LNS NEWS

LAB. FOR NUCLEAR SCIENCE

M.I.T. CAMBRIDGE, MA.

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PROMOTIONS

Peter Bonneau, Bates - to Project Technician

John Byrnes, Bates - to Senior Technician

Richard Campbell, Bates - to Senior Technician

Dayton Fitch, Bates - to Technician B

James Grenham, Bates, from Project Technician to Sponsored Research Staff Supervisor

Audrey Iarocci, Bates, from Senior Secretary to Administrative Secretary

Ann McInnis, Bates, from Receptionist to Secretary

Coles Sibley, Bates - to Technician A

APPOINTMENTS

Ming-Chung Chu - has joined the Center for Theoretical Physics as a Sponsored Research Staff member. Dr. Chu is a nuclear theorist who received his Ph.D. from Caltech.

John M. Cornwall - is a visitor at the Center for Theoretical Physics. Dr. Cornwall is visiting the Laboratory from UCLA.

Karen Dow - recently received a Ph.D. from M.I.T. and is the Data Acquisition Systems Physicist at Bates.

Laurence H. Ford - is a visitor at the Center for Theoretical Physics. Dr. Ford is visiting the Laboratory from Tufts University.

Theresa Fuess - recently received a Ph.D. from M.I.T. and has joined the UA1 group as a Sponsored Research Staff member at CERN, Geneva, Switzerland.

Carmen Garcia-Recio - has joined the Center for Theoretical Physics as a visitor. Dr. Garcia-Recio is visiting from Spain.

Dong-Hee Kim - has joined the staff at the Bates Linear Accelerator Center. Dr. Kim is visiting from Syracuse University.

Christos N. Ktorides - is a visitor at the Center for Theoretical Physics. Dr. Ktorides joins the Center from the University of Athens.

Edward Shellard - is a Sponsored Research Staff member at the Center for Theoretical Physics. Dr. Shellard joins the Laboratory from Trinity College, Cambridge, England.

STEPHEN W. HAWKING VISITS CENTER FOR THEORETICAL PHYSICS

Although Stephen W. Hawking's visit to the Center for Theoretical Physics was some time ago (April 26-30, 1987) we would be remiss if we did not mention it. Stephen W. Hawking is a theoretical physicist from the University of Cambridge, England.

At Oxford University where he did his graduate and undergraduate studies he became interested in thermodynamics, relativity theory, and quantum mechanics. During his graduate studies he was diagnosed as having a rare and progressive neuromotor disease called Amyotrophic Lateral Sclerosis (commonly known as Lou Gehrig's disease), a disease which handicaps motor and vocal function. In spite of his handicap he is a distinguished and productive physicist.

His present objective is space-time and the beginning of the universe. When he spoke at the Center his talk was about the loss of Quantum coherence due to gravitational vacuum tunnelling events.

A number of people helped to make Dr. Hawking's visit here both comfortable for him and rewarding for the physics staff. He was invited to the Center by Prof. Roman Jackiw. The details of his trip were ably handled by the Center's administrator, Milda Richardson, with the assistance of Ann Wiggins of the M.I.T. Medical Department, Charlene Placido of the Dean's office, Thomas DeChicco, and Roger Gilson of LNS.

The evolution of the world can be compared to a display of fireworks that has just ended: some few red wisps, ashes, and smoke. Standing on a cooled cinder, we see the slow fading of the sun, and we try to recall the vanished brilliance of the origin of the world.

--Lemaitre

THE BERMUDIANIZATION OF EMILY

As Delta flight 63 took off on Thursday, September 24, I was looking forward to my 10th anniversary of visiting Bermuda with my group of women friends. Seven of us visit the island every September for a little sun and fun. Our flight left on time and arrived on time which was something spectacular in itself, and I thought it as a sign of good things to come on this special anniversary trip. We were met in Bermuda with a gorgeous 85° clear day. After checking into the South Hampton Princess on the South Shore Road, we immediately headed for the beach. We had decided for the next five days our biggest worry was what to wear to dinner. All anxieties were left in Boston.

After an afternoon on the beach soaking up the sun, we returned to the hotel to prepare for dinner. The dining room in the hotel was as beautiful as I remembered it. We were pampered and fussed over, for it's not often you see seven women vacationing together on a honeymoon island! After renewing old friendships with people we had met over the years, we returned to our rooms to plan our itinerary for our first full day in Bermuda. After making more plans than were humanly possible to do, we settled down in the wee hours of the morning anxiously looking forward to what we expected would be a great Friday.

