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**LOS ALAMOS NATIONAL LABORATORY  
SCIENCE EDUCATION PROGRAMS  
PROGRESS REPORT**

**April 1, 1995 – June 30, 1995**

Los Alamos National Laboratory  
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## TABLE OF CONTENTS

|   |    |
|---|----|
| TEACHER/FACULTY ENHANCEMENT .....   | 1  |
| National Teacher Enhancement Program (NTEP).....  | 1  |
| TOPS Mentor/Storm Tracking Project .....  | 1  |
| Nonproliferation & International Security – Teacher Enhancement Program (NIS – TEP).....                                    | 2  |
| Teacher Environmental Assessment and Monitoring Program (TEAM) (Formerly FCCSET High School Teacher Summer Institute) ..... | 2  |
| Teacher Research Associates (TRAC).....   | 3  |
| Teacher Opportunities to Promote Science (TOPS) .....   | 3  |
| National Geographic Kids Network Teacher Institute .....  | 4  |
| <br>CURRICULUM IMPROVEMENT .....  | 5  |
| MegaMath .....  | 5  |
| Neighborhood Environmental Watch Network (NEWNet).....  | 5  |
| <br>INSTITUTIONAL IMPROVEMENT .....   | 7  |
| Pre-Service Institute for Science and Math (PRISM).....   | 7  |
| SIMSE Support .....   | 7  |
| <br>STUDENT SUPPORT .....   | 8  |
| Students Examining Issues in Science (SEIS) .....   | 8  |
| Summer Experience for the Economically Disadvantaged (SEED) .....   | 8  |
| Summer of Applied Geophysical Experience (SAGE) .....   | 9  |
| Exploring Science Careers .....   | 9  |
| High School Forum on Critical Issues .....  | 9  |
| New Mexico Supercomputing Challenge .....   | 10 |
| Historically Black Colleges and Universities (HBCU) .....   | 11 |
| National Science Bowl .....   | 11 |
| Underrepresented Minority/Female Initiative .....   | 12 |
| Atomic, Molecular, and Optical Physics Summer School (AMO) .....  | 12 |
| Science Engineering Research Semester (SERS) .....  | 13 |
| Science and Technology Alliance .....   | 14 |
| Regional Two-Year College Initiative.....   | 14 |
| International Science Partners .....  | 15 |
| <br>EDUCATIONAL TECHNOLOGY .....  | 16 |
| Teaching Hearing-Impaired Students to Speak .....   | 16 |
| Educational Networking Support (EduNets) .....  | 17 |
| Distance Learning and Educational Technology.....   | 18 |
| Hypermedia Compact Disc as an Educational Tool for the Use and Maintenance of Machine tool Enhancements .....               | 19 |
| Systems Modeling for Education (Formerly Cyberpede) .....   | 20 |
| Science Outreach Program .....  | 21 |
| Robotics Challenge.....   | 21 |
| GEONet/TOPS Electronic Bulletin Board .....   | 22 |
| Model-Nets: A National Study of Viable Models of Networking Technology in K-12 Education .....                              | 22 |

|   |    |
|---|----|
| PUBLIC UNDERSTANDING OF SCIENCE .....                           | 24 |
| Perspectives on Science Newsletter.....                         | 24 |
| Practical Applications for Young Scientists (PAYS) .....        | 24 |
| Science Education Information On-line .....                     | 24 |
| Family Math .....   | 25 |
| Science at Home.....  | 25 |
| OTHER .....   | 26 |
| Assessing Middle School Students Understanding of Science ..... | 26 |
| K-12 Equipment for Education Program .....                      | 26 |

LOS ALAMOS NATIONAL LABORATORY  
SCIENCE EDUCATION PROGRAMS  
PROGRESS REPORT

April 1, 1995 – June 30, 1995

**TEACHER/FACULTY ENHANCEMENT**

**National Teacher Enhancement Program (NTEP)**

Summer Institute: June 12-30, 1995

During the 1995 summer institute, NTEP teachers worked with Laboratory scientists from the ESH-20 Environmental Impact Group on a science immersion scenario involving the hypothetical plan that the Laboratory would be building a new site in Sandia Canyon, and that they would be responsible for creating a biological assessment of the area. They received training from ESH-20 scientists in how to carry out field surveys, and collect and analyze data. Teams of 4-5 teachers worked with Laboratory scientists in the fields of mammalogy, ornithology, botany, and terrestrial and aquatic insects. They also received field training in water and soil testing, aquatic insect collecting, and botany. Additional training was provided in applying the constructivist method in life science in the classroom, using the Boston University Microcosmos curriculum to teach microbiology, and using the provided field microscopes. They also received additional training in the Science at Home curriculum, the Project Wild Program, and using the Internet for research and communication with other teachers, schools, and scientists. The final day of the institute was spent with school principals reviewing leadership material on systemic change that they will use in their schools and districts to facilitate discussions with fellow teachers, parents, and community leaders and administrators on the future of science and math education in their schools.

**TOPS Mentor/Storm Tracking Project**

The TOPS (Teacher Opportunities to Promote Science) Mentor Teachers met as a group for the first time at a workshop on April 19, 1995, in Albuquerque. The workshop was held in conjunction with the final workshop for the '93 TOPS cohort and the introductory workshop for the '95 cohort. The workshop gave the participants a chance to meet with LANL science coordinator, Andrea Palounek, for an overview of the storm tracking project. They began to make plans for the two week TOPS Mentor Summer Institute which will be conducted at LANL July 17-28, 1995.

Plans for the first week involve the training of the mentor teachers in the advanced math, science, and technology skills needed to implement the storm-tracking research. Training will be provided by scientists and education outreach staff from both LANL and SNL. Participants will also plan for the following (second) week when they will be providing similar training for the TOPS teachers. They will present mini workshops introducing the TOPS teachers to basic concepts of meteorology through demonstrations and hands-on activities.

