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The Light Shines on SPEAR3

By Neil Calder

2004 starts with a bang at SLAC with the Dedication Ceremony for the new SPEAR3 facility. Everyone is invited to attend this event, which will pay tribute to all the people around the lab whose contributions led to the successful completion of the project.

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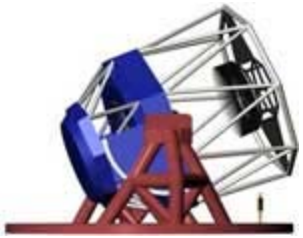
Astrophysics Program Investigates Dark Matter

By Linda DuShane White



Steve Kahn's primary focus as Deputy Director of the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) is to develop major new programs.

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E-165 Reveals True Colors of Light

The Many Lives of Mark II

By Anna Gosline

For 13 years, the Mark II detector sat in retirement at the east end of the Collider Experimental Hall (CEH), patiently waiting to be dismantled. Life was not always so quiet for this 1800-ton feat of engineering glory. Now that it is being dismantled, we reflect again on the detector's glorious past.

See whole story...

Synchrotron Research Reveals How to Remove Uranium from Water

By Heather Rock Woods

A new technology that acts like a giant underground filter is successfully beginning to mop up the uranium contaminating an aquifer in a remote Utah canyon.

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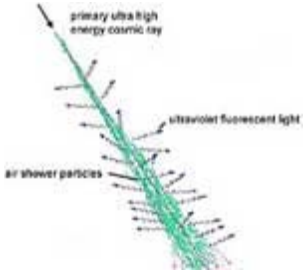
By Anna Gosline



Using electron pulses, a sensitive prism and just the right amount of air, researchers at SLAC have revealed the true colors of fluorescent light triggered by ultra high energy cosmic rays. The results will shed light on an important discrepancy between two recent observations of this energetic phenomenon and provide a solid foundation for future generations of cosmic ray experiments.

See whole story...

Peter Segura Retires

By Paul Bellomo

Pete Segura, (ESD-PCD Technical Manager and Head of Power Systems Operations Support) retired on December 31, 2003, shortly after celebrating his 25th SLAC anniversary.

Segura, who hails from Bisbee, Arizona, became an expert electronics technician while in the Air Force. He migrated to California and earned an AAS electronics degree from Merced College.

See whole story...

Explained

By Emily Ball

Andy Coe (Director of Community Relations, Stanford University) and Jim Inglis (Manager of Design and Construction, Stanford Management Company) came to SLAC in December to present the latest information on the Sand Hill Road Menlo Park Roadway Improvement Project.

See whole story...

New Separate Prescription Drug Benefit by Express Scripts

By Anita Piercey

In an effort to contain the costs of healthcare, Stanford has carved out, or separated, the drug benefit from each of the health plan options (except Kaiser) and created a separate single drug benefit plan, administered by Express Scripts, Inc.

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The Light Shines on SPEAR3

By Neil Calder

2004 starts with a bang at SLAC with the Dedication Ceremony for the new SPEAR3 facility. Everyone is invited to attend this event, which will pay tribute to all the people around the lab whose contributions led to the successful completion of the project. "SPEAR3 is a remarkable resource that will produce state-of-the-art science in numerous fields," says SSRL Director Keith Hodgson. "On this special occasion we look forward to recognizing the people whose extraordinary teamwork made the project successful."

(Photo by Peter Ginter, courtesy of Tech Pubs)

The event will take place in a huge tent in the parking lot opposite the SLAC Guest House. Please be there at 1:45 p.m.—it will be an exciting afternoon!

Speeches

Stanford President John Hennessy, Patrica Dehmer from the DOE, Amy Swain and John Norvell from the National Institutes of Health and Palo Alto Mayor Bern Beecham will make short speeches. SSRL Director Keith Hodgson will round off the official part of the program.

Movies

A special SPEAR movie featuring archival footage and interviews will be shown before and after the speeches.

Tours

This is your chance to walk around the new accelerator with a guide from SSRL. Sign up for a tour outside the tent.

Celebration

Join us for the food and beverages that will be served in the tent following the Dedication.

Start Up

The accelerator start-up will be simulated using sound, light, video, thousands of balls, shovels and a wheel barrow! Curious? Don't miss the full production on the afternoon of Thursday, January 29. RSVP for the event

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Voices on SPEAR3

By Kate Metropolis

Bob Hettel, Head of Accelerator Systems Department (SSRL's) and Deputy Director of SPEAR3 project:

(Photo by Nicolle Rager)

"The project started off as a very modest upgrade to SPEAR2, based on an idea from Helmut Wiedemann and an initial low emittance lattice design created by one of his graduate students more than a decade ago. It was most gratifying to receive funding jointly from DOE and NIH, administered by the DOE. Thanks to a ground-breaking collaboration between those two agencies, we were able to build a much better machine.

"We are proud of a number of new technical developments that made the project more than just building another light source. These innovations were done largely in collaboration with other SLAC groups in areas including vacuum, magnets and supports, power supplies, rf, and instrumentation and controls and alignment.

"Two very challenging aspects of the project were one, SPEAR3 had to fit into the SPEAR2 footprint, which imposed many constraints in component and lattice design; and two, SPEAR3 had to be installed in a very short time frame (about seven months), a task that most outsiders (and some insiders) viewed with quite some skepticism.

"The rapid success of commissioning, where we were able to accumulate beam in a few days, is a real testimony to the whole SPEAR3 project staff and to the accelerator physics and engineering groups in collaboration with the ALS accelerator group. I think more has been learned about the SPEAR3 optics in the last couple of weeks than was learned in years of working on SPEAR2."

Richard M. Boyce, SPEAR3 Project Engineer for mechanical systems and manager of the eight-month long installation:

"This has been a very, very enjoyable experience. The dedication of the SSRL and SLAC staff is extraordinary. I never hesitate to ask a question, because there are so many people around who can assist me. They are very knowledgeable, talented people. You just give them the authority and a little bit of direction, and they can do anything."