At 6:30 A.M. the phone rang. Who would be calling at that hour? When we answered, we were told by Hotel Security that Hurricane Emily was approaching Bermuda and due to deliver a direct hit somewhere around 8:00 A.M. At first we thought someone was playing a joke on us. No one on the island had even muttered the word hurricane. Back in Boston the weather forecasters had claimed that it would brush by Bermuda and that we might possibly get some rain, but that was it. Now we were being told to bring in our balcony furniture, close our windows, and draw the drapes! We did as we were told, thinking that the hotel was going a bit overboard; however we did notice that the sky and ocean were a deep black and there was a little wind. Workmen were scurrying around tying down chaise lounges and anything else that could do some damage. The only thing we could do now was to go down to breakfast, wait for it to blow over, and continue with our plans for the day.

We were seated in the dining room in front of 20 foot high windows which surround the room. The hotel personnel were carrying on business as usual. Now the wind was ferocious and objects were being thrown around outside like toys. Perhaps, we thought, we should take this storm a little more seriously. But we were in a huge hotel, safe and snug. What could go wrong? While the wind was howling outside, we were enjoying our lavish breakfast and happily chatting. We had just finished when the hotel manager ran into the dining room and announced to the diners that we should move quickly and in an orderly manner out of the dining room. He said that the eye of the hurricane was

moving in, and the winds on the other side were even stronger than what we had already experienced. Moments ago there were ferocious winds, now it was totally still. Now it was serene -- nothing moved. What an eerie sensation. We all filed out, and as we approached the door the winds began to pick up as quickly as they had died down. Emily was delivering her second powerful punch. It was much worse than before the eye. The hotel seemed to shudder. There was a crash, and as we turned to look, the windows blew in where we had just been sitting. Two of the waiters were cut by flying glass and required medical attention.

The dining room opens on to the front lobby, and as we arrived there, all the windows came crashing in. The wind was so strong that we had a difficult time standing erect inside the hotel. There was confusion everywhere. Some people were crying, some literally were running around in circles, and most just looked totally helpless. Hotel personnel were trying to move everyone down to the lower lobby where there were no windows. We also went down to the lower level, however after a very short time it became almost impossible to breathe with so many people there. Now what do we do? Stay there in a stifling environment or try to go back to our rooms? Our decision was to go back to our rooms to see if there was any damage.

We were very fortunate to find that our rooms were safe, and that everything was just as we had left it. However, I soon found out that our decision to return to our rooms was the wrong one. One of my friends called me to come into the bathroom. When I walked in I found her totally drained of color; her eyes were growing larger and larger, and I soon realized why. The bathroom floor was moving underneath our feet. It looked like we were standing on a treadmill and some sort of machinery was making our feet move. Wait! Was it the floor or was it my feet that were moving? It was impossible to tell. I had visions of the floors collapsing one on top of the other, and that we would be caught in the rubble. Now our only thought was to get out of our rooms.

As we ran from our rooms, we heard a woman screaming from the room across the hall. The windows in her room had all blown in and the wind was causing a vacuum, trapping her in the doorway. Her husband was in the room pulling on the door as hard as he could, but without success. We all pushed on the door from the hall and freed them, however, their personal belongings were lost.

Using the elevator was now out of the question. (In retrospect, we shouldn't have used it at all.) We filed down the stairway along with hundreds of other guests. Everyone was orderly and proceeded along quietly until we reached the door which led to the lobby. Again, the vacuum was so great that the first person could not open the door. People were now backed up in the stairway not knowing what was happening. We could hear

screams echoing through the stairwell as people were trying to find out why no one was moving. Fortunately, we were at the front of the line and together we pulled the door until we managed to open it and keep the stairway line moving.

I just wanted to scream. Here we were again in the lower lobby. It took a lot of deep breathing and positive thinking to keep myself under control. I wanted it to be over. I kept thinking about my husband, George, back in Boston going about his daily routine, unaware of what was happening to me. Above us windows continued to break. It sounded like wind chimes echoing throughout the hotel. The chandeliers were swaying and glass was breaking, and it was as though we were caught in a disaster movie, except it wasn't make believe. It was real!