TOPS mentor teacher, Peggy McCracken, presented a two day "Microcosmos" workshop for the NTEP teachers during their summer institute in June. Ms. McCracken trained at Boston University with the author of the "Microcosmos" curriculum, Dr. Zook; she was selected for training following a TOPS workshop with Dr. Zook.

### **Nonproliferation & International Security – Teacher Enhancement Program (NIS – TEP)**

This summer there are 5 NIS-TEP teacher participants. Two of the teachers have returned from the summer of 1994, Catherine Mannon and John Drabanski. They are working with Roger Byrd and Bruce Barraclough of NIS-1. In addition, there are three new NIS-TEP teacher participants. Robert Downs of Bloomfield, New Mexico is working with Abe Jacobson of NIS-1, Anita Gerlach of Santa Fe, New Mexico is working with Paul Argo of NIS-1, and Steve Schum of Albuquerque, New Mexico is working with Dave Suszcynsky, also of NIS-1. All of the NIS-TEP teachers are participating in all planned activities with the Teacher Research Associates Program – TRAC. The teachers meet every Wednesday morning to work together on the transfer plan to take to their classrooms, and on Wednesday afternoons they tour a variety of laboratories at LANL. The NIS-TEP teachers have been meeting informally for weekly lunches to plan their transfer. They are working as a team to create a curriculum that will introduce the concept of nonproliferation to their classrooms. Each teacher has a role in the plan and it is coming together quite nicely. The program will end on August 4 and the transfer plan will be presented at a reception on August 3.

In addition, progress has been made on a small project currently being formulated by the SEO Office and a Laboratory staff member from NIS-2. The effort involves Susan McKinney and Dick Powell of Los Alamos High School and Dave Gram of Santa Fe High School in an atmospheric study utilizing scientific balloons. The project is centered on the development of a curriculum that uses remote sensing techniques to examine and analyze atmospheric pollutants. The final curriculum will be piloted this academic year with high school freshmen and sophomores.

### **Teacher Environmental Assessment and Monitoring Program (TEAM) (Formerly FCCSET High School Teacher Summer Institute)**

There were two major accomplishments during this quarter:

(1) The third—and final— follow-up workshop was held for program participants, and; (2) TEAM program participant recruitment and program development.

The third and final follow-up workshop was held May 4-5 at Los Alamos. Among the highlights of the workshop:

- A review session in-Hyper-Text Mark-up Language (HTML) by Los Alamos National Laboratory.
- A session from the Science Education and Outreach Office at Los Alamos National Laboratory, on "Grant writing."
- A tour of Los Alamos National Laboratory water quality research sites with LANL scientists and technicians.

Planning efforts in April and mid-May for the TEAM program concentrated on participant recruitment. Calls to follow up the mailing sent in May to administrators throughout New Mexico and southern Colorado were made to individual teachers and administrators. Nine teams of teachers and administrators were recruited through these efforts, for a total second-year cohort of twenty-five teachers and nine administrators. Of the nine teams, three are from New Mexico, three are from western Texas, one is from Colorado, one is from Mexico, and one is from Arzamas-16, Russia.

TEAM program development activity for the summer institute was greatest mid-May through June. Laboratory scientists were contacted to assist in the delivery of sessions in various areas. These include Using the Internet, Using GEONet, Conducting Water Quality Research, Hydrology and Groundwater, Chemical Indicators of Water Quality, Biological Indicators of Water Quality, and Risk Assessment. More LANL connections are expected to develop in coming weeks. In addition, educational consultants were contacted and enlisted to conduct sessions at the institute.

The TEAM program summer institute begins on July 5 and runs through August 1. There will be three two-day follow-up workshops for TEAM participants during the academic year.

### **Teacher Research Associates (TRAC)**

The summer TRAC program began on June 12, 1995, with 11 national TRAC teachers and 3 regional TRAC teachers. All of the teachers are currently conducting research with a mentor. As a group, we meet every Wednesday morning to discuss and learn how to transfer their research to the classroom. The teachers are working on their transfer designs and will videotape a short 5-minute segment describing their research and their ideas for transfer on July 31. In addition, we also spend Wednesday afternoons on a tour of a variety of Laboratory facilities.

The LANL TRAC teachers hosted a day of discussion and tours with the Sandia National Laboratory and Inhalation Toxicology Research Institute TRAC participants. The LANL TRAC teachers have designed a schedule of special social events and plan to see Northern New Mexico. Another special event brought the teachers together for a potluck at the coordinator's home to meet the International Science Partners Russian teachers and students on June 18. A new teacher participant from New York just arrived to the TRAC program on July 5. The program will officially end on August 4, 1995.

### **Teacher Opportunities to Promote Science (TOPS)**

April – Conducted final workshop for second TOPS cohort ('93) and introductory workshop for the third cohort ('95). The workshops were held at the Ramada Classic in Albuquerque on April 19-21, 1995. The new cohort met April 19-20 and the '93 cohort met April 20-21. The '95 TOPS teachers were welcomed into the program by educational outreach staff from both LANL and SNL. They were introduced to the constructivist learning theory by UNM Professor Teresa Kokoski and visited the Atomic Museum at Kirtland AFB. The '93 TOPS teachers reviewed the constructivist teaching model for science and math with Prof. Kokoski and participated in a workshop on implementing change presented by LANL's Science Education and Outreach Office. The groups combined for lunch and activities.

May – Conducted site visits to the classrooms of the new ('95) cohort of TOPS teachers. The purpose of the visits were to observe the teachers in their school settings, meet their

peer teachers and administrators, and observe their first efforts in the implementation of the constructivist model into their classrooms.

