EX-Ls
EX-PRESS

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Winter 2006

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The EX-Ls Board of Directors and members gratefully acknowledge the
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Volume 24 #1: Winter 2006
(Published January 2006)

President's Message
John Kadyk

It was with a feeling of awe that I accepted the gavel from Gene Binnall at the last luncheon. He expressed his fondness for that small piece of wood, and I have begun to appreciate how important it was to him in keeping the EX-Ls under control, a challenging prospect that he and the gavel accomplished successfully.

I'm sure that it will be an enjoyable experience during this next year to wield the gavel, and I doubt if it will have to be used directly on any members. At the Board meetings, in fact, I have found everyone very helpful and friendly, and I look forward to getting through the year without many bruises, bloody noses, or black eyes (mine, not yours).

The Board is the working team that has kept this group really functioning so well. Board members volunteer a substantial part of their time toward keeping the EX-Ls a vital organization, with interesting luncheon meetings and talks as well as activities extending to the community and even further afield. An example is the financial contribution made to the American Red Cross as support during the recent disasters (Katrina, specifically), and educational support given through members contributing as fifth grade teaching assistants in an educational outreach program.

It is hard to know in what order to acknowledge and thank the hard working Board members, since they contribute in different ways. However, outgoing president Gene Binnall deserves special thanks and commendation for his leadership this past year (and for relinquishing the gavel). With Gene joining the ranks of the illustrious, and my trying to fill his shoes, we now have new first and second vice-presidents, Janis Dairiki and Jose Alonso, respectively, who have volunteered to carry on the EX-Ls traditions, as I know they will. Janis is responsible for finding luncheon speakers, and I think our next speaker, Bob Stokstad, will be quite interesting. We depend upon Bud Larsh, our treasurer, to keep us financially solvent, and Eleanor Dahl, our meticulous secretary, who sees all and hears all at the Board meetings, and transcribes it all. Tom Beales and Bob Fulton represent us at the CUCRA (Council of UC Retirees Associations) meetings twice per year, and Tom also does another job of enormous importance: negotiating the contract with Spenger's for our luncheons, including meal costs (quite reasonable, don't you agree?), equipment for the luncheon talk, and all the other amenities necessary to make the luncheon proceed smoothly. Dick Baker is our Webmaster, and I hope you log on our website occasionally to see what our group is doing (http://www.lbl.gov/ex-l-express/). Dave Stevens, Editor for our newsletter (EX-Ls Ex-Press) has the very demanding job of putting together announcements, the luncheon reservation coupon, write-ups on varieties of subjects, submitted by members who have had unusual or interesting experiences, changes in membership, group activities, and even the traditional blurbs from your president. [continued on Page 9.]

2006 Winter Lunch

Date: **Thursday, February 16, 2006**

Where: **Spenger's Fresh Fish Grotto**
1919 Fourth St.
Berkeley

Time: **No-host Bar: 11:30 AM**
Lunch Served: 12:00 Noon

Speaker: **Bob Stokstad**

Subject: **IceCube: A neutrino telescope at the South Pole**

Menu: **Bay Shrimp Louie Salad/1000 island dressing (with cup of chowder)**
Grilled salmon (with dinner salad)
Flatiron Steak w/ mushroom demi-glaze (with dinner salad)

Cost: **$20 per person (PREPAID)**

Reservations: **Please make checks payable to EX-Ls. Send to**
Vicky Jared
4849 John Muir Road
Martinez, CA 94553

Spenger's management policy makes it absolutely imperative that they receive reservations by February 13, 2006

(Reservation slip on last page)

From our November lunch

Reported by John Kadyk, EX-Ls First Vice-President Emeritus: Our speaker was Graham Fleming, LBNL's Deputy Director, who spoke on "Berkeley Lab: A view to the future."