After about two hours, Emily moved on. We walked down the hall toward our hotel rooms, when we noticed an open door. As we approached the room, we saw a young couple who had stayed in their room throughout the storm. It was a miracle they were not injured or killed because their room was totally demolished. The windows were not only blown in, but the frames were twisted out of shape. The noise deadener that is put in between the walls and ceilings (it looks like insulation that you would put in your home) was all over the room. The ceiling was hanging down on top of the bed; the dressers were blown over; the wall between their room and the next one was totally gone; and in the bathroom the bathtub from the room above was dangling from what was once the ceiling. On the floor just above a small fire broke out. Hotel Security were running everywhere checking on people.

After things quieted down a little, we wanted to go outside and survey the damage first hand. By now the sun was shining and the temperature was in the mid-80's. We were informed that tornadoes were predicted to hit the island. (I was unaware that hurricanes spawn tornadoes.) We took matters into our own hands and left the hotel, much to Hotel Security's dismay. We soon realized that we couldn't go very far because of all the downed trees, but just observing the outside structural damage to the hotel was amazing. We found out later that first-hand observers witnessed a waterspout. They described it as a "big orange, gray and white ball coming out of the water. It looked like it was a quarter of a mile in height and as wide as a football field. When it approached land it took the shape of a funnel." That funnel slammed into the Mermaid Beach Club (on the same road we were on) and took the roof right off. It continued inland demolishing everything in its path. Emily definitely had the last word.

Now that I am home and safe, I must admit it was the most exciting and frightening experience I have ever had. None of my friends were hurt or lost any personal belongs, but not everyone was as lucky as we were. The residents of Bermuda are still recovering. Following is a brief capsule of the aftermath of Emily:

-- 70-90 rooms at the South Hampton Princess were damaged.
-- a yacht in Hamilton Harbor was picked up out of the water and sent through the windows of a waterfront hotel.
-- many hotels were damaged and smaller guest houses were put out of business.
-- property damage to virtually every home on the island.
-- homes were without electricity, running water and toilets.
-- numerous boats were either sunk or destroyed on the rocks.
-- extensive damage to the island's nine golf courses.
-- the island's only television channel and six radio stations were knocked off the air.
-- the cruise ship Atlantic, with over 800 passengers aboard, broke free from her mooring in the harbor and floundered helplessly listing to her side before the crew could start her engines to ride out the storm.
-- the entire island totally without power for approximately 1 to 2 weeks. Telephone and light poles had to be brought in from the U.S. via boat.
-- the Navy's Blue Angels, who were in Bermuda for an air show, evacuated the island just prior to the storm.
-- the crew of a Pan Am plane on the ground at the airport also evacuated the island just prior to the storm.
-- the airport suffered extensive damage. When we left on the following Tuesday, it was still without power. There were no lights, running water or toilet facilities. We had to be hand searched. People who had boarding passes with pre-assigned seats were boarded first; all others were boarded and took the first available seat they came to.

Officials said that Hurricane Emily was a Category 2 hurricane. The storm's sudden intensification into a Category 2 hurricane from a waning tropical storm was not detected until four hours before she struck the island. She was described as small and compact with a forward speed of 45 M.P.H., nearly three times the speed of a normal hurricane. She hit the island with winds of 93 M.P.H. and the back side of the eye carried winds of 116 M.P.H. Her cloud canopy was 200 miles across and the eye was roughly 20 miles in diameter. First estimates of damage were in the millions of dollars.

--Sheila Dodson

If you have an experience that you should like to share with us, send it along to LNS News, 26-505 .

NOTEWORTHY NOTES FROM BATES

by Bill Lobar

Two recent Ph.D. degrees have been awarded based on work done at Bates. Eric Austen (Boston University) wrote his thesis on "Elastic Photon Scattering from ^{4}He in the $\Delta(1232)$ Region" and is now employed at Lincoln Laboratory. Karen Dow's (M_3I.T.) thesis title was "Deep Inelastic Electron Scattering from ^{3}H and ^{3}He." Karen is now employed at Bates as Data Acquisition Physicist.

A CPR course was given at Bates in late September by Richard Keating, Safety Coordinator, and Barbara Keating, R.N. The course was primarily for the Operations and Radiation people, but open to all others.

The ninth grade honors science class at Masconomet Regional High School visited Bates on September 30. The forty-two students and two science teachers heard a talk on physics at the laboratory by Jay Flanz and toured the facility under the guidance of Karen Dow, Krishna Kumar, and Bob Michaels.

The Bates Program Advisory Committee will meet next on January 14 - 16, 1988. The deadline for proposals has been set for December 4, 1987. The Annual Meeting of the Users' Group will take place on January 13, 1988.