Surveys were distributed to all the teachers either during the site visits or through the mail. The surveys were administered to their students and will be used as the first step in collecting data about the attitudes of students towards science, math, and technology.

June – Mailings were sent out with assignments including readings on Euclid which will be used in their work at St. John's College. A collaboration with TOPS, TEAM and St. John's College in Santa Fe is being piloted during the TOPS and TEAM summer institutes. Professors at St. John's will conduct tutorials on Euclid with the participants to immerse them in an intense constructivist experience. Teachers will also have the opportunity to observe regular sessions on campus.

### **National Geographic Kids Network Teacher Institute**

Applications for the NGS Summer Institute were solicited and all 20 participant positions were filled. Acceptance letters were mailed out with pre-institute surveys and a tentative agenda for the week of the institute.

The FY95 NGS/DOE/LANL Summer Institute will be held in Los Alamos during the week of July 31- August 4, 1995. The topic for this year's institute is "What's in Our Water?" This topic was chosen to coordinate with LANL's Teacher Environmental Assessment and Monitoring (TEAM) program. TEAM mentor teachers will work with the NGS Kids Network participants during the summer institute and network with them during the following academic year using GEONet.

The instructor for the NGS Summer Institute is Lorraine Whalen, a participant in FY94's summer institute. Lorraine will work with two TEAM mentor teachers, Dick Powell and Peter Graham. They will take the NGS participants on a field trip that will include two rivers in the Jemez Mountains for examples of healthy and unhealthy river systems. Participants will learn how to perform chemical tests and make collections of aquatic life to be used in assessing the water quality of the two rivers.

## **CURRICULUM IMPROVEMENT**

### **MegaMath**

The production of a 30 second Public Service Announcement has been completed in conjunction with LANL CIC-9 Video Team headed by Booth Gallet. The director of the PSA was Harry Hamburg of Sunrise Productions in Albuquerque. MegaMath principal investigator Mike Hawrylycz organized the effort and participated through the development and filming. The storyboard received input from Andy Andrews of laboratory education projects and Carol Evans, of the Moving Image Arts Department of the College of Santa Fe. A proposed final copy has been delivered to upper laboratory management and public affairs. In airing this PSA we hope to give LANL and DOE education projects national level publicity. A copy of the video is available by contacting the LANL Science Education Program Office.

The MegaMath Internet workbook has undergone significant revisions. We have made an effort to speed up the access time for the workbook images by reducing and reorganizing the material. New material currently being developed will soon be added to the workbook. The workbook resides at the World Wide Web address

<http://c3.lanl.gov/mega-math/>

As the workbook is one of the prime sources of MegaMath materials this should lead to a broader exposure of the materials.

MegaMath has been accepted for a 20-minute presentation at the NCTM (National Council of Teachers of Mathematics) meeting in San Diego, CA, October, 1995.

MegaMath materials, including the workbook, summary, three-page informational pamphlet (produced with collaborator John Speckien of SAMI, Science and Math Initiatives in the previous quarter) are being sent out to many nationwide requests. This includes presentations at educational conferences by Speckien.

### **Neighborhood Environmental Watch Network (NEWNet)**

Environmental Teller Machine (ETM) Software – We have converted the ETM software for use with a touch screen monitor. We also have rewritten the data input code so that all new format stations, MET format, can be read and displayed. The MET format data files contain some new data such as humidity, and wind direction using wind direction vectors, so we can more accurately calculate the wind direction and magnitude. We are working on a new display for wind parameters, something other than an XY plot.

We are also working with displaying graphs that contain the last 24 hours worth of data in 15-minute averages and possibly the last year's worth of data in monthly averages. We have developed an algorithm, and are writing the code for downloading the last 15 minutes worth of data from the VAX database, rather than the last 24 hours, so that we will be displaying real time data. We will have the latest version of the network installed offline next week so we can start testing this application out.

ETM Hardware – We purchased a kiosk from KIS in Boulder. It was a success at the ISE convention in Albuquerque we attended in early May. The touch screen was an instant

draw. We have also purchased a multi-media notebook for demonstrations when setting up the kiosk is not possible.

ETM Miscellaneous – We have been working with SCISO Inc. of Albuquerque in helping design a better ETM user interface. Some of the areas where they are involved are helping to create two tutorials, one in radiation education and one in NEWNet system design and information. SCISO is also interested in adding worldwide maps into the ETM for location selection, where the user can zoom in or out.

We have talked about adding local site location information in a "home page" format.

## **INSTITUTIONAL IMPROVEMENT**

### **Pre-Service Institute for Science and Math (PRISM)**

Student research projects for second year students (first cohort) are at various stages of articulation and implementation. One student has designed curriculum activities in computer science and will help train secondary teachers. Two students at UNM main campus are designing and creating WWW Pages for UNM School of Engineering. Another student as part of a UGS assignment has designed a macro insulator and copper connector to an ion mill. An environmental science major is developing a research question for next year regarding radon gas detection and remediation.

Nine new students have been accepted into the second cohort. Another cluster of applications will be considered and hopefully the remaining openings will be filled before the Summer Institute begins on July 31. Collaborative planning efforts are underway for the institute activities. Laboratory scientists and UNM-LA instructors meet biweekly to coordinate activities that support the institute theme: Systems Thinking, Modeling and Simulation.

A new strategy for implementing the program goals and objectives based on formative evaluations over the two years has been developed. We are choosing to emphasize the students' first two years as undergraduates and also to include both students and faculty from Northern New Mexico Community College and Santa Fe Community College into the program. Additionally, we hope to link each two-year college team with high school faculty to help strengthen the bridge between high school and college. By making these changes we hope to help more students from the surrounding communities make the necessary transitions toward completing a four year degree in science, mathematics, engineering or technology.