At first glance, nothing has really changed at the Lab: 1) we do world-class science, 2)we operate major facilities, and 3) we train the next generation of scientists. UC recently won the DOE contract for managing the Lab for the next period. Part of the contract competition process, called the "orals", involved twelve key personnel on an evaluation board, meeting in Chicago. There were the LBNL contract advocates on one side, and, on other side, the board, along with camera and recording equipment. In the first part of the "exam", the LBNL advocates had to explain the jobs being proposed. This seemed normal. However, the second part seemed "strange": the advocates were given a problem to work on, and the board left, leaving the cameraman and the recording equipment operating in the room while the problem was being worked on (this shed some light on how the team members got along – Steve Chu did not get "slugged" in this session). The problem given was: "If the DOE decides to close one of the multipurpose National Labs, for value to the taxpayer, why should this Lab not be LBNL?" The advocacy group was given an hour to develop a response. At the end of the hour, the advocates were still trying to define the problem, but since process seemed to be at least as important as product in this exercise, the LBNL group passed. Other parts of the exam involved questions similar to: "when did you stop beating your wife?" – hard to answer in a satisfactory manner. The LBNL response described new management, new science strategy, new performance measures and new initiatives, as will now be shown.

The organizational structure of Lab has four sciences areas – 1) general sciences (includes Physics and Engineering), 2) computational sciences, 3) chemical sciences, and 4) life and environmental sciences – plus the operations part of the Lab. There is an Associate Lab Director for each of these areas. The Lab annual budget in 1990 was just over $200 million, and it is now $520 million. One big change is that biology now constitutes one quarter or more of the Lab, while physics and nuclear science, which used to make up the core effort, are now relatively small portions of the Laboratory. What does the Lab do? The same as it did in the past: solve the most pressing and profound problems facing humanity. Specifically, these efforts include basic science for a secure energy future, understanding living systems to improve the environment and human health, and understanding the nature of matter and energy in the universe. To accomplish all this, we need to build and operate facilities. Examples are: 1) the Advanced Light Source, 2) the largest unclassified computer facility in the country, 3) the new Molecular Foundry, and several other new buildings under review. We are in many ways the eleventh campus of the University of California: Training future scientists is a crucial part of the mission, and there are about 800 students and 800 postdocs working at the LBNL.

Taking this mission seriously requires bringing together skills of the entire Lab, and specifically those of the physical and biological sciences. One goal of Graham Fleming and Steve Chu is to integrate the strength of skills at the Lab to bring out new ideas, new sciences, and new

technologies that will come from the areas of chemistry, biology, particle and photon beams, and the environmental, computational, and materials sciences. Examples are the creation of new materials using nanoscience, seriously confronting the impending energy crisis without destroying the planet's atmosphere, understanding the nature of biology at the systems level, and applying advanced computing to all sorts of problems.

The projected power consumption of the world 100 years from now is very frightening. Based upon the "Business as Usual" model, the GDP (gross domestic product) goes up about 1.4% per year (GDP is closely linked with population and energy use). The model predicts that by the year 2050 we will have at least doubled the world's power requirement, from the present 12 terawatts (a terawatt is 1000 times a billion watts, or a trillion watts). To render this fact more readily comprehensible, the additional 12 terawatts could be obtained by building additional nuclear power plants at the rate of one per week for the next 45 years! This is a problem of massive scale, and is not far in the future. As we know, carbon dioxide, or CO2, is a major contributor to global warming: it is now at a level of about 375 parts per million (ppm) of air. In order not to increase this already dangerous level, new energy sources must be based mostly upon technologies that do not add additional CO2. Oil supplies will be exhausted soon, but coal will last at least another 200 years. On the present course, by 2050 there will be about 600 ppm of CO2 in the atmosphere, and although the effects of this are not exactly predictable, they are almost certainly very bad. In the past two years there has been a substantial jump in the CO2 level, believed to be due to the expanded economies of India and China, by 7 and 9% respectively, indicating a direct link between GDP and carbonization.

Because of this clear problem of CO2 pollution, thinking has turned to sources of solar and chemical energy: solar, because of the plentiful supply of non-polluting energy from the sun, and chemical, because there must be some means of storing energy. The energy supply must be available at all times, day and night and transportation systems (autos, for example) generally will not have enough instantaneous solar power. So efficient means of energy storage is essential. With present technologies, 220,000 square kilometers of silicon solar cells would generate 12 terawatts, but only about 8 square kilometers of solar cells have thus far been made worldwide—an example of the scale that needs to be achieved. The development of *organic* solar cells may be one solution, and the new field of synthetic biology integrated with nanomaterial science shows promise of attacking this problem.

