signal to background

Night shift with a visual reward; debunking fake science; anniversary fight: Einstein vs. Godzilla; people-watching at the SLAC race; hot relationships in particle and astrophysics; pixel art with particle collisions; letters to the editor.

Photo: Marty Murphy

Night shift

Twenty-four hours a day, seven days a week, a crew of four to five operators plus a crew chief are on shift in Fermilab's Main Control Room, monitoring the accelerator complex. You would think that the midnight to 8 a.m. shift would be dreaded. While it probably isn't anybody's favorite, working into the wee hours of the morning can have its perks.

"There is definitely an advantage to working the night shift," said Marty Murphy a crew chief in Fermilab's Accelerator Division. "You get to see gorgeous sunrises, lunar eclipses—all kinds of astronomical events. And you get to be here when nobody else is, which can be nice."

On the evening of November 7, 2004, the midnight crew experienced a rare treat as the *aurora borealis* lit up the sky for hours. Even though he wasn't on shift at the time, Murphy knew that he couldn't pass up the opportunity to photograph the aurora at Fermilab. "It was fairly constant, and you could see waves," he said. "It almost looked like a veil waving in the breeze."

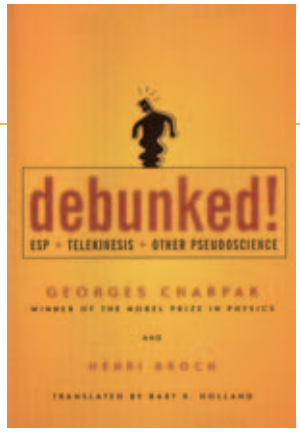
This isn't the first time that Murphy has found a use for his photography skills during a midnight shift. "I had a photograph published in *FermiNews* in 1997 when beam went into the Main Injector for the first time," Murphy said. "Because the event happened around 3 a.m., there weren't many volunteers to photograph it. I guess another perk of the midnight shift is getting a chance to exploit your talents when other people don't want to be awake."

Elizabeth Clements

Reviewed by Elizabeth Clements

Debunked!

Georges Charpak and Henri Broch
The Johns Hopkins University Press, Baltimore, 2004



I know you pretty well: Sometimes you are extroverted, affable and sociable, while at other times you are introverted, cautious and reserved. You need others to like and admire you, yet you are apt to be critical of yourself. And you are a person who possesses a substantial untapped potential that you haven't exploited for your own benefit.

Aren't you amazed with my telepathic abilities?

Debunked! by Nobel Prize winner Georges Charpak and physics professor Henri Broch reveals the tricks of the trade that keep palm-readers and amateur magicians in business. Using the sentences above, one of the authors of the book conducted an experiment and found that 69 percent of his students judged the description of their personality to be accurate.

Entertaining and amusing, *Debunked!* begins by exposing some basic magic tricks such as walking on broken glass and levitating in the air. Charpak and Broch go beyond the basic parlor tricks, however, and demonstrate how pseudoscientists use simple science, statistics and psychology to dupe an audience. Writing for a general audience, Charpak and Broch use basic math and simple scientific arguments to support their explanations of the paranormal and beyond. While I found some of the examples enlightening—you'll never see me reading a horoscope again—some readers may not be convinced by all of the book's arguments. If you are a strong believer in ESP or telekinesis—especially if you are a *Matrix* fan who is still trying to bend that spoon with your mind—you may consider Charpak and Broch to be more opinionated than convincing.

In their conclusion, Charpak and Broch acknowledge that readers should not abandon their beliefs. A couple of sentences later, they warn readers, "But remember, only idiots never change their minds."

Einstein vs. Godzilla: The Green Guy Wins

So who's this Einstein guy I keep hearing about? He writes these five papers a hundred years ago, and now the whole world wants a year to glorify him? Booshwah, I say. This year is WYOG—World Year of Godzilla, my 50th anniversary, kicking off my second half-century of tromping on Tokyo and New York, and whomping on any monster wannabe or pusillanimous professor I spot along the way. If this bad-hair egghead wants to do some banging—BRING IT ON!