### **SIMSE Support**

The LANL Science Education and Outreach (SEO) group has continued its support of the New Mexico Systemic Initiative in Mathematics and Science Education (SIMSE). SIMSE is an NSF-funded initiative to reform math and science education in the state through teacher enhancement, policy reform, and school-based reform. After receiving word in early April that NSF would continue funding SIMSE for the balance of the five-year, \$10-million grant, SEO turned its attention to the SIMSE Year 4 plan. Year 4 activities will focus on institutionalizing reform through continued policy reform, "scale-up" (spreading reforms beyond participating schools and educators) and communicating about reform to the public and to policy makers. A key element of scale-up is the widening of our efforts beyond individual schools to include entire districts. In support of this strategy, SEO will provide technical assistance to a local school district, Pojoaque Valley Schools, in developing a long-range strategic plan for reform across the district. SEO staff continue to support SIMSE's communications work and policy reform.

## **STUDENT SUPPORT**

### **Students Examining Issues in Science (SEIS)**

The SEIS program is currently in session. The SEIS program began June 19, 1995, and will run through July 28, 1995.

Planning for the institute included the formation of a core planning team composed of Laboratory scientists involved in the field of tritium. Information from the planning meetings were used to establish the institute curriculum. A number of Laboratory scientists and technicians were contacted and many volunteered to give presentations and tours. Community leaders were also contacted and many agreed to participate in the program.

Informational flyers, application forms and reference forms were disseminated to all Northern New Mexico high schools. Twenty-four students were selected from a pool of fifty-eight. Criteria for selection was established and all student applications were screened by the program coordinator and the team supervisor.

The following will occur during the third quarter of 1995.

- Completion of the SEIS summer institute.
- Evaluation of the SEIS program.
- Follow-up letters to all volunteers.
- Follow-up letters to all participants and participant high-schools.
- Preparation of final report.

### **Summer Experience for the Economically Disadvantaged (SEED)**

Students were recruited in cooperation with counselors and principals from area high schools. As a result, 12 students were selected to participate in summer research experiences, with 3 students in SEED II and 9 students in SEED I.

We held an orientation sessions for students on June 12 from 8 - 11:30 AM at the Otowi sideroom C, followed by a no-host luncheon with the mentors. A class at UNM-LA was scheduled for SEED students to be held every Wednesday morning from 9 - 11:30 AM during the summer appointment period. The class curriculum centers on developing career interests and the educational requirements accompanying these career choices. Student training as requested by the mentors was coordinated with Training and Development.

The program coordinator attended a mentoring workshop and distributed materials to mentors to help them better understand their role with students and to provide strategies for effective mentoring.

We provided the American Chemical Society with Matching Funds Verification form in order to receive funding for the program. Also, the Student Financial Information Statement and Initial Student Survey were submitted to ACS for funding purposes.

## **Summer of Applied Geophysical Experience (SAGE)**

During this quarter, applications were received and reviewed for the 1995 Summer of Applied Geophysical Experience program. Thirty students were selected from 27 U. S. and foreign institutions. Students comprise 16 "REU undergraduates" (U.S citizens who are currently undergraduates or who graduated in the spring semester of 1995), 11 students who are currently enrolled in graduate programs, and 3 "professionals." "Professional" students in this year's group are a staff member from the U. S. Bureau of Mines, a professor from a junior college, and a high school teacher (a participant of the TRAC program at LANL). SAGE 1995 began on June 16, and is currently in progress. To date, industry participants from Zephyr Geophysical Company, Zong Engineering, the Colorado School of Mines, and Kennecott Exploration Company have participated with the students in the field, contributing equipment and expertise. Field work, data processing, and interpretation are in progress.

## **Exploring Science Careers**

The spring semester of Exploring Science Careers culminated with a Junior Sprint Solar Car competition sponsored by DOE and NREL. Students were assisted by Laboratory engineer Marty Shipley, who worked with the students to design and construct their solar cars. Other students participating in the race were from the classrooms of teachers participating in the TOPS and NTEP programs.

The final awards ceremony was held at the Otowi cafeteria and certificates were presented by Rebecca Phillips, Deputy Director for Human Resources. The 28 students receiving certificates and high school credit were from Taos, Española, Mesa Vista, Pojoaque, Los Alamos, and Santa Fe. Awards were also given for their solar cars.

Evaluation of the program is in progress and the fall recruitment for Exploring Science Careers will begin in September.

## **High School Forum on Critical Issues**

The High School Forum on Critical Issues was held in the Study Center at Los Alamos National Laboratory on April 21 with 15 teams participating in the event. Each team consisted of up to 5 students and a teacher/coach. Student teams gave multi-media presentations to an audience of students, educators, and Laboratory scientists and personnel. A poster session involving all teams was also held in the afternoon. During the day, we gathered teacher and student feedback in order to evaluate the process of the High School Forum. The forms are being analyzed and will be a primary piece in the assessment of the Forum.

The winning team along with 4 ambassadors were selected to participate in a joint research experience designed by the Laboratory and the University of New Mexico. The participating teams were given a reimbursement and a travel allowance for all those teams coming from outside of the Albuquerque area. A research experience was coordinated for student winners in cooperation with the University of New Mexico that centered on the topic of rain forests. The LANL Science Education Program Office sponsored a trip to Miami, while UNM funded the group to travel to Costa Rica.

To prepare for the trip, we held an organizational meeting at Highland High School on June 8 to discuss the schedule of events and arrangements for the research experience for student winners and their parents. We began planning for a follow up presentation by the student winners, to be given to LANL and UNM employees.