The 1986 Bates Annual Report is now available. Information on the Program Advisory Committee meeting and the Annual Report is available from Bill Lobar and information on the Users' Group is available from George Dodson.

A contract has been placed with the Porter Construction Company of Peabody, Ma. for the construction of a warehouse structure. This building will be located west of the Engineering Building. Ground breaking began on October 1 and completion is projected for February 1, 1988.

A system for measuring the transverse phase space of the Bates Linac electron beam has been implemented this summer. Preliminary tests with the beam were performed in August. The apparatus consists of three wire scanners installed in a 20 meter drift space. The motor control and data acquisition is microprocessor-controlled. With one mil position control, we expect to be able to measure a phase space emittance of .01 πmm-mrad to 10% accuracy. This is the nominal emittance of the Bates beam at 500 MeV. Future studies to optimize the beam phase space are planned in the next running period. This project is a cooperative effort between the Accelerator Physics Group, under Jay Flanz, and the Electrical Engineering Group, under Tom Russ.

Another result of the tritium epoch runs has now been reported. Inclusive deep-inelastic electron scattering cross sections were measured for ^{3}H and ^{3}He. Longitudinal and transverse response functions were obtained for $200 < q \leq 550$ MeV/c. The experimental response functions were compared with several theoretical calculations, all of which use exact three-body ground state wave functions for the initial nuclear state. Calculations with simple final states overestimate the longitudinal responses, although they agree reasonably well with the transverse responses in the region of the quasi-elastic peak. This behavior has been seen in heavier nuclei as well. The theories under-estimate the transverse response in the dip region; this is not surprising, since effects, such as meson exchange currents and final state interactions, which are expected to be important, are not included. A calculation which

includes some final state interaction effects agrees with the ^{3}He longitudinal response, but not the ^{3}H. The Coulomb sum rules were formed from the data and compared with the exact calculation. Saturation is seen, and evidence for two-proton correlations in ^{3}He is clear.

JOB PROFILE -- JEAN HUDSON

Jean Hudson is the Travel Officer at LNS, which puts her in the position of making sure that the travel needs for faculty, staff, and students runs smoothly. In part, her job is similar to that of travel agent. The industry itself looks at her as the central coordinator for travel needs of the laboratory. No matter who initially contacts an outside agency for travel arrangements, the agency quite frequently contacts Jean in order to more clearly put together the travel material for the final user.

The travel needs for the Laboratory for Nuclear Science are extensive. Travel increases the experimental possibilities for the scientists at LNS by making experimental facilities all over the world available. Travel also provides them with the opportunity to collaborate with other experimental groups and attend workshops and seminars in order to share information and/or learn from others in their field.

Ms. Hudson is a member of the Passenger Traffic Association. The majority of its members are in-house travel planners like herself. This Association has monthly meetings during which other professionals in the travel industry attend as guest speakers. The Association is active in lobbying efforts as well. For example, they have been attempting to get legislation passed that would enable in-house corporate planners to receive commissions for direct bookings. Although their efforts have been unsuccessful up to this point, they believe that such an opportunity would lower corporate travel expenses.

Since there are a set number of experimental facilities which the scientists at LNS can utilize, there is a certain amount of repetition in Jean's travel planning. It is quite common for her to make reservations to places like Los Alamos, New Mexico; Chicago, Illinois; Washington, D.C.; San Francisco, California; and Geneva, Switzerland.

Jean is not only responsible for obtaining airline tickets. She is responsible for obtaining travel advances, car rentals, hotel reservations, limo service, and taxi service. This means that Jean must know about the final destination. She needs to know whether the traveler will need transportation to and from the airport, if the hotel is near where the traveler wants to be, whether there are any restaurants nearby, and any other information specific to each trip.

Jean also must consider the individual's personal needs when they are traveling on business for M.I.T. For example, is the traveler a smoker, or do they need special service because of a medical disability? While the traveler is away, Jean is still available to assist with any problems that might occur.

The majority of Jean's travelers go by air. However, other modes of transportation are used as well. Quite often rental cars are used at the final destination. Since a majority of her travel arrangements are for air travel, Jean has to have a good working knowledge of that industry. Price, in fact, is very important to Jean's job, particularly since LNS is run on a DOE contract. Deregulation of the airline industry has made Jean's job much more difficult. Jean says that before deregulation began, she knew the costs and flight schedules of all the airlines. Now she must search out the better prices and schedules. She also finds that flights are canceled at the last minute, which means that the process begins all over again.