Now, if, as some say, I'm the kinder, gentler sort of radiation mutation, I admit this much: I do give the guy a tip of my hat. "Einstein, old pal," I say, "I really do owe it all to you, bless your relativistic, chain-reacting little heart. Why, without $E=mc^2$, I would never have seen the light of day." It's true, too. Split some atoms here and there, toss in a little 1950s-style superpower brinkmanship, test a few nuclear devices, and—AAAR-RRRRGGGGHHHHH!—I come bursting on the scene with tongue flaming and top billing right from the start: "GODZILLA, KING OF THE MONSTERS!" It *is* good to be the king.

Sure, you've been on the cover of *Time*, Einstein, but do they call you "EINSTEIN, KING OF THE PHYSICISTS"? Do populations flee in fear when you're near? No way, sockless savant! You got your five papers in early, but how many did you do 50 years later? Ha! I thought so. My 29th movie just came out in Japan last month—and I'm still doing all my own stunts! Match that, equation-head.

You say you've still got some tricks up your sleeve, Einstein? Remember King Kong? I fought King Kong. I outlasted King Kong. And Einstein, you're no King Kong!

Godzilla (as told to Mike Perricone)

Photo: James Stanfield

SLAC Race

The near-perfect weather in California inspires many SLAC employees to enjoy jogging and walking at lunch time. The long, straight stretch beside the world's longest building, the klystron gallery of the two-mile Stanford Linear Accelerator, seems to compel exercise. On any given day, lunch-time athletes are found running in casual groups or pairs, but one day a year the walkers and runners compete *en masse* during a unique event: the SLAC race, also known as the *Run & Walk*.

The people-watching at that event is worth the walk out to the accelerator building. Over 200 scientists, technicians, managers and office workers turn out to participate in the two-mile race, and I've seen all types ranging from those with concentrated serious expressions—warming up and stretching like *Run & Walk* was an Olympic event—to disorganized first timers who rush up at the last moment asking, "Can we still register?"

The fog lifts just in time, revealing ideal conditions for the 33rd annual SLAC race. The race is coordinated by a committee and staffed by a group of volunteers. Although this is my third consecutive year serving as water woman at the turnaround for the walkers, many are still surprised when they see my colleague Boni and me seated at a table, smiling, cups ready with water, as the walkers emerge thirsty from the brush.

It's a fun event, a great chance to get some exercise, see friends from across the lab, and a unique way to soak up some California sunshine before the first chill of winter sets in.

Joni White, SLAC

Hot relationships

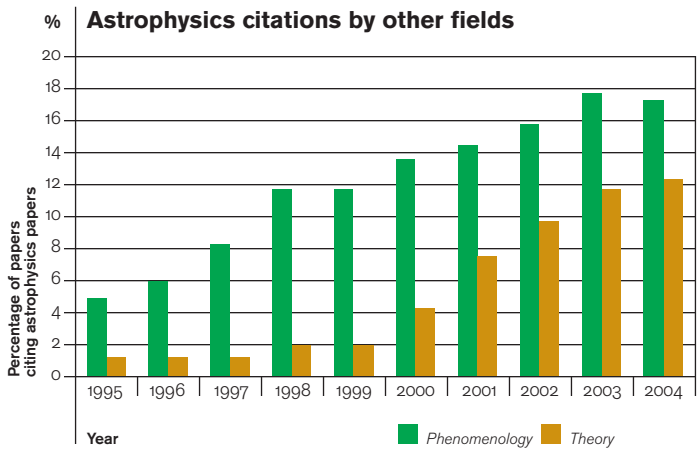
The growing relationship of astrophysics and particle physics is a hot topic these days. In addition to the appearance of new faces and institutions at the labs, the growth of this area of research can actually be seen in the references of particle physics papers.

High-energy physics research papers are usually posted to arXiv.org, and are categorized as Theory, Phenomenology, or Experiment. There are also several other archives, including Astrophysics. Using SPIRES citation data, one can check the fraction of papers in a given category that cite papers from one of the other archives. Because these numbers are limited to arXiv.org papers, there are several omissions. However, they can still give a rough idea of the influence that the various fields have on each other.

While all of the percentages have risen somewhat over the last 10 years, most notable is the rise in citations by theory and phenomenology papers of astrophysics papers (see chart). This increase (a tripling in phenomenology and even more in theory papers) is steeper than the rises seen in other fields and can be attributed, in part, to the growing relationships between astrophysics and particle physics.