Finally, we met with evaluators from the University of California at Los Angeles to begin the design of an in-depth evaluation for this program.

### **New Mexico Supercomputing Challenge**

Los Alamos National Laboratory's highlight of the year with respect to the Challenge is the Awards Day activities which were held on April 26 and 27. Approximately 100 LANL people were involved with the activities in one way or another. Several different CIC groups were represented. The Awards Day went well with over 225 students and teachers participating. Nine of the ten scheduled tour groups "made". Three of the possible ten foreign national students attended and were handled appropriately. Over half of the participants came from such distances that they were housed for one night in Los Alamos.

Out of the 104 teams still in the Challenge in April, 82 submitted final reports. This is the best percentage yet. From the 58 competitive reports submitted, 11 were selected as "finalist teams" to come to LANL a day early for final judging. Finalist teams came from Albuquerque, Bloomfield, Española, Moriarty, Pecos, and one home school. The title of the winning project was "Predicting the Necessary Radius for an Ice Comet to Reach the Earth's Surface".

Special awards were given to recognize 11 teachers that were part of the first Challenge 5 years ago who were part of this year's Challenge.

Listed on the Awards Ceremony program were the 12 1995 Challenge Sponsors and the 16 1995 Challenge Contributors showing that the Challenge is a big cooperative effort between LANL and many New Mexico business and educational institutions.

The participants were given tours that included many scientific talks given by LANL scientists. They were able to see the computers that they had been working on in both the Laboratory Data Communication Center machine room and in the Advanced Computing Laboratory. Talk topics included: In Vitro Models of Cancer, Snake Awareness Program, Conversations With Your Computer--Voice I/O, Video Teleconferencing, Romancing the Winds, Vacuum Science Demonstration, Advanced Simulation Laboratory, Rocketry, and Robots.

In June, three LANL employees went to Lawrence Livermore National Laboratory to learn about the National Education Supercomputer Program and how it can be used in the Challenge. They will teach NESP courses to the teachers and students involved in next year's Challenge and will be able to respond to questions and problems in the future.

In June, a LANL employee presented a poster session about the Challenge at the Society and the Future of Computing '95 conference. The anti-nuclear sentiment was evident and many sociologists and philosophers attended the meeting which reduced the technical content but it was good PR to show how LANL is reaching out to women and minorities and people in rural areas through the Challenge.

In June, a LANL employee attended the National Educational Computing Conference in Maryland and got many useful ideas to use in different phases of the Challenge.

We have been working hard preparing for July 31-August 11, when we will have the New Mexico Supercomputing Challenge Summer Teachers Training Session. Thirty Challenge teachers have enrolled for the two-week session to learn C++, UNIX, the Internet/WWW, HTML, NESP, and other topics. They will be housed in Los Alamos and if they pass the tests, will receive 3 units of college credit from the University of New Mexico, Los Alamos branch. Most of the classes will be held at UNM-LA. The Session is being sponsored by LANL, New Mexico Technet, and Cray Research.

### **Historically Black Colleges and Universities (HBCU)**

This Quarterly Progress Report will outline major activities for the Historically Black Colleges and Universities (HBCU) Program.

- Attended DOE/Veterans Affairs Regional Conference April 24-25, in Miami, Florida, hosted by Florida International University.
- Attended Third Annual Symposium on Historically Black Colleges and Universities and Minority Serving Institutions (April 27-29) in Atlanta, GA, hosted by Clark Atlanta University.
- Orientation Programs (June 1 and 16) for summer students and their mentors. Dr. Howard Adams was guest presenter June 1 and Mrs. Sheila Scott June 16. Reception for mentors and students followed the formal program.
- STB/UO hosted (June 22) a group of student (40) from Sandia National Laboratory, on a technical tour.
- Attended the American Society for Engineering Education, Anaheim, CA. (June 25-28) Annual Conference. Also participated in a special "Summit" meeting with the leadership of major minority Engineering organizations. The group agreed to form a coalition and work together.
- May and June: 42 HBCU students are working as summer interns at LANL. Each student is assigned a mentor to supervise the student's research experience. Two faculty members are engaged in collaborative research at LANL this summer.

### **National Science Bowl**

The regional winning team, La Cueva High School, was escorted to the National Science Bowl in Washington, D.C. on April 28 - May 1. The program coordinator participated as a volunteer in National Science Bowl competition and completed a follow-up survey for DOE-HQ.

In cooperation with Sandia National Laboratories, we planned a trip to the Laboratory for students from Armand Hammer World College. They are fourth place winners from the National Science Bowl. This trip will emphasize research at both Sandia and Los Alamos Laboratory facilities, and will incorporate hands-on activities designed to engage students.

## **Underrepresented Minority/Female Initiative**

- Currently there are 9 GRA students on board. Four of the nine GRA students are on a 50/50 salary cost-share basis with their host technical organization and the URM/F program.
- Twenty-six UGS students and one faculty member are part of the summer internship program. Five of the twenty-six students are at NMSU as part of the LANL NSF/AMP collaboration.
- Twenty-one high school graduates are at UNM-LA this summer (1995) for an eight-week summer institute. In addition, the program co-sponsored a UNM-LA three-credit-hour science course for 15 graduating seniors at the Jemez Valley High School.

## Other Activities

- Supported the Northeastern New Mexico Regional Science Fair by providing math/science/technology related books as awards to winners.
- Supported LANL Native Americans in several recruiting and conference initiatives. They have submitted names and employment applications needed for possible summer internships placements.
- Discussions are underway to explore a three- to four-day institute for "Earth Shuttle" teachers in Northern New Mexico this summer (1995).
- Remain active on the Council for Technology as it pertains to distance learning education in New Mexico Schools.

