> Janet Wilson, *Los Angeles Times*
> December 21, 2007
>
> The head of the U.S. Environmental Protection Agency ignored his staff's written findings in denying California's request for a waiver to implement its landmark law to slash greenhouse gases from vehicles, sources inside and outside the agency told The Times on Thursday.
>
> "California met every criteria . . . on the merits. The same criteria we have used for the last 40 years on all the other waivers," said an EPA staffer. "We told him that. All the briefings we have given him laid out the facts."
>
> EPA administrator Stephen L. Johnson announced Wednesday that because President Bush had signed an energy bill raising average fuel economy that there was no need or justification for separate state regulation. He also said that California's request did not meet the legal standard set out in the Clean Air Act.
>
> But his staff, which had worked for months on the waiver decision, concluded just the opposite, the sources said Thursday. The sources spoke on condition of anonymity because they were not authorized to talk with the media or because they feared reprisals.
>
> California Air Resources Board Chairwoman Mary Nichols said she was also told by EPA staff that they were overruled by Johnson.

> She said Johnson's decision showed "that this administration ignores the science and ignores the law to reach the politically convenient conclusion."
>
> Nichols, who served as assistant EPA administrator overseeing air regulations under President Clinton, said she had helped write waiver decisions there, and "I know California met all the criteria on this one."
>
> California Gov. Arnold Schwarzenegger has vowed to fight in court to overturn the decision.
>
> Technical and legal staff also concluded that if the waiver were denied, EPA would very likely lose in court to the state, the sources said.
>
> But if Johnson granted California the waiver and the auto industry sued, "EPA is almost certain to win," said two sources quoting the briefing document. They advised him to either grant the waiver outright or give California a temporary one for three years.
>
> Instead, three sources said, Johnson cut off any consultation with his technical staff for the last month and made his decision before having them write the formal, legal justification for it.
>
> "It's very highly unusual," said one source with close ties to the agency.
>
> Normally the technical staff would be part of the final decision-making process, including briefing the administrator and writing the formal legal document before his decision. In this case, the briefings were done, but the formal finding has yet to be drafted.
>
> [...]
>
> Some staff members believe Johnson made his decision after auto executives met with Vice President Dick Cheney and after a Chrysler executive delivered a letter to the White House outlining why neither California nor the EPA should be allowed to regulate greenhouse gases, among other reasons. The Detroit News reported Wednesday that chief executives of Ford and Chrysler met with Cheney last month.
>
> "Clearly the White House said, 'We're going to get EPA out of the way and get California out of the way. If you give us this energy bill, then we're done, the deal is done,' " said one staffer.
>
> Chrysler spokesman Colin McBean said that records show that Chrysler submitted position papers on the mileage issue with the Bush administration's Office of Management and Budget about five weeks ago. Neither McBean nor a Ford spokeswoman would comment on whether company executives met with Cheney.

The states have been battling to impose these new fuel efficiency standards since 2002. The only way we'll break this logjam is by booting out Bush and electing a Democrat for president next year. (Or McCain — he's the only Republican candidate who gives a hoot about the environment.)

December 22, 2007

Some good news, brought to my attention by the physicist Sabine Hossenfelder at her blog *Backreaction* (one of my favorites):

- Doug Saunders, The hush-hush regreening of Europe, *Globe and Mail*, December 20, 2007.

A quote:

> According to a study released last month with absolutely no fanfare by the United Nations Ministerial Conference for the Protection of Forests in Europe, the continent's forest cover has expanded by almost 10

per cent since 1990, and a much larger greening seems to be under way, reversing centuries of deforestation. The greatest share of this growth is a result of deliberate policies designed to turn farmland into woodland.

It is safe to say the European continent now has more forest than at any time since the beginning of the industrial revolution.

You can see the results if you care to look. On the back forty of Mr. Thibert's farm, a thick glade of oak, chestnut and poplar trees, lined with walking trails and visited by hunters, mushroom gatherers and nature seekers, covers land that was productive field a decade ago and joins the forests of other farmers who have turned the clock back on their land. Across the valley, you can see dozens of erstwhile farms reverting to wild nature.

The European Commission's Department of Agriculture and Rural Development — the most expensive department in the 27-nation federation, responsible for a huge and controversial system of agricultural subsidies that eat up 44 per cent of the EU's tax revenues — is launching a new "afforestation" program this month, with a budget of $3.6-billion over the next six years, that it hopes will turn hundreds of thousands of hectares back into forest and encourage thousands of families to get out of farming.

This is great — and not just because forests are wondrous places, foster genetic diversity, and lock up carbon, while agricultural subsidies waste money. The other reason it's great is that agricultural subsidies *make it impossible for farmers from poor countries to compete with farmers from rich ones!* These subsidies are a major cause of third-world poverty.

December 29, 2007

Good news! I got a contract in the mail that'll let me use the Wolframtones cellular automaton program to make an album and distribute it freely from my music website!

December 31, 2007

Happy New Year!

An interesting New Year's resolution:

Instead of a hamburger for lunch, try a peanut butter and jelly sandwich — you'll save as much as 2.5 pounds of carbon dioxide and 280 gallons of water! You don't need to be a vegetarian (I'm not) to realize that enormous herds of cattle are a danger to the planet. They're responsible for 18% of greenhouse gas emissions, if we count the fact that methane creates 23 times the greenhouse effect than CO_2.

We had a small New Year's party with some UCR faculty and their mates: the mathematician Richard Block and his wife the environmental activist Jane Block, the anthropologist David Kronenfeld and his wife the poet Judy Kronenfeld, Vivian-Lee Nitray from the Department of Religious Studies and her husband Doug Oliver, and the English professor John Briggs. My friends Danny Stevenson and Alissa Crans couldn't make it. It was a nice evening of conversation. Some people had to leave early, but the serious ones stayed until 2:30 am!

For my January 2008 diary, go here.

The appearance of
snow. It is as if
everything I

had thought possible
suddenly occurred
and nothing happened.
- Cid Corman

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home