The Molecular Foundry will be finished in early 2006, and its goal is to design, synthesize and characterize state-of-the-art nanomaterials. It will be a users' facility providing the latest developments in making nanomaterials. (Among the diverse applications in this area are the world's smallest motor and targets for the National Ignition Facility at Livermore.) The Molecular Foundry building will have six floors, each devoted to a different methodology, and tours of the facility will become available in the spring of this year.

An example of nanoscience in progress: Consider a virus, including a long "string"—its DNA—which fits inside a small "box" (technical term: capsid). Under normal conditions the DNA is

drawn inside the box by the equivalent of a tiny helical “motor” with a screw thread. A method has been developed, using a pair of lasers, called “optical tweezers”, that can grab one end of the DNA string and pull on it while the box is anchored. This allows us to measure the force of the motor drawing in the DNA by conducting kind of “tug of war” between the motor and the tweezer: the DNA string could be pulled out of or drawn into the box, depending on the strength of the external tweezer pulling force vs. the motor force. A movie showed this process going in each direction, with small “beads” attached to the DNA string to render it visible. The practical import is that the force generated by packing all that DNA inside the box is equivalent to about “20 champagne bottles”, and is used to expel the DNA in a burst when the virus enters a new cell to be infected. At that time, new replications of the virus are made inside the cell, including new DNA and boxes (capsids). Eventually, the cell bursts, allowing the viruses to escape, and the infection process continues.

Microbes can do things that are very good as well as things that are very bad. One of the good things they can do is bioremediation. The nuclear Lab at Oak Ridge (Tenn.), where there are several areas that have contamination, provides an example of this: Tanks containing radioactive materials were sometimes not properly lined, and the resulting leakage contaminated the ground water. However, there are microbes that will turn dissolved heavy-element compounds, such as those of uranium and plutonium, into insoluble compounds, preventing them from leaching into the ground water. We have a large project at LBNL to understand the interactions between these microbes and the environment that influence their ability to render metals and radionuclides into insoluble compounds. We know, for example, that pH and oxygen levels in the water have some influence, and we must learn about the metabolic and genetic pathways of the microbes. We are beginning to think about these cells as if they were little electronic circuits with inputs and outputs. The genes of the cell determine the proteins, which in turn determine the chemical behavior of the cell, and learning how this all fits together to determine the behavior of the microbe is a large project underway.

Microbes can eat rock. This is a big problem in old mines, because they will take the sulfide in the rock and convert it to sulfuric acid, which may get into the water runoff from the mine. Miners have been known to leave a shovel in mine water and come back the next day to find it dissolved. Microbes do this, but not just one species by itself: studies show that five different species of interdependent microbes are necessary to accomplish this acid formation. One of these microbes does nitrogen fixation, necessary to produce amino acids needed by the rest, and stopping its function could be sufficient to stop the entire operation. This area of study is new, and called ecogenomics.

Synthetic biology is the consideration of cells as consisting of components, much as in an electrical circuit. Jay Keasling is a prominent scientist at LBNL in this field. The basic components are known, as are transistors, capacitors, and resistors in electronics, but how they go together to perform a function is not known. Two large grants were just given to have LBNL work in this area. Malaria is a very deadly disease worldwide. It is resistant to almost all drugs and is responsible for more than two million deaths per year in sub-Saharan Africa. There is a

plant from China called “sweet wormwood” that is a “magic bullet” cure, but it costs about $20 per dose: this is too costly for extensive use in undeveloped countries. Jay has taken the entire genetic pathway from the plant and inserted it into the bacterium *E. coli.* He found, however, that the molecule necessary to start the pathway was not present in the *E. coli,* but he found another pathway in yeast that produced the needed molecule. Using this, he was able to assemble a production line inside the bacterium to produce the drug synthetically,at a cost of only about 25 cents per dose. Bill Gates, of Microsoft fame, has donated 23 million dollars to enable setting up a non-profit company to manufacture this drug and distribute it in Africa. This is a notable example of thinking about cells as little “factories”, having functional components, and not just molecules, and this will be of tremendous importance in the future.

This application of synthetic biology is not restricted to life sciences, as studies in this new science are underway for production of fuels based on hydrogen and ethanol, and even production of electrical power directly. If cellulose can be converted to chemical fuels, that would make an important contribution to the energy supply. There are microbes in the digestive system of termites that convert the cellulose eaten by termites into sugars, i.e. into chemical energy – we have not yet learned how they do this, but expect to.