## **Atomic, Molecular, and Optical Physics Summer School (AMO)**

This third quarter encompasses our final organizational stage before the beginning of the session on June 5 as well as the first half of the Summer School. Out of over 50 completed applications, we selected 21 students based on a combination of grades and letters of recommendation. Seventeen accepted, which was the optimal number dictated by the budget. Of this number over 40% represent minority groups, including about 25% female students. The students come from a wide variety of geographical locations and educational institutions. For the first time in our seven-year history, we have accepted students from several New Mexico schools [UNM, NMSU, and ENMU].

The basic program is divided into two components: 1) a series of lectures by distinguished scientists on topics of current interest, and 2) a full-term mentored research project under the guidance of one of the scientific groups at Los Alamos or the University of New Mexico. This year, we have nine mentors, both from theoretical and experimental programs, across a broad range of fields in atomic, molecular, and optical physics. Projects include the experimental investigation of coherent control of molecular reactions and of resonances in two-electron systems, spectroscopic analysis of laser-generated plasmas, reactive and heavy-particle scattering, molecular dynamics simulations of atoms in fields, quantum optics investigations of the Lamb shift and gravitational lens effects, and transient quantum mechanical phenomena such as switching in artificial atoms. Generally two students work with a mentor. The projects, even the experimental ones, all have a strong supercomputing component with access to the

Laboratory's CRAY YMP machines as well as workstation clusters. The lecturers again represent top people in their respective fields coming principally from the Laboratory and UNM.

We also have several visiting lecturers, including Prof. Peter Winkler [Univ. Nevada-Reno], Dr. Barry Schneider [NSF], Prof. Jon Weisheit [Rice Univ.], and Dr. Al Merts [Oklahoma].

The students are housed in two units very close together. Several additional activities have already been planned, including tours of the laser facilities and the Advanced Computer Laboratory [ACL]. In addition, a reception for students, mentors, lecturers, and administrators was held at the end of the first week; a School picnic is scheduled for the first week in July. The students have also been integrated into the Laboratory's summer activities program with access to such facilities as the Wellness Center [full-range Gym].

#### Universities Represented:

|                |                  |                    |
|----------------|------------------|--------------------|
| North Carolina | Tulsa (OK)       | Eastern New Mexico |
| Rochester (NY) | Ohio             | Jacksonville (FL)  |
| Colgate (NY)   | Fordham (NY)     | Kansas             |
| Miami (OH)     | Colorado         | Temple (PA)        |
| Illinois State | Bryn Mawr (PA)   | Kansas             |
| New Mexico     | New Mexico State |                    |

Students – 11 undergraduates; 6 first-year graduate students 4 women, 3 Asian, 1 African-American.

### Science Engineering Research Semester (SERS)

The spring 1995 SERS program ended on May 5, 1995. A total of 25 undergraduates from throughout the country participated. Thirteen of the students were accompanied by the coordinator to the Bisti Badlands in northwestern New Mexico for a special field trip on April 29-30. All of the students gave a technical talk to their sponsoring group before leaving the program. The final poster session was held again at the Bradbury Science Museum on May 4 and there were about 100 visitors at the event. Of the 25 spring SERS students, 11 have remained at the Laboratory for summer employment either in the UGS or GRA programs.

Selections have been made for the fall of 1995 and there will be 27 SERS participants.

On June 30 in conjunction with an annual picnic sponsored by the HR Staffing group, all SERS students, past and present, were invited for a reunion. There were 2 cakes with the SERS logo on them and approximately 20 SERS students were able to attend. They represented SERS students from the very first group in the spring of 1989 and as recent as the incoming students for the fall 1995 semester.

## Science and Technology Alliance

- Attended Manufacturing Workshop (May 11) , San Juan, PR, hosted by the engineering program at the University of Turabo, sponsored by the Science and Technology Alliance Program. LANL S&TA program sponsored two Laboratory staff members as presenters.
- Twenty-seven S&TA students are working as summer interns at LANL. Each student is assigned a mentor to supervise the student's research experience. Two faculty members are engaged in collaborative research at LANL this summer.

## Regional Two-Year College Initiative

Status:

- To date there are three research projects in place and one research contract being formalized with another regional postsecondary institution, along with other proposals being considered from other two-year schools.

Contracts in place:

- Northern New Mexico Community College (*Pemphigus vulgaris* -DNA sequencing)
- Navajo Community College (GIS transportation costs of solid waste and recycled materials on the Navajo and Hopi reservations)
- Santa Fe Community College (environmental restoration and waste management regional needs assessment as it would apply to regional rural communities and Native American pueblo reservations)

The research contracts in place involve four (4) faculty members and eight students.

- The contract that is currently being formalized is with the United World College to develop an educational program derived from the adaptation of geothermal energy on their campus.
- A "Memorandum of Intent (MOI)", has been signed between the Laboratory, Albuquerque TVI, and the Intel Corporation. The Laboratory and Intel will collaborate with TVI and other regional two-year institutions in the training and education of microelectronics technicians, making use of the LANL/AML clean room facility. The two-year initiative program has two part-time UGS students from TVI working at the AML facility with a LANL mentor. As a result of the 1995 New Mexico Legislature funding of \$300K, work continues with the five two-year institutions. These dollars will provide support to the two-year participating institutions for additional faculty support.
- Northern New Mexico Community College and Luna Vocational Technical Institute have implemented a similar curricula; Santa Fe Community College and San Juan College are scheduled to start next fall.
- Eight student/faculty teams are in place at LANL as summer internships. Four teams are part of the continued advanced manufacturing technologies from last summer and

four teams are involved in environmental restoration/waste management on-site applied research and cleanup projects.