Some of the most prevalent requirements for Jean's travel planning are those that pertain to government requirements. Since the laboratory is DOE funded, trips taken through the laboratory must follow DOE guidelines. Pre-travel forms and trip reports must be completed and filed with the DOE. The laboratory must also meet certain requirements in traveling. For example, if someone from LNS is traveling abroad, they must have the trip approved by DOE prior to the trip and they must fly by an American carrier both in and out of the country. Travelers must also stay within a per diem set by DOE for that country.

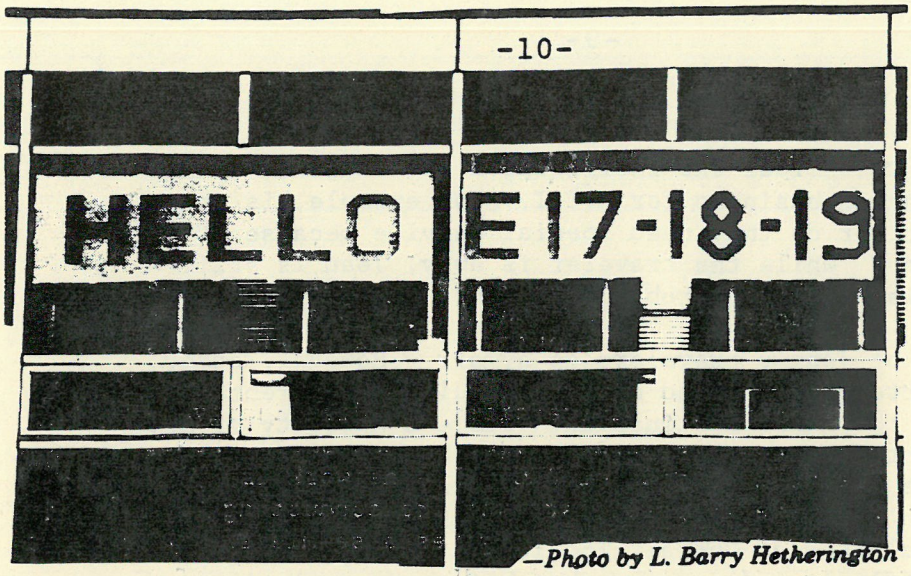
Jean's job is one of importance and responsibility. Without the ability to travel, LNS would not exist. Jean estimates that 90% of the research done by the laboratory is done off-campus. It is this research as well as attendance and knowledge gained at conferences and workshops that make up the goals and purpose of the laboratory.

--Marita E. Filios

If you would like to read about what someone else in LNS does, why not talk to them and prepare a profile similar to Marita's and submit to LNS News, 26-505.

NOTEWORTHY NOTES

If you worked in E17, 18 or 19 or if you walk across the courtyard from the East Garage you may have noticed the friendly "Hello Bldgs. E17, 18, and 19" that Don Souza lettered and put up across the windows in the Drafting Room. The sign can be seen very clearly from those buildings now that the TRW Building has been torn down.



—Photo by L. Barry Hetherington

Tech Talk, Vol. 32, No. 14, November 4, 1987.

Marita Filios, Medium Energy, has announced her engagement to Gary Magnant. A September wedding is planned.

Dr. Frederic Eppling, HQ Office, became a grandfather on October 25, 1987. Emalie Ann Pyror weighed 6 lb. 6 oz.

Born to Donna Paul, Fiscal Office and Elis Gonzalez, a 6 lb. boy on July 22, 1987 at 9:53 P.M. His name is Joelis.

Born to Cristiano, Electronics Design, and Deborah Gomes, a 10 lb. boy on October 2, 1987 at 12:30 A.M. His name is Zakarias.

Dan Devlin retired from Bates on October 31. He was in the Experimental Research Support Group, specializing in the many exotic targets used at the laboratory. Dan recently became a member of the M.I.T. Quarter Century Club.

Joe St. Hilaire left Bates on September 30th to open a Bed and Breakfast Inn upcountry. Joe was a Technician in the Mechanical Group. He will welcome anyone needing a place to stay during the hunting, skiing, or summer vacation time. He can be reached at P.O. Box 116, Waterford, Me. 04088.

Graduate Student David C. Williams, who also worked in the Laboratory as a Northeastern Co-op Student was featured in an article in the Northeastern University Alumni News, August 1987, Vol. 12, No. 6. David won Northeastern's Alcott Award for exceptional co-op achievement and intellectual accomplishment.