The Advanced Light Source (ALS) at LBNL is an electron synchrotron producing an intense and highly collimated photon beam, or “light source”. It is one of several such machines in the country used for studies in the materials and life sciences, and in other fields as well. There are normally many beam lines in use at such machines, and a recent survey of all these machines in the U.S. revealed that only the ALS has nearly every beamline at the “state-of-the-art” level, and it is by far the most effective light source in the country. Beamlines now exist using “wiggler” magnets and superconducting magnets to produce X-rays that are perfect sources for the study of the structure of proteins, and several beamlines are now dedicated to such investigations. These ALS studies have been extremely successful, and have been made possible by use of the wide range of skills and technologies available at LBNL. In planning for the future of the ALS, one concept is to build a 100 – 200m long linear accelerator to inject extremely short beam pulses, to make very short X-rays. This will allow the study of very, very rapid phenomena, and a whole new class of experiments at the ALS. This project will cost in the range 400 – 700 million dollars.

One of the amazing projects at the ALS is the study of the structure of the ribosome: this is the “machine” that stitches amino acids together to make proteins. It is a large molecule (molecular weight of about 2.5 million Daltons). It goes through many states and cycles in creating a protein from amino acids, and gets its structure information from messenger RNA (mRNA), which in turn derives its information from the DNA of the gene (note – most antibiotics work by disabling the ribosomes of bacteria).

One project in Graham Fleming’s laboratory studies the response of plants to the environment. For example, plants respond continuously to environmental conditions such as light levels. Well known is the ability of plants to manufacture free oxygen molecules in the photosynthesis

process. The chemistry involved in removing oxygen from water molecules, which is done by plants, is “difficult”: a process that even today’s chemists do not know how to accomplish using visible light. It is known how to do this with ultraviolet light, yet plants can do this with visible light and we cannot. What has been learned is that the plant regulates how well the light is collected and at the same time how to minimize the chemical damage that is inevitable. This regulation mechanism controls crop yields worldwide, but we don’t know what it is. Studies are underway to try to understand this, using chemistry and molecular genetics. Experiments have been devised to determine how individual molecules in the proteins do the work, talk to each other, and how the energy flows.

The conventional model of the history of the universe now held by most cosmologists is that it started with a “Big Bang” about 14 billion years ago, and that it rapidly expanded, but gradually the expansion slowed due to the influence of gravity. It was not known whether the universe would ultimately begin to contract to a “Big Crunch”, or continue expanding forever, but at a diminishing rate. Saul Perlmutter and his group discovered that the universe expansion is not slowing but accelerating. This came as a total surprise. We used to think that we knew what the universe was made of, based upon observational astronomy. However, galaxy rotations were too rapid to be explained by known laws (Newton’s) and indicated an abundance of matter, “dark matter”, not visible to us. Measurements show that dark matter seems to make up about one-quarter of the universe, and yet is unidentified and unknown, while the known and visible matter makes up only about 3%. To account for the acceleration of the expansion of the universe it seems there must be in addition a repulsive force – “antigravity”, or “dark energy”. This additional component is about 70% of the universe, and its nature is completely unknown at this time. The great surprise, (or shock) is that only about 3% of the universe is made up of matter as we know it, and the rest is quite unknown at present.

A joint DOE and NASA collaboration is envisioned to explore this unknown territory: the Joint Dark Energy Mission, or JDEM. An LBNL satellite experiment— SNAP (Supernova Acceleration Probe)—has been proposed to make detailed investigations of dark matter, as part of JDEM. Again, the knowledge and skills involved in this proposal cross many fields: particle astrophysics, detectors, engineering, and computer science. SNAP will detect and measure supernovas from earth orbit. A supernova is an exploding star, and one type (type 1a) always has nearly the same intrinsic brightness, so by measuring the brightness seen on earth, the distance to the supernova can be calculated (brightness is proportional to 1/(distance squared)). From the “redshift” of the spectral lines of the emitted light, the speed of the receding star or supernova can be obtained (a Doppler shift – like the frequency of a train whistle, receding at a certain velocity). These two pieces of information serve to determine the expansion of the universe: recessional velocity vs. distance. The SNAP project will make very detailed and precise measurements from space of a very large number of the supernovas, mapping the expansion history of the universe, helping to obtain answers to such cosmological questions.