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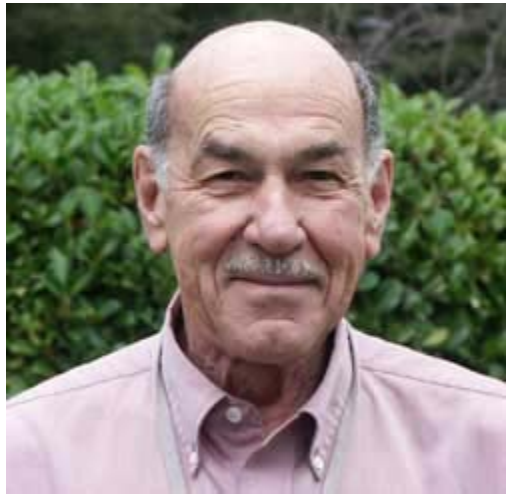
Tom Elioff, Project Director for SPEAR3 design and construction:

(Photo by Nicolle Rager)



(Photo by Nicolle Rager)

"There were three main elements that made the project a success.

"First, SPEAR3 had a top-notch staff overall. We had the best group leaders for the various technical systems within the Laboratory from both SSRL and SLAC. On the SLAC side, the experience of the recent PEP-II project with some similar technical systems was extremely beneficial, while SSRL provided the knowledge and experience for design and the requirements for overall operational needs.

"Outside collaborations, especially the one with the Institute for High Energy Physics in Beijing (IHEP) where all the magnets were constructed, were outstanding.

"Second, the group leaders provided very good technical and schedule planning.

"Third, we were lucky to get our funding requirements on time and appreciate the support of both NIH and DOE (perhaps a first joint funding effort for such a project). There was a good and beneficial relationship with DOE throughout the project."

Uwe Bergmann, *ex officio* Chair, SSRL Users' Organization Executive Committee:

"SPEAR3 is the newest of the third-generation synchrotron radiation facilities. It's remarkable that the same infrastructure that housed the first multi-GeV synchrotron ever used now houses one of the top rings in the world. Even more remarkable, electrons are already stored at SPEAR3 after a shutdown of less than nine months.

"What does SPEAR3 mean?

"For users, in all different fields, it means they can collect data about 50 times faster than before, or tackle projects about 50 times more difficult. If it takes you one week to collect data for an experiment, it may not be practical to do that experiment. But if you can get your data in just three hours, then that can change

things.

"SPEAR3 also means that we can develop new techniques for using synchrotron light, so that whole classes of experiments that haven't been done here before can now be conducted. The new techniques include microbeam probes, so. x-ray emission, and advanced spectroscopy with high resolution."

(Photo courtesy of Uwe Bergmann)

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SPEAR3 Dedication Ceremony Program

January 29, 2004

1:45 PM

Tent Open for Seating

2:00 PM

Start of Dedication

Welcome by Jonathan Dorfan, SLAC Director

John Hennessy, Stanford University President

Patricia Dehmer, Associate Director, DOE Office of Basic Energy Sciences

Amy Swain, Health Scientist Administrator, National Institutes of Health

John Novell, Protein Structure Initiative Director, National Institutes of Health

Bern Beecham, Mayor of Palo Alto

Keith Hodgson, SSRL Director

3:00 PM

Accelerator Start Up Ceremony

3:15 PM

Refreshments and Tours

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Illuminating Facts about SPEAR3, its Predecessors and Laboratory

By Heather Rock Woods

• SPEAR3 is built within the same curved walls of the original SPEAR machine. Built in 1972 for SLAC's particle physics program, and upgraded to SPEAR2 in 1974, it yielded two Nobel prizes in particle physics (Burton Richter's charm quark and Martin Perl's tau lepton).

• During the upgrade and rebuild, SPEAR2 was almost completely dismantled (including the floor) to make way for its successor.

• The scientific user community had to wait a mere 11 months from when SPEAR2 was shut off to when SPEAR3 comes on-line March 2004, a remarkably speedy schedule for such a complex and comprehensive rebuild of an accelerator.

• Thirty years ago, SSRL was the first laboratory in the world to use storage ring based synchrotron x-rays for studying matter at atomic and molecular scales. SSRL was also among the first to operate as a user facility, offering beam time to a broad user community of scientists from academic, industry and government labs on a peer reviewed proposal basis.

• Synchrotron radiation was originally considered a nuisance to particle physicists because it decreased the particles' energy. The far-sighted founders of SSRL siphoned off the unwanted radiation, realizing they had the world's most intense x-ray source, many times more powerful than any conventional x-ray sources could ever produce.

• In 1990, the SPEAR machine was turned over solely to synchrotron radiation research.

• The ring is one-fourth kilometer in circumference and 80 meters in diameter. Its x-ray beams can be used to take images on the sub nanometer scale (one billionth of a meter).

• The synchrotron radiation illuminates everything from radioactive material to the workings of DNA. What researchers see can help them design drugs, gauge the toxicity of environmental pollution and overcome impurities in high-tech materials like silicon chips.

• SSRL expects to operate SPEAR3 24/7, 10 months a year, delivering hard and soft x-rays and ultraviolet light to 32 experimental stations.

• The major milestone of first electrons circulating around SPEAR3 occurred on December 12, 2003.

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• Innovations: SSRL has pioneered many new technological and scientific developments in synchrotron research, including permanent magnet wigglers and undulators, synchrotron structural biology (including MAD phasing, XAS, photoemission) and other new techniques for surface and intersurface studies. These advances helped spawn some 50 second- and third-generation synchrotron light sources around the globe.

•Since 1974, SSRL has served over 5,600 unique users (many scientists return for multiple experiments) and users have reported results in more than 6,000 publications.

•Tech notes: The SPEAR3 storage ring will produce beams having one to two orders of magnitude higher brightness and flux density than the old SPEAR2 ring, accommodate many new high performance insertion devices and beam lines, and—with time—become capable of top-off operation by virtue of its improved at-energy injection system. Brightness for new undulators exceeds 10^{18} at 5 keV.