- In addition to the student/faculty teams, there are four other students working on other science and engineering related projects this summer at LANL.
- Preliminary collaborations with Luna Vocational Technical Institute, Allied Signal, New Mexico State University, and LANL have begun in a joint effort to assist Luna Vocational Technical Institute in developing a regional advanced manufacturing technology training center.
- A Northern New Mexico Consortium for Advanced technologies (NNMCAT) NSF/ATE pre-proposal is being drafted to meet the August 3, 1995 deadline.

### **International Science Partners**

Effort on the International Science Partners Program (ISP) during this quarter focused on the following two areas: (1) Planning and implementing the program's culminating event: a Student Research Summit; and (2) Planning and implementing an ISP Teacher Leadership Workshop.

The ISP "Student Research Summit" was held June 26-28, 1995 at Los Alamos National Laboratory. The Summit was designed to give students and teachers the opportunity to discuss the results of their scientific investigations, learn from one another, discuss solutions, celebrate new friendships, and chart future directions for their mutual environmental investigations.

Student teams from high schools in Tennessee, California, New Mexico, and Russia were present at the Summit. The three components delivered by each team at the Summit were: (A) Research Report; (B) Verbal Presentation of Research, and; (C) Visual/Cultural Display. In addition, student teams participated in a water quality research dry-lab exercise facilitated by a scientist from Livermore National Laboratory, toured Los Alamos National Laboratory water quality research sites with LANL scientists and technicians, and participated in discussions of the global implications of their research. Representatives from the Science Education Programs at Los Alamos, Livermore, and Oak Ridge National Laboratories facilitated these discussions.

The ISP "Teacher Leadership Workshop" was held June 29-30, 1995, at Los Alamos National Laboratory. Teachers from high schools in Tennessee, California, New Mexico, and Russia were present at the workshop. The workshop was designed to give these teachers the opportunity to refine the ISP program design and chart ways for continued collaboration and participation in the ISP program. In addition, the workshop presented participants with skills necessary to be "teacher-leaders." The workshop was facilitated by staff from the "Global Rivers Environmental Education Network," (GREEN). GREEN is a partner in the ISP program.

## **EDUCATIONAL TECHNOLOGY**

### **Teaching Hearing-Impaired Students to Speak**

Our major technical accomplishment for this reporting period was to develop a method for inferring and displaying the movements of the *back part* of the tongue, deep within the pharynx, as well as the front part of the tongue, and to develop a substantially more accurate mapping that includes all of the tongue.

In our previous displays, the front of the tongue was modeled accurately, but the back of the tongue was not (although it is just as important for pronunciation as is the front of the tongue). The reason for this shortcoming was that the data we had available to us was obtained from microbeam pellets that we could only place towards the front of the tongue. Although we did have available some regular x-ray photographs of speakers that showed the positions of the back part of the tongue, as well as the front, we did not have available the acoustics that accompanied the x-ray photographs (which would be required to learn the relationships between the acoustics and the positions of the tongue). Our solution to this problem was to develop a method that allows midsagittal articulatory data to be expressed in terms of a common representation regardless of recording technique (e.g., microbeam, x-ray image, MRI, ultrasound, etc.) or the number or placement of the points recorded. With this system, we can use microbeam data (which only shows points towards the front of the tongue) and interpret it as though it showed data at the back of the tongue as well. The acoustic-articulatory relationships can then be learned. We have written a technical paper that explains the process in detail [Representing Tongue Profile Data Using PARAFAC Tongue-Shape Factors], but the important practical consequence of this work is that we now have the means to display the movements of the tongue down to the point where it attaches to the hyoid bone, deep within the vocal tract.

For individual speakers, the mapping to the tongue factors now accounts for over 90% of the variance, which is much better than it has been previously. Across speakers, the mapping is much poorer, accounting for only about 60% of the variance. This must be improved.

We have analyzed the motions of the tongue in terms of their tangential and normal accelerations. With these analyses, we have discovered sharp peaks in the normal component of the acceleration, which we tentatively interpret as the impulses that drive the tongue into the correct position for the forthcoming phoneme. In order to test this interpretation, we must study the peaks in the context of the positions of the tongue when the peaks occur. If our hypothesized interpretation is correct, the peaks plus positions would appear to be useful to language learners for showing them how to move their tongue.

We have made further advances in our techniques for inferring articulator positions from acoustics without the requirement for measured articulator data. By applying the constraint of smooth path motion, the results have been improved.

## **Educational Networking Support (EduNets) (Formerly Technology Planning Support for Schools and Internetworking Models for Education)**

The educational networking support projects were in great demand and the networking advisory team was very busy this quarter. Primary efforts included: networking advisement and support, forming regional/district Internet Education Working Groups, schools and site support, establishing regional training centers and Internet computer labs, teacher and staff training and support, Internet education resources support, model documentation, and information dissemination.

We are currently working with the superintendents and technology coordinators in nine New Mexico school districts; three were added this quarter. Through the School Networking Advisory Program, we try to help schools and school districts determine how to get connected and plan their networking infrastructure to ensure feasible and validated networking plans and implementation. Current stages of district internetworking: Cuba school district completed; Pojoaque school district near completion; Central Consolidated and Gallup-McKinley County districts installing school local-area networks, completing wide-area network design specifications; and, five districts doing network planning and needs analysis. New school districts are phased in as current districts progress.

Over 100 teachers and administrators are actively involved in the projects now in our regional and district educational working groups for Internet training and support; the groups more than doubled this quarter. Education Working Groups were expanded for the Navajo Nation Networking Project and for the Zuni, Gallup-McKinley County, and Central Consolidated school districts. A working group was started in the Santa Fe school district.

Internet support teams of 2-6 teachers were started and Internet workstations set-up at 24 schools this quarter. Internet slip accounts and electronic mail accounts are provided by LANL and New Mexico Technet for the members of the site-support teams. The LANL EduNets team made site visits to schools and administrative offices, completed initial site surveys at 35 schools, and installed software and configured workstations at more than 30 sites.

In order to ensure future support and assist with staff training, we are working with five community colleges to establish training centers and Internet-support hubs for their regions. This quarter at UNM-Gallup new software installations were completed in the two Internet labs that we helped set up last quarter, more staff office workstations were set-up for Internet access, basic training for the administrative and support staff continued, and we conducted regional teacher training sessions using the labs. (UNM-Gallup computer science instructors were able to use the Internet access with their classes at the end of the spring term - as soon as the first lab was set up - and the campus began offering courses on the Internet this summer.) Basic training for administrative and support staff was started, and Internet accounts and workstation set-ups were completed for staff at the Crownpoint Institute of Technology (CIT) and Shiprock Navajo Community College. Support planning continued and administrative Internet accounts were set-up for staff at Tsailie Navajo Nation Community College, and support planning began with Northern New Mexico Community College (NNMCC). Curriculum support and development planning for fall courses at CIT continued. Sun workstations are being prepared and Unix training planned for the support staff at CIT, UNM-Gallup, and NCC-Shiprock campuses. This quarter we also partnered with the community colleges on several funding proposals for

helping the school districts and the communities in planning and implementing networks. Schools in the projects' districts are spread out over 12,000 square miles and many of the areas are very remote and hard to reach, but the establishment of the central training centers enables us to get teachers from the district together for workshops. This proved very helpful this quarter.

**Teacher and Staff Training and Support:** Through the EduNets projects, we provide training for teachers, staff, and administrators on using systems, software, and Internet resources for education. This quarter on-site training was provided for over 100 staff and teachers at 24 schools, two district offices, and 12 support/community sites. One-day Internet workshops were held for the core site-support teachers and administrators in the Navajo and Zuni Internet Educational Working Groups in May and June, using the UNM-Gallup labs; approximately 60 working group members have participated in one or both of the workshops. We are holding monthly workshops through the summer. Two half-day workshops were held for the teacher team at Eldorado Elementary School, a model site.

Work continued with the New Mexico State Department of Education on their network and central server plans. Possibilities for a cooperative effort with Cooperative Education Services were investigated. The Solar System Tour on the LANL server was expanded and video segments were added.

This quarter information continued to be gathered for documenting the Crownpoint Community Network Model, the Central Consolidated and Gallup-McKinley Large Urban-Rural District Models, and the Pojoaque and Cuba Small Rural District Models. Installation orders were completed and equipment orders were received for the Internet lab for the Alvord Elementary School Model site.

One of the primary goals of the EduNets program is to make the school networking models and other information gained through these efforts available to administrators and planners both state-wide and nationally. This quarter presentations, demonstrations, and displays included:

- Education Committee Presentation, Navajo Nation Networking Project, April 7, 1995
- Demonstration for the NII Task Force, Santa Fe, NM, April 11, 1995
- Demonstrations for Larry Irving, NTIA Advisory Group, Pojoaque, NM, April 12, 1995
- Internet Workshop I for Education Working Groups, UNM-Gallup, May 12, 1995
- Internet Workshop II for Education Working Groups, UNM-Gallup, June 9, 1995
- Display at the Society and the Future of Computing '95 Conference, Durango, CO, June 12-15, 1995
- Display for the 13th Annual National Indian Impacted Schools Association Conference, Albuquerque, NM, June 15-16, 1995
- Internet: Practical Uses, Navajo Nation Health Division, Window Rock, AZ, June 28, 1995

## **Distance Learning and Educational Technology**

The MegaMath cooperative research and development agreement with EnterLearn Technologies moved forward with the completion of work by Write Right and the forwarding of the draft agreement to EnterLearn for comment. When completed, this

agreement will provide for the movement of a Laboratory science education program to the private sector for further development and distribution.

Also in the MegaMath area, the Lab's first public service announcement was finished through the efforts of CIC-9 (Video Production) of the Laboratory and Sunrise Productions of Albuquerque. The announcement, promoting math education, feature a Laboratory laser scientist and her daughter. Laboratory Public Affairs is now arranging distribution of the announcement to the approximately 1600 television stations around the US. These stations are obligated to air public service announcements as part of their licensing agreements with the FCC. Built into the Laboratory announcement is a contact number which will provide a means of evaluating the response and determining if further announcements are worthwhile.

In support of the Department of Education's Southwest Educational Development Laboratory (SEDL), Los Alamos provided consultation on establishing a distance learning system between the elementary school in Columbus, NM (Deming School District) and the elementary school in Palomas, Mexico, directly across the border. These schools currently share students and it is desired to broaden their interaction. The Laboratory developed concept included a distance learning classroom on both sides of the border as well as the microwave links for both data and full motion video.

Finally, the Laboratory took an instrumental role in developing a Challenge Grant Proposal in cooperation with the Santa Fe Public School, Pojoaque Public Schools, Española Public Schools, the New Mexico Rural Education Association, the Calhoun County, West Virginia Public Schools, the NASA Classroom of the Future, and SWOOP. The proposal is based on technology developed in the Laboratory under the Laboratory Directed Research and Development program. Specifically, it addresses creating tools and the connectivity necessary to make the Internet a useful tool for education. Currently, use of the Internet during school hours is limited because response times are poor. Classroom use demands near real-time response. The Internet capacity problem can be solved in a general sense by using compression techniques demonstrated in the Laboratory's Sunrise project and through the use of intelligent local file servers. These file servers would be the hubs of LANs established in school districts and provide the efficient gateway to the Internet.

### **Hypermedia Compact Disc as an Educational Tool for the Use and Maintenance of