Travis Brooks, SLAC

Source: SPIRES



Pixel Art

Inspired by the pixel structure of far away objects in astronomical images, artist Tim Otto Roth uses live scientific data to create visions of science in action. His artwork, entitled *I see what I see not*, relies on data from five laboratories in Europe and North America to illuminate a huge outdoor display of 76 individually controllable panels in Munich, Germany.

In December, he transformed images from the German KASCADE cosmic ray experiment into squares of rapidly changing colors. Projected onto the 700-square-foot array, the artwork becomes "a super-eye, looking for the causes of space and matter."

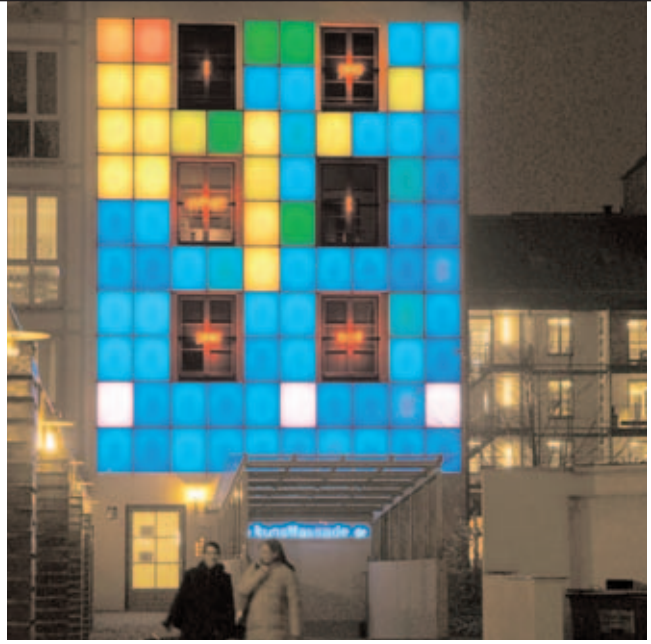


Photo: Tim Otto Roth

Future imagery will rely on data from the particle collider experiments at Fermilab and SLAC, as well as from two astronomical observatories.

Readers can view the images in motion at: www.kunstfassade.de/tor/current_e.html.
Kurt Riesselmann

Letters

symmetry vs. Vikings

Out here in rural Stearns County, Minnesota, I have taken to leaving my copy of *symmetry* on the coffee table. Then when people ask, "Say, what is this all about?" I casually reply, "Oh, that's a little magazine that Fermilab and SLAC send me every month. Would you like to read it?"

Then I quickly change the topic to the latest Viking football game. Unless I am mistaken, people think I'm brilliant.

The fact is, *symmetry* is a challenge and I am honored by your sending it to me. I read the first edition cover to cover and enjoyed Ms. Cole's piece at the end. I was also pleased to find that I had read her book *A Hole in the Universe.*

I must find a way to drop that piece of information into my social conversations.

The magazine is spectacular. But what I want to know is: How can a bunch of science nerds like yourselves be so darn creative?
Roland Froyen
South Haven, Minnesota, USA

Grid to fight cancer

Radiotherapy Grid computing offers an application of high-energy physics research-work-still-in-progress with tangible and immediate clinical utility to the one million Americans who will be treated with radiotherapy next year. The "voices" article from the first issue of *symmetry* does promise a deep and wide resonance indeed.

In a computer simulation, pencil beams of ionizing radiation are directed towards a finely segmented calorimeter. The challenge: determine the optimal aiming of these beams so that a specified amount of energy is deposited to certain target volumes of the calorimeter, while non-target volumes are avoided. For bonus points: run enough particles in the simulation so it results in a sharply defined energy deposition per voxel (volume element).

This is not a proposal to test new particle physics calorimeters, it is cutting edge radiotherapy treatment planning. Patients indicated for radiotherapy are imaged prior to their treatments, usually via computerized tomography. Typical imaging voxel segmentation is a few millimeters.

Cancerous lesions are designated as target-volumes, while nearby uninvolved organs are characterized as targets-to-be-missed. This is a straightforward calculation. Alas, the computer running time needed under realistic clinical conditions, even on a modest size parallel cluster, exceeds a workday. To increase calculation speed, the vast majority of radiotherapy planning is done today with algorithms of intrinsically reduced accuracy.
Dimitri A. Dimitroyannis
Harvard Medical School, USA

Letters can be submitted via letters@symmetrymagazine.org