• Operations and Development: SSRL is supported by the DOE Office of Basic Energy Sciences and the SPEAR3 upgrade jointly funded by DOE-BES and NIH. The SSRL Structural Biology Program is supported by the DOE Office of Biological and Environmental Research and NIH.

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Astrophysics Program Investigates Dark Matter

By Linda DuShane White

Steve Kahn's primary focus as Deputy Director of the Kavli Institute for Particle Astrophysics and Cosmology (KIPAC) is to develop major new programs. "As is essential for scientific programs at SLAC, two programs have been presented to and approved by the Experimental Program Advisory Committee (EPAC) in November 2003. So we have the green light to go forward," explains Kahn. These two programs are cornerstone elements of the new Kavli experimental program. Both are in the early stages, and both involve relatively substantial programs in experimental cosmology performed at SLAC. "Both of these projects are very visible national projects that have a prominent role in U.S. programs," Kahn added.

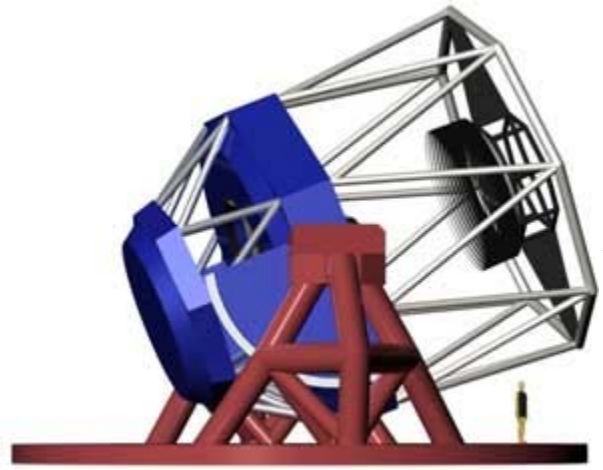

Image of the LSST facility, one of two major approved programs in experimental cosmology. *(Image courtesy of G. Muller/C. Claver, NOAO/AURA/NSF)*

The first of these programs is the Joint Dark Energy Mission (JDEM), an acronym that was created by the program coordinators—NASA and DOE. Originally initiated by LBNL, SLAC is now collaborating on JDEM. Some readers may know this program by its former name, the Supernova/Acceleration Probe (SNAP) Mission.

According to Kahn, the mission is designed to explore the physics of dark energy, one of the great mysteries in cosmology that have come up in the last five years.

Universe Expansion

JDEM is a space-based experiment designed to measure the expansion history of the Universe, motivated by the discovery that the expansion is accelerating.

"The expansion of the Universe implies the existence of an energy field which effectively gains energy as the Universe expands," Kahn notes. "We have no current physics idea about where this comes from." As always in science, questions lead to more questions. Other scientific aspects of JDEM include looking at gravitational lensing. There will be an optical telescope in space and what is basically a large camera that takes pictures of the sky.

SLAC will provide most of the electronics that make the camera work, as well as the flight software and flight computer that will control the whole unit. Currently there are only a few people working on JDEM, but Kahn predicts that 20 people will eventually work on this significant project. The estimated launch date is 2014.

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Surveying the Sky

Kahn describes in fascinating detail the second project—the Large Synoptic Survey Telescope (LSST)—another way of learning about the intriguing field of dark energy and dark matter. LSST is a very large ground-based telescope that can take pictures of the sky over a very wide field, and is a joint collaboration of NSF and DOE. LSST will survey the entire sky every few days down to very faint levels.

"The science here is to use the distortion of background galaxies due to gravitational lensing," said Kahn. There is dark matter in the Universe and the light from distant galaxies propagates to us. It gets slightly bent by the intervening gravitational matter which you can see by looking for correlated distortions in the sky. Those distortions will tell you about the dark matter and the clumping of the dark matter. How concentrated it is tells us about the expansion history of the Universe.

The entire camera will be built here at SLAC—and what a camera it will be. Kahn explains, "This is large—bigger than any camera built before in astronomical work—and it will be almost comparable in size and complexity to the inner regions of an accelerator detector. So that's why a lot of the SLAC experience in building detectors for high energy physics is applicable to this project." Five or six people are now working on this project, and it will probably end up with 15-20 people. SLAC is the lead DOE laboratory on this project with collaborators at LLNL and at BNL, as well as university based high energy physics groups.

This incredible camera will take deep, wide pictures of the sky every ten seconds, thereby covering the entire sky every few days. Befitting such an amazing invention, "We've been calling it celestial cinematography," Kahn says.

We are indeed fortunate at SLAC to have KIPAC provide the opportunity to delve deeply into mankind's age-old questions about the Universe via JDEM and LSST. The resultant deeper understanding of dark energy, dark matter and the Universe itself will prove not only fascinating, but enchanting, to scientists and non-scientists alike.

For more information see: http://www-group.slac.stanford.edu/kipac/

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Synchrotron Research Reveals How to Remove Uranium from Water

By Heather Rock Woods

A new technology that acts like a giant underground filter is successfully beginning to mop up the uranium contaminating an aquifer in a remote Utah canyon. Uranium contamination in groundwater is a serious problem because the toxic metal can travel long distances in underground aquifers, which are vital sources of fresh water for people, animals and agriculture.

Installation of the apatite PRB at Fry Canyon, Utah. *(Photo courtesy of John Bargar)*

Recent research at SSRL showed that the filters—called PRBs for permeable reactive barriers—intercept uranium in an unexpected way. This fundamental knowledge has important implications and serves as the latest example that many environmental cleanup ideas work differently in reality than in theory.

"We knew that the barriers worked to stop uranium, now we know how they work. We can use this information to predict how long they will work and what the costs will be," said John Bargar (ESRD), molecular environmental scientist at SSRL. "This information is necessary to compare this concept to other technologies and to select and engineer new designs."

Originally, scientists thought uranium would react with a mineral—called apatite—in the filter to form an inert mineral that would effectively remove uranium from the water. This general concept has worked well for lead and cadmium contaminated soils. Apatite is also the mineral that makes up the teeth and bones in all vertebrate animals.

To verify this hypothesis, Bargar and two colleagues, Christopher Fuller and James Davis from the US Geological Survey in Menlo Park, used x-ray diffraction and EXAFS spectroscopy, both of which are synchrotron-based techniques. They were surprised to find that uranium adsorbs, or sticks, to the surfaces of apatite, rather than chemically reacting with it to make the new mineral.

The team studied samples created in a lab as well as samples from Fry Canyon, Utah, where several government agencies (USGS, EPA, DOE and BLM) are collaborating to demonstrate PRB technology in a shallow aquifer contaminated by an abandoned uranium-ore processing plant. Numerous sites throughout

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America, particularly in the Four Corners area and Wyoming, are contaminated with uranium and other radionuclides as a result of mining, milling and other industrial processes.

"It's really unacceptable to have polluted watersheds. This is a clear example of how synchrotron techniques can be used to solve a very practical problem regarding the clean up of uranium contamination in aquifers," said Bargar.

The field demonstration also shows that PRBs will need to be monitored over time to ensure they are still working. Apatite was the best hope yet for encapsulating uranium through chemical reaction into a mineral, providing a way to permanently remove uranium's threat. Still, scientists are happy that apatite does trap uranium, with the advantage that there is no new mineral precipitate that could clog up a PRB.

One key area to investigate now is how much uranium the PRBs can trap and for how long before it gets re-released under certain conditions (e.g. a change in groundwater acidity or saturation of the barrier).

"Field tests are really the only way to evaluate the useful lifetime of any PRB," said Fuller. "A number of kinds of barriers are being studied around the country. However, knowledge of the contaminant removal process is critical to designing an effective PRB with sufficient lifetime necessary for real world applications."

Monitoring the apatite PRB at Fry Canyon will continue for at least three more years.

For more information, see: http://www-ssrl.slac.stanford.edu/research/highlights_archive/u_ha_prb.html

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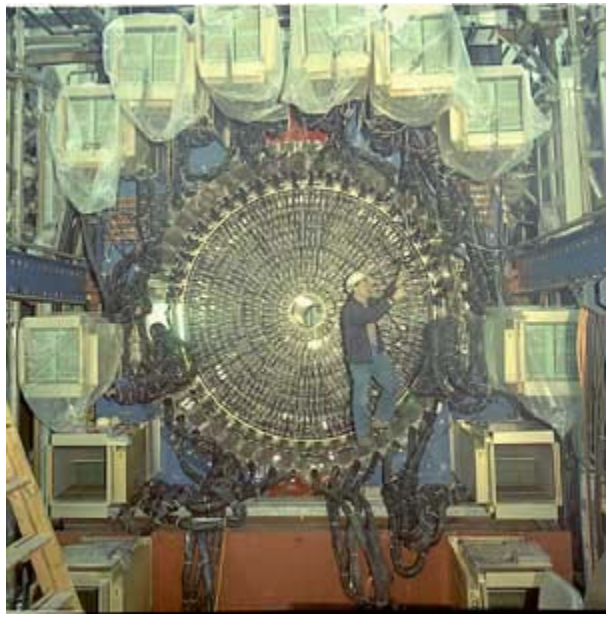
The Many Lives of Mark II

By Anna Gosline

For 13 years, the Mark II detector sat in retirement at the east end of the Collider Experimental Hall (CEH), patiently waiting to be dismantled. Life was not always so quiet for this 1800-ton feat of engineering glory. Now that it is being dismantled, we reflect again on the detector's glorious past.



Sean Dyer (retired EFD) outfitting Mark II for SLC run. *(Courtesy of Tech Pubs)*

Constructed in part with steel salvaged from a sunken Pearl Harbor battleship, Mark II was installed in three different locations, survived a massive earthquake and saw reams of important physics whose legacy can still be felt in the halls of SLAC today.

Mark II had big shoes to fill upon installation at SPEAR in 1977. Its predecessor on the beam line, Mark I, was the revolutionary cylindrical detector that saw not one but two Nobel Prize winning discoveries: the charm quark and the tau lepton. The discovery of these two particles is responsible for our current understanding of the different generations, or families, of matter that exist at successively higher energy levels.

"Mark I blew the lid off particle physics. There was a lot of important complementary work that followed the discovery of the tau and the charm, which was done with Mark II," said SLAC Director Jonathan Dorfan, who was a spokesperson for the Mark II experiments from 1980 to 1989.

Mark II was similar to its older brother in basic design, but was much more sensitive. "Mark II was a large improvement from all concepts of Mark I," said Vera Luth (EC), who worked with both detectors. "It could measure neutral particles, like photons, really well and was much better at detecting leptons." These improvements allowed physicists to make a detailed study of the charm meson as well as to describe several different decay modes of the tau lepton.

"Those decay modes were interesting at the time because people weren't quite convinced that there was a tau," said John Jaros (EA).

The Lifetime of a Particle

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After its brief stint at SPEAR working with energies from 3-7 GeV, in 1979 Mark II found a new home in the 28 GeV PEP storage ring. Its job there was, among many other things, to measure the lifetimes of the tau, the charm and the B-meson. In 1981, Jaros and his group added a new piece of hardware called a vertex detector, which made these measurements possible. This precise central device gave physicists the ability to trace particle tracks back to the original point of decay

"The tau particle lifetime was well predicted by theory. But we didn't know what the B-meson lifetime would be. The prejudice was that it would be very short. It turned out to be incredibly long. That was really surprising," said Jaros.

The lifetime of the B-meson determined a crucial missing parameter of the Standard Model. Its unexpected length is also the key to the B Factory physics program at SLAC today.

On the Move Again

After Mark II's successes at PEP, it was on the move again in 1987. This time to the 50 GeV Stanford Linear Collider (SLC)—the world's first electron-positron linear collider, built to produce and study Z-bosons.

The hulking detector was removed from PEP and lowered by crane into the SLC pit. Dorfan remembers looking down at the dangling detector from an office high up in the CEH. "It was nerve-wracking to watch the crane inch across the 65 foot deep collider hall pit," he said. "The whole experiment was hanging by a chain. If it was dropped, I was responsible. And they decided to leave it hanging there overnight."

Despite this precarious picture, Mark II's installation at the SLC went smoothly. It began taking data in 1989. A great consortium of physicists had worked diligently to upgrade Mark II for the SLC. The silicon vertex detector, a technology now used in BABAR, was pioneered in Mark II during this time. In addition, a high precision drift chamber, packed with a tremendous number of fine wires, was installed to back up the vertex detector. Together, these hardware additions could adeptly sense particles fleeing from the interaction point.

In November 1989, the hard work of the Mark II and SLC teams paid off when they published research that limited the families of matter to three, answering the nagging question first posed after the revolutionary discoveries made with Mark I in the 1970s. "It was certainly very competitive, but we did have the first significant measurement limiting the number of neutrino particles to fewer than four," said Dorfan.

After its final moments of glory, Mark II was rolled off the SLC beamline in 1990, soon to be replaced by the much larger and more complex Stanford Large Detector (SLD) in 1991.

Now, under the supervision of Sandy Pierson (RD), Mark II is being torn down. Some of the battleship steel will be saved, perhaps to be used for the next generation of outstanding SLAC detectors.

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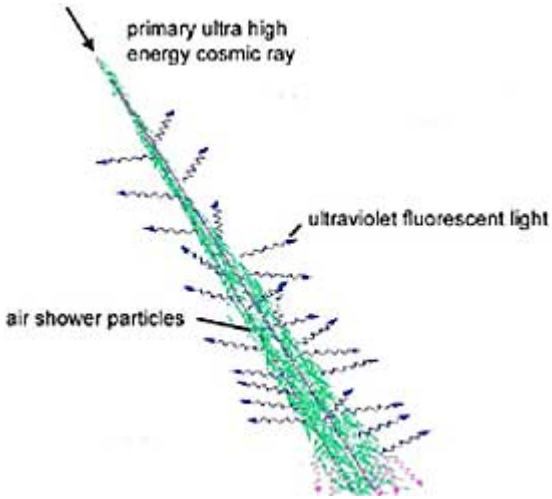
E-165 Reveals True Colors of Light

By Anna Gosline

Using electron pulses, a sensitive prism and just the right amount of air, researchers at SLAC have revealed the true colors of fluorescent light triggered by ultra high energy cosmic rays. The results will shed light on an important discrepancy between two recent observations of this energetic phenomenon and provide a solid foundation for future generations of cosmic ray experiments.

Cosmic rays—usually elementary particles or nuclei—zip through the Universe at the speed of light. They have been detected with energies in excess of 10^{20} electron volts (eV)—millions of times greater than any accelerator can create on earth. The origin of these ultra high energy rays remains an astrophysical mystery.



Schematic drawing of an air shower. As the primary ultra high energy cosmic ray hits the Earth's atmosphere, it rapidly decays into a cascade of thousands of lower energy particles, like electrons. The particles excite gas molecules, causing them to emit ultraviolet fluorescent light.

Initial Results Vary

Adding to the mystery is a discrepancy between two experiments in the observed abundance of extremely rare cosmic rays in the ultra high energy range (greater than 10^{20} eV).

The High Resolution Fly's Eye (HiRes) Experiment in the U.S. lead by the University of Utah and the Akeno Giant Air Shower Array (AGASA) in Japan exploit different techniques to detect and measure cosmic rays through what is known as an air shower—the multiplying cascade of decaying particles set off when an ultra high energy cosmic ray hits the earth's atmosphere.

AGASA reconstructs the initial cosmic ray using detectors that collect air shower particles that fall to the ground. HiRes determines the energy of an event based on the total amount of ultraviolet light emitted by atmospheric gas molecules after they are excited by air shower particles, a technique called air fluorescence.

Now, in an international collaboration that includes members from SLAC, the Center for Cosmology and Particle Astrophysics (CosPA) in Taiwan, and HiRes (University of Utah, the University of Montana, Rutgers University), researchers are using the unique controlled laboratory environment at SLAC to investigate a

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potential source of the discrepancy on the UHECR spectrum at the very high energy regime. A precision measurement of a spectrally resolved air fluorescence yield, such as what they intend to do in E-165, will hopefully shed some light on this existing discrepancy between AGASA and HiRes results.

"There was a real need for independent calibration of air fluorescence. Laboratory experiments can have such importance to direct detection," said Pisin Chen (ARDA), who, together with Pierre Sokolsky of Utah, leads the SLAC experiment E-165, called FLASH (Fluorescence in Air from Showers).

To make complete and accurate measurements of the light spectrum in the first phase (Thin Target phase) of E-165 during their September 2003 run, the team shot pulses of 28.5 GeV electrons from the Final Focus Test Beam through a gas-filled chamber. While the air chamber is not long enough to trigger an air shower, the electrons induced the gas to emit fluorescent light.

"Even though we don't let the particles shower in our Thin Target run, they still trigger fluorescence production and we are able to measure the precise number of photons produced per particle. By not letting it shower we know exactly what goes in and what comes out," said Kevin Reil (ARDA), a post-doctoral researcher on E-165.

Light production was tested under a variety of conditions. The chamber was filled alternately with pure dry air, pure nitrogen, different mixtures of oxygen and nitrogen, as well as 'SLAC air' (which includes various impurities like water vapor).

After shooting out from the gas molecules, the photons of light were then sent through a series of narrow band filters and amplified by a photo-multiplying tube before being measured. Each filter transmits only a narrow range of ultraviolet light, yielding a measurement of the total light produced along the spectrum.

To confirm the shape of the spectrum in a separate setup, light was sent through a spectrograph, which acts like a prism to separate the light into small wavelength bands, producing an almost continuous picture of fluorescence.

While Chen cautions that small deviations in the resolved fluorescent spectra will have some impact on energy calculations, the initial results support the measurements made by the air fluorescence method at HiRes.

The results could have vast importance to the 3,000 square kilometer Pierre Auger project in Argentina, which has already begun limited operation and is due for completion in 2005. This hybrid cosmic ray experiment combines both air fluorescence and ground array detectors.

Further Implications

"The precise measurement of this spectrum goes way beyond the HiRes, AGASA and Auger," Chen said. "Knowing the spectra of air shower fluorescence will have further implications for future generation of space based cosmic ray experiments."

Air fluorescence will be the only available technique for cosmic ray detectors placed on satellites, like NASA's proposed OWL project and the joint US-European EUSO project. While air fluorescence is traditionally conducted in the desert, where humidity is extremely low, these projects will likely focus on air showers that fall over oceans in order to reduce contamination of background light. Until now, researchers didn't know exactly how water vapor would impact the production and quality of cosmic fluorescent light.

"NASA is very interested in our fluorescence results under various levels of humidity," Chen added.

Air Shower Models

In the next phase of the SLAC experiment, Chen and his team will shoot the same electron pulses through a ceramic material called alumina. Using different thicknesses of this dense material, they will recreate the progress of full air showers at various depths through the atmosphere. This experiment will test models of air shower development and give scientists an astonishingly intimate look at the cascade of particles and the fluorescent light they trigger.

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Sand Hill Roadway Improvement Project Explained

By Emily Ball

Andy Coe (Director of Community Relations, Stanford University) and Jim Inglis (Manager of Design and Construction, Stanford Management Company) came to SLAC in December to present the latest information on the Sand Hill Road Menlo Park Roadway Improvement Project. The project includes many initiatives to be carried out over the next two years. There is a possibility that work will be delayed by a year, starting Phase One in 2005. If all goes according to plan, the project schedule follows.

2004

Pre-construction Activities, Clearing & Utility Work (Jan – Apr) Phase One Roadway Construction (Apr – Nov) Sand Hill Road widening, golf course reconfiguration and parallel bridge construction (four lanes from I-280 to Stanford Shopping Center) Alpine Road/Junipero Serra (interim intersection) improvements

2005

Pre-construction Activities, Clearing and Utility Work (Jan – Apr) Phase Two Roadway Construction (Apr – Nov) Santa Cruz Ave widening (closed between Sand Hill Road & Junipero Serra Blvd) Complete Intersections: Junipero Serra Blvd/Alpine Rd/Santa Cruz Ave & Sand Hill Road/Santa Cruz Ave

The work on affected intersections will include extended bike lanes, additional dedicated left-turn lanes, and improved pedestrian crossings. Stanford University is not only funding the project, but also giving up significant real estate to make room for expanded roadways.

Stanford University intends to minimize disruption and inconvenience during construction, and to be responsive to issues as they arise. For more information call the Project Information Hotline (650-306-0350). In the future, periodic updates will be posted at: http://www.stanfordmanage.org

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SLACSpeak Book Back in Print

The third edition of SLACSpeak, a dictionary of terms and acronyms used in all areas at SLAC, has been reprinted. It is now available at the Library Circulation Desk. The paper edition has been produced for use by those on site who do not have ready access to a computer at those moments when their need for a definition or explanation strikes.

SLACSpeak is also a continuously updated database, that is available via the Web at: http://www.slac.stanford.edu/find/slacspeak

Maintained by SLAC's Archives and History Office, this database attempts to comprehensively cover all areas of SLAC work which generate their own terms and acronyms. Suggested additions are always welcome and can be proposed on-line at: http://www.slac.stanford.edu/spires/slacspeak/add_term.html or by e-mail to jmdeken@slac.stanford.edu.

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Traffic Control Program

By Anna Gosline

SLAC's Traffic Control Program is still in effect. With the start of a new year, everyone at the Lab should remind themselves to be courteous and responsible drivers.

Robbie Robertson (SEC) is one of the many security officers who helps keep SLAC safe. (Photo by Diana Rogers)

"This program is designed for the protection of all people at SLAC. We need to follow the basic rules of the road here just as we do on city streets or highways," said Rick Yeager, Head of Safeguards and Security.

The key to the program is vehicle registration. All employees, longtime users or contractors must register their vehicles with Security. Color-coded numbers on windshields or rear view mirrors let security personnel inform vehicle owners when something goes awry with their cars, like parking lot accidents, oil leaks or when headlights are left on. Registered vehicles also gain more rapid access to the site during non-business hours.

Registration numbers also help security personnel identify vehicle owners who aren't obeying the rules. Under this program, Safeguards and Security personnel can issue two types of citations: parking violations and moving violations (such as running stop signs, speeding or not stopping for pedestrians). Penalization increases in severity for these actions as an individual accumulates citations in a 90-day (parking violations) or 180-day (moving violations) period.

Yeager reports that since Safeguards and Security began monitoring speed with random radar checks, the average on-site speed has dropped from 40 mph to 32 mph. He hopes that this program will give people the added push to keep their speeds at 25 mph, which is the posted speed limit.

"25 miles per hour has been determined to be the safest speed for the site for pedestrians, cars and wildlife," said Yeager.

With the cooperation of everyone at SLAC, we can keep traffic running smoothly and safely for years to come.

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Peter Segura Retires

By Paul Bellomo

Pete Segura, (ESD-PCD Technical Manager and Head of Power Systems Operations Support) retired on December 31, 2003, shortly after celebrating his 25th SLAC anniversary.

Segura, who hails from Bisbee, Arizona, became an expert electronics technician while in the Air Force. He migrated to California and earned an AAS electronics degree from Merced College.

Peter Segura wraps up his work prior to retirement. *(Photo by Paul Bellomo)*

Segura joined SLAC in 1978 when the high energy physics program consisted of the linac, four Research Yard beam lines and SPEAR. Later, he was instrumental in getting the Positron-Electron Project, the Stanford Linear Collider, the Final Focus Test Beam and PEP-II commissioned.

During his first 15 years at SLAC Segura wrote troubleshooting procedures for pinpointing ground faults in string magnet circuits. He also designed and fabricated mimic panels for large magnet power supplies. In 1999 he became the Deputy Head and in 2002 the Head of Accelerator Maintenance East and West. In one form or another, he was responsible for the upkeep of all SLAC power conversion systems. Concurrently, Segura served as the project manager for fabricating and installing new 2.5 megawatt, 90kV RF klystron power supplies for PEP, the klystron test laboratory and SPEAR.

A large measure of SLAC's success over the past two decades is attributable to Segura. He was the soul of the Power Conversion Department and was very well liked and respected. He will be sorely missed. Everyone wishes him good luck and a long and happy retirement.

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Coat and Blanket Drive a Big Success

By Barbara Mason

SLAC's participation in our first Coat and Blanket Drive was a tremendous success.

The generosity of our colleagues was truly unbelievable. The idea was supported by a team consisting of Linda Ahlf (HR), Kay Ganapathi (TD), Thanh Ly (DO) and Barbara Mason, Claudia Ransom, Erin Smith, and Barry Webb (all HR).

The coats and blankets received were donated to the Ecumenical Hunger Program in East Palo Alto and the Chinmaya Mission in San Jose. These organizations were picked for their continual service to people in local communities.

The committee would like to take the opportunity to thank all coat and blanket donors.

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Service Awards

5 Years

Corpus, Josefina (PUR), 1/16

Elioff, Tom (SPEAR3), 1/16

Escudero, Laurie (BU), 1/05

Nagahashi, Naomi (NLC), 1/16

Pereira, Carlos (SEM), 1/05

Phee, Jocelyn (PUR), 1/16

Puig, Joseph B. (SCS), 1/05

Weisskopf, John (SCS), 1/16

10 Years

Cai, Yunhai (ARDA), 1/18

Hewett, Joanne (THP), 1/01

Rizzo, Thomas (THP), 1/01

Yang, Kenneth (SEM), 1/04

Yan, Yiton (ARDA), 1/10

15 Years

Chatwell, Maura (COM), 1/25

Flick, Irene (SEM), 1/16

Hudspeth, Carl (EFD), 1/09

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Krejcik, Patrick (LCLS), 1/01

Langeveld, Willem (SCS), 1/01

Nguyen, Andy (KLY), 1/23

Vizmanos, Gerardo (MD), 1/30

20 Years

Benne., Brian (ESD), 1/04

Carr, Roger (ESRD), 1/01

Himel, Thomas (NLC), 1/01

25 Years

Bechtel, Carol (HR), 1/01

Griffin, Levirt (MET), 1/29

Gruber, Shirley (SCS), 1/15

Melen, Randal (SCS), 1/15

35 Years

Fieguth, Theodore (EFD), 1/20

Hostetler, Thomas (ESRD), 1/10

Retired

DeLaCerda, Abel (SEM), 12/10/03

Segura, Pete (ESD), 12/31/03

Deceased

Hale, Charles J. (formerly with SEM), age 81, passed away on January 6, 2004

To submit a Milestone, see: http://www.slac.stanford.edu/pubs/tip/milestoneindex.html

See Awards and Honors at http://www.slac.stanford.edu/slac/award

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New Separate Prescription Drug Benefit by Express Scripts

By Anita Piercey

In an effort to contain the costs of healthcare, Stanford has carved out, or separated, the drug benefit from each of the health plan options (except Kaiser) and created a separate single drug benefit plan, administered by Express Scripts, Inc. In 2003, each medical plan had a different list of formulary drugs—drugs that are preferred by the plan. Beginning January 1, 2004, all of those lists have been replaced by a single formulary for all Stanford medical options except Kaiser. Kaiser members will continue to use the Kaiser formulary.

If you have not received ID cards from Express Scripts, need replacement ID cards or require general assistance with your prescription benefit, please call the Express Scripts customer service toll-free number (1-866-454-7137). The ID card lists the employee's name only; your eligible dependents are included under your account.

If you require a prescription to be filled and do not have your Express Scripts ID card with you, the pharmacy can verify your prescription coverage by calling the Express Scripts Pharmacy Help Line (1-800-824-0898).

You can also view your personal prescription profile, look up formulary drugs, or request mail-order service by registering (establishing your own username and password) on the Express Scripts Web site at: http://www.express-scripts.com

For 2004, prescription drug copays remain unchanged as follows:

Pharmacy 30-day supply

Generic $10

Brand Name $20

Non-Formulary $40

Mail Order 90-day supply

Generic $20

Brand Name $40

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Getting Material Safety Data Sheets from the Web

By Joseph Kenny

Step 1: Get into your Web browser.

On your computer's desktop, click twice on the Internet Explorer or Netscape icon.

Step 2: Go to MSDS-Search page.

In the address field near the top of the window type http://www.slac.stanford.edu/esh/reference/msds.html and press Enter. You can set a bookmark or a favorite to speed future access.

Step 3: Choose an MSDS search engine.

A number of MSDS search choices will be in green underlined lettering in the middle of the page. The SLAC SEM Searchable MSDS Database (https://www-internal.slac.stanford.edu/sem-msds/bin/SEM-MSDS.asp) and the Stanford Electronic MSDS System (http://www.stanford.edu/dept/EHS/prod/MSDS) are both excellent resources.

Step 4: Follow the search engine directions.

Most MSDS search engines will have you enter the name of the material and perhaps the material's manufacturer. When an MSDS comes up, be sure the name matches your material exactly. (For instance, two percent sulfuric acid and sulfuric acid, concentrated are very different materials.)

Questions? Call the Safety, Health and Assurance Department, Ext. 3517.

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Excavation Clearance Form: What is it All About?

By Eva Dusek

If you have ever done excavation work at SLAC, you are probably familiar with the Excavation Clearance Form. The form, along with instructions and background information, can be found on the Web at: http://www.slac.stanford.edu/esh/forms.html

The Excavation Clearance Form helps you complete your project safely and protect the environment during excavation work. It is required for all excavation projects at the Lab.

Fill It Out Before You Dig

One of the greatest hazards during excavation work is accidental contact with utility lines. When you submit an Excavation Clearance Form, the Mechanical Design-Facility Design Services (MD-FDS) group completes the Utility Survey section and provides you with maps of all documented underground utilities that are in your excavation area. Because locations of utilities shown on maps are approximate, a utility line locator may also need to locate and mark utilities in the field. MD-FDS can assist you with this process by arranging for a private locator to come on site to locate and mark utilities in your excavation area.

Protect Yourself from Things You Cannot See

Potentially harmful chemicals ranging from metals such as lead to oils and solvents may be in the soil where you will be working. It is important to know what kinds of chemicals you might encounter so that you can protect yourself and your co-workers. Excavated materials should also be managed properly to protect the air and nearby streams. The Chemical Survey portion of the form gives information to help protect both workers and the environment.

SLAC's high energy physics research results in radiologically activated materials. In areas where activated soil or other materials could be encountered during excavation, please pay special attention to recommendations provided in the Radiological Survey portion of the form. SLAC has several miles of underground tunnels that are covered with at least 25 feet of soil to shield humans and animals from radiation generated within the tunnels. If your excavation area is near one of these tunnels, it will be important for you to pay special attention to the Radiation Safety Survey Beam Lines portion of the form.

Timely Tips

•Be sure to indicate on the form exactly where you plan to dig and the depth to which you will dig.

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• Review the comments on the form so that you can protect yourself, workers and the environment.

• Remember to have the form at the worksite during excavation work.

• Submit a new form if the limits of your excavation expand or deepen.

Contact Eva Dusek (Ext. 3025) or Mike Hug (Ext. 4042) with any questions or comments about the Excavation Clearance Program.

The Stanford Linear Accelerator Center is managed by Stanford University for the US Department of Energy

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Winter Holiday Celebration

By Linda DuShane White

The Feast of Joy, SLAC's Holiday Party held on December 18, 2003, was the largest ever: 1,200 people made the lunch time celebration a resounding success.

(Photos by Diana Rogers)

Jeff Machado catered the delicious food which included turkey, ham, stuffing, ravioli, roasted vegetables and desserts, desserts and more desserts. Stephan Davies (MD) said it all in his enthusiastic e-mail to the Holiday Party Committee when he wrote, "The food at the buffet—I have been at SLAC 12 years now and never, I mean never, has it been that good. And the desserts! Cascading down like that! Even the coffee was good and strong. Everyone had a really good time. We are all feeling really good right now. Please tell your Chef. Thank you for the best buffet yet!"

Top-notch musical entertainment was provided. The Leonard Webb Quartet played, and it was as good as any club in the world. We were treated to hearing Jamie Davis (EE) sing when he made a guest appearance with the Quartet. And if anyone wanted even more entertainment, the movie *Shrek* was playing in Panofsky Auditorium.

Concepcion Zelaya (RD) noted the wonderful holiday atmosphere. "Everyone laughed and enjoyed the fun when Neil Calder (COM) gave out the gifts for the drawing," she said. "Especially when he jokingly said his own name every time a gift certificate from the Stanford Shopping Center came up." Numerous prizes were awarded including turkeys, poinsettias, a gingerbread house, See's candy and themed gift baskets.

Pief Panofsky (DO) won a prize for the first time ever during the raffle. He, and Dieter Walz (EFD) who followed, received a rousing cheer.

"The party was really well organized," noted Jan Louisell (RD). "The Committee did a fantastic job. It went off without a hitch." Louisell also commended the SLAC administration for their generosity in hosting the festivities. "The money was well spent. The party was a great morale booster and put everybody in the holiday spirit."

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Got Kids? Don't Miss Next WIS Presentation

Karen Friedland-Brown

"Talking to Our Children in Troubled Times—Growing up in a Post 9-11 World"

Current Topics such as:

politics, war or terrorism

can be scary to discuss. Come find out how to tackle tough issues and communicate effectively with children and teens.

Tuesday, January 27

12:00 noon – 1:00 p.m.

Redwood Room A&B

ROB, Bldg 48

Friedland-Brown is the Parent Education Coordinator at Parent's Place in Palo Alto and the former director of the Parent Education and Consultation Program at the Children's Health Council. She specializes in limit-setting, sleep issues and social-emotional development. She has expertise in helping couples parent together effectively to build healthy families.

Bring lunch and a friend, everyone is welcome.

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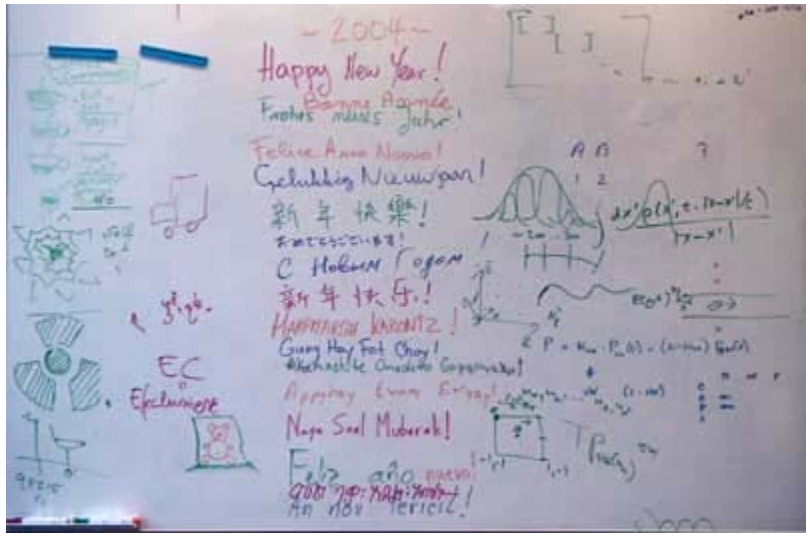
An International New Year

By Harvey Lynch



(Photo courtesy of Harvey Lynch)

It is a new year, and over here in the ROB we have people from many parts of the world. Someone wrote on the white board, "Happy New Year" and soon many other versions were added. Mixed with the greetings are various other things, like instructions for the coffee machine, some discussions of physics, and hardware.

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