There is an ever-increasing interaction of LBNL with industry – especially in nanotechnology, biotechnology, energy, and oil exploration; software for the latter is a "big seller". Money gained from licensing these inventions is significant revenue that can be plowed back into research.

Now that the Lab contract with the University has been renewed, there are plans to construct new buildings, to renew the infrastructure of the Laboratory.

In the matter of demographics, 43% of the Lab is over 50 years old, and will be retiring soon. It will be a big challenge to replace these "fantastic" people with the next generation of great scientists, engineers and support staff. [And to persuade them to join Ex-Ls. ed]

Luncheon Attendees:

Al Amon
John Anderson
Bill Baker
Dick Baker
Winnie Baker
Josephine Barrera
Tom & Marcia Beales
Roy Benedict
Gene & Myrna Binnall
Bob & Elizabeth Birge
Igor Blake
Dick Burleigh
Geores & Katie Buttner
Per & Eleanor Dahl
Janice & Ned Dairiki
Jack & Darlene Franck
Bob Fulton
Bill Gilbert
Abe & Marjorie Glicksman
Ingeborg Henle
Paul & Nancy Henrickson
Wini Heppler
Egon Hoyer
Roger Hughes
Vicky & Richard Jared & Guest
John & Ann Kadyk
Don & Joan Landis
Bud Larsh
John & Barbara Lax
Branko Leskovar
Katherine Lucas
Don & Jean Lundgren
Bob Miller
Ken Mirk
Nancy & Vic Montoya
Mack & Ann Morgan
Bob Mortiboy
Charles Ogden
Rollie Otto & Dale Koistinen
Fred Perry
Conway Peterson
Terry Powell & Tiffaney Dressen
Don Prestella
Ellie & Gwen Ralph
Sig & Cindy Rogers
Stephanie Roth
Doug & Claire Shigley
Elmer Silva
Robbie & Mary Smits
Dave & Sally Stevens
Suzanne Stroh
Clyde Taylor
Dick Wolgast
Speaker Graham Fleming & Martin Jara

President's Message (continued from p. 2)

This all has to fit into the newsletter, be edited into reasonably correct English, and then be mailed in time so you can get your lunch reservation to Vicky Jared. That brings me to Vicky, who has replaced Inge Henle as the Activities Chairperson. Vicky helps in many ways, but especially in receiving the luncheon reservations, notifying Spenger's, and getting us checked in at luncheon time. She has been bringing the EX-Ls projection screen from her home in Martinez because we've been fearful that Spenger's will not provide theirs. She also helped to spice up the fall newsletter with an interesting linguistic observation ("Not a new lgnaague"), and brings good grace to the group (how's that for "g" alliteration). We also thank Bob Birge for being active with the Board, and for years being the representative at the UC Retirement Center; our outgoing president, Gene, is now taking over this responsibility. Ken Mirk, a former president comes to

our Board meetings, as does Per Dahl, and their advice is always helpful and welcome, as is that of former president Sig Rogers (who will soon be leaving the Bay area, alas).

Finally, there are the important representatives at Board meetings from Public Affairs Office of the Lab itself: Reid Edwards and Terry Powell. Reid is an important link with the Director, and Terry is the *sine qua non* of the EX-Ls – LBNL connection: she has her secret list of the best candidates for luncheon speakers to offer us, and is influential in persuading these speakers to sign up for our luncheon talks, and knows all about what is going on that could, and does, affect our activities; she does all this, offers us good advice, and sustains the very best spirit and humor.

Well, enough of organizational stuff. Perhaps the most interest and fun is just getting together four times a year to see again former friends and colleagues, and meet for the first time others who shared our time at LBNL, but whom we did not happen to meet before retirement. As mentioned earlier, there will be some news distributed on our website, and important announcements also sent via email to those who have submitted to us their addresses. If you wish to be on this email distribution list (which will be kept scrupulously private), please give your email address to Dick Baker or Vicky Jared, or any Board member (including me). The free membership in the UC Retirement Center is a bonus, subsidized by the Lab, and enabling us to obtain privileges and reduced prices, audit courses at UC, and other benefits; they can be contacted by phone at 510-642-5461, and their website (http://thecenter.berkeley.edu) will show what special offerings they have.

Also, remember that next year there will be a 75th anniversary celebration of the Lab, and any ancient photos and other history that can be displayed are being sought: please lend anything that you think might be interesting and useful.

All of the above make the EX-Ls a unique group – perhaps you can persuade retiree friends who are not yet members to join us. Here's looking forward to a very enjoyable year. Our next luncheon speaker is Bob Stokstad, talking about his physics experiment at the South Pole – this subject should be most interesting: please come! (I think the fish entrée choice will be salmon in February.)

Editor's Note

Berkeley Lab View has begun a series of articles on the history of the Lawrence Berkeley National Laboratory. The first installment, covering the period from the recruitment of Lawrence to UCB and the construction of ever-larger cyclotrons through the Rad Lab's campus years, is in the January 20, 2006, issue of the *View*, on-line at www.lbl.gov/Publications/Currents/archive/. (If you do not receive the *View* and would like to, contact Editor Pam Patterson at 510-486-4045, or via e-mail at pjpatterson@lbl gov.) A few excerpts are given elsewhere in this issue. And as always, articles or ideas for articles are welcome; the deadline for each issue is ten days after the preceding Board meeting (a full year's schedule is listed on the back page). You can contact me at david_stevens@comcast.net, at 1107 Amador Ave, Berkeley 94707, or 510-524-2904. // dfs

75th Anniversary

This year marks the 75th anniversary of the Lawrence Berkeley National Laboratory. Founder Ernest Lawrence launched the Radiation Laboratory, predecessor to LBNL, on August 26, 1931 in a small building on the UC Berkeley campus The Lab already has a new logo and Web home page design to commemorate the occasion: see

http://www.lbl.gov/today/2006/Jan/05-Thu/01-05-2006.html

Numerous activities and events are being planned to celebrate this historic year; look to forthcoming issues of the *View* and the Lab's website for more information. One of the planned events is a "Family Day" on August 26. The lab has asked the Ex-Ls for any photographs, mementos, stories, or anecdotes members are willing to share to add to the celebration. Please contact Terry Powell (TPowell@lbl.gov, or 510 486-4387) or Ron Kolb (RRKolb@lbl.gov or 510 486-7586) if you have any contributions.

The Ex-Ls plan to have a special program to celebrate the Lab's 75th anniversary at the August 2006 luncheon. Again, your suggestions and ideas as well as anecdotes and photos would be appreciated. Please contact Janis Dairiki (JMDairiki@lbl.gov or 510 486-5673). Check the Ex-Ls website (http://www.lbl.gov/ex-l-express/) for program details as they develop.

LBNL: The Campus Years

Lynn Yarris

75 years ago a young physicist on the Berkeley campus of the University of California, Ernest Orlando Lawrence, founded a laboratory that would eventually bear his name. For three-quarters of a century the Lawrence Berkeley National Laboratory, as it is now known, has continued to make scientific history. Ten Nobel Laureates have called Berkeley Lab their home institute. A dozen Berkeley Lab scientists have won the National Medal of Science. Behind these and countless other awards and honors has been a wealth of scientific discoveries and technological breakthroughs that have made enormous contributions to the knowledge-base of humanity.

From finding the antiproton, to deciphering the photosynthetic process, to unraveling the mystery behind the extinction of the dinosaurs, the list of accomplishments by Berkeley Lab scientists runs both wide and deep. Equally important, the unique approach to research, in which tough questions are tackled by interdisciplinary teams of scientists, engineers, and support staff, that has been the tradition of Lawrence and his laboratory, became the foundation for the modern approach to Big Science….

Ernest Lawrence arrived at the University of California's Berkeley campus in the summer of 1928, having been wooed from a faculty position with Yale University by promises that included auxiliary connections to the chemistry department. Until then, the traditional practice of science

was that physicists, chemists, and biologists worked within their own departments and seldom ever did the twain meet. Access to scientists and students from other disciplines, as well as to engineering staff, was critical to Lawrence's success as a researcher. It also set the pattern for the unique laboratory he created.

Inspired by a paper from Norwegian engineer Rolf Wideroe, Lawrence, early in 1929, drew up plans for a unique circular particle accelerator, which he referred to as his "proton merry-go-round", but which would later become known as the cyclotron.…The first crude cyclotron was constructed in the spring of 1930 by Lawrence and his student, Nels Edlefsen. It was a pie-shaped concoction of glass, sealing wax, and bronze….The first working model [a 5" cyclotron] came later that fall with the help of another Lawrence student, M. Stanley Livingston. …In August 26, 1931, [Sproul] committed to Lawrence the Civil Engineering Testing Laboratory, an empty building adjacent to Le Conte Hall which featured substantial concrete flooring, strong enough to support an 80-ton magnet. Lawrence renamed this building the *Radiation Laboratory* but it soon became known simply as the *Rad Lab*.…The design, construction, and operation of increasingly larger cyclotrons required an increasingly larger number of physicists, engineers, and chemists.…The 60-inch cyclotron began operations in 1939…[and] Lawrence won the 1939 Nobel Prize in Physics. The end of the decade would mark the end of the era of new Lawrence cyclotrons on the UC Berkeley campus. For the next machine he envisioned, a giant more than double the size of 60-inch cyclotron, the laboratory would have to leave the campus.

Teaching Assistants Wanted

Rollie Otto's group has developed two hands-on science lessons for 5th grade students and that were use-tested at all 11 elementary schools in Berkeley last year. It was a big success but they could use some help with the teaching of the lessons again this year. He is recruiting Berkeley Lab staff and retired staff for this project. He is looking for a commitment to go to one school twice in the winter and spring months. Volunteers would work directly with the students doing hands-on activities that we have developed. Give Rollie a call (486-5325) or e-mail him (rjotto@lbl.gov) if you are interested.

E-mail Distribution List

We have established an e-mail distribution list to be used only for late-breaking Ex-Ls news. Inclusion on the list is completely voluntary. If you would like to be on the list, please either e-mail our List Master (Richard Baker [robaker@lbl.gov]) or complete the form below and send it to **Dick Baker, 635 Yuba Street, Richmond, CA 94805**. (You may list more than one address, but be aware that all addresses will be used for distributions.)

Please add me to the e-mail distribution list; my e-mail address is:

_____

Signed: _____

In Memoriam

Gerald Downey	**Michael McClure**
Heinz Heinemann	**Adelaide Morris**
Bill Oosterhuis	**Victor Perez-Mendez**
Doug Shigley	**Tony Vuletich**

>>WELCOME NEW MEMBERS<<

{None Reported}

Membership in EX-Ls is open to all past employees of LBL/LBNL. Annual dues are $12 per family, forgiven during the calendar year of joining for new members, and are now due for 2006. New members, please include your name, address, phone number, and e-mail address if you wish to be included in the e-mail distribution list. Also, please include any other information you would like included in the annual membership directory, such as spouse's name, e-mail address, or fax number. Please send your check payable to EX-Ls to

Bud Larsh, Treasurer
610 Devonwood
Hercules, CA 94547

SEE YOU AT THE FEBRUARY 16 LUNCHEON

To: Vicky Jared
4849 John Muir Road
Martinez, CA 94553
Be sure to make reservations by February 13

From: _____

I plan to attend the EX-Ls luncheon >> $20pp << PREPAID

I will bring __guest(s). Name(s) of guest(s): _____

Menu Choice(s): Beef __ Salmon __ Salad __

Please make check payable to EX-Ls Total Enclosed: _____

EX-Ls EXPRESS – Winter 2006
Published Quarterly at the end of January, April, July, and October
Editor: Dave Stevens *Deadline for newsletter submittals is 10 days after the preceding Board meeting.*

Calendar of Board Meetings & Luncheons

	L: February 16, 2006
B: April 13, 2006	L: May 18, 2006
B: July 13, 2006	L: August 17, 2006
B: October 12, 2006	L: November 16, 2006
B: January 11, 2007	L: February 15, 2007

Board meetings take place in the LBNL cafeteria at 3:45 on the dates mentioned; we welcome attendance by interested members.

Ex-Ls Life Members
Shirley Ashley
Esther Colwell
Inge Henle

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