We are saddened to report that Mary, wife of Joe Gano, passed away suddenly on October 6. Joe was an Electrical Engineer and longtime employee at Bates prior to his retirement in 1978.

The Laboratory's High Energy Physics Program was reviewed by DOE on Monday, September 28th, 1987. Participants from DOE were Drs. Raymond Fricken, John O'Fallon, Enloe Ritter, C. Roche, and P.K. Williams.

KALETKA TELLS ALL ABOUT HEPNET

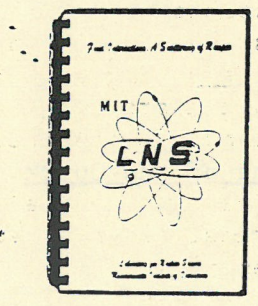
Mark Kaletka, Computer, represented HEPNET recently at DECWORLD and was also interviewed on DEC closed circuit TV. The live interview was broadcast throughout the DECWORLD area including the World Trade Center, the QEII, and the local hotels.

HEPNET is a DECNET that links universities to High Energy Physics labs like SLAC, LBL, Fermilab, Argonne, and BNL. HEPNET is the largest DEC network outside of DEC. The network is primarily used by high energy physicists who are conducting experiments at these laboratories. HEPNET gives a seamless environment which means that a researcher can sit at M.I.T. and actually be working on the computer at CERN. About the only difference is that it is a bit slower than actually being at the laboratory.

Working at the HEPNET booth at DECWORLD was a lot of fun according to Kaletka, but it was also a lot of work. Mark was not alone. He had help from Phil Demar of Fermilab, George Brandenburg of Harvard, and Jamie McCauley of LNS and some Digital staff from the Santa Clara and Marlborough plants. HEPNET gained good exposure at DECWORLD and many universities and NSF are interested in connecting with HEPNET.

Looking for a stocking Stuffer or perfect gift for one of your co-workers or friends?

Why not get them a LNS Cookbook and T-Shirt. Only $5.00 each!!



Call 3-2361 if you would like to purchase a cookbook or a T-shirt.

The Martin Deutsch Symposium was held on Friday, October 23rd, 1987. The afternoon symposium began with a series of talks by friends and colleagues of Prof. Deutsch. The evening festivities were held at the Museum of Science. Prof. Deutsch was given two rare first editions. It was announced that a yearly financial award will be made to a student in the Physics Department in recognition of experimental research of exceptional originality and quality. The award is created by M.I.T. in honor of Prof. Deutsch's outstanding career in Nuclear Physics, both for his influence as an educator in the development of physicists of high quality, and for high deeply insightful experiments and contributions to the field.

RECENT PUBLICATIONS

"Periodic Trajectories for a Two-Dimensional Nonintegrable Hamiltonian," by M. Baranger and K.T.R. Davies, Annals of Physics, Vol. 177, No. 2, August 1, 1987, p. 330-358.

"Search for anomalous particles in high-energy hadron-proton interactions," by T.A. Fuess, E.S. Hafen, P. Haridas, R.I. Hulsizer, T. Junk, A. Levy, C. Milstene, I.A. Pless, I. The, and R.K. Yamamoto, et al., Physical Review D, Vol. 35, No. 11, 1 June 1987, p. 3297-3309.

"Anisotropies in transfer-induced fission of $^{16}O + ^{232}Th$," by F. Videbaek, S.G. Steadman, G.G. Batrouni, and J. Karp. Physical Review C, Vol. 35, No. 6, June 1987, p. 2333-2335.

"Functional Representation for the Isometries of de Sitter Space," R. Floreanini, C.T. Hill, and R. Jackiw, Annals of Physics, Vol. 175, No. 2, May 1, 1987, p. 345-365.

"Superstrings from the (1,0) Superspace Non-linear Sigma Model," by Roger Brooks, Physics Letters B, Vol. 186, No. 3,4, 12 March 1987 p. 313-320.

"Explicit Construction of Anomalies," by Stefano Forte, Nuclear Physics B288 (1987) p. 252-274.

IN THE NEXT ISSUE OF LNS NEWS

A review of Michael Riordan's book, The Hunting of the Quark

A personality profile of Cristiano Gomes.

Thanks to all who have contributed to LNS News, especially to Dick Adams for his contribution to the personnel news.

Please send submissions to LNS News, 26-505.

Jean P. Flanagan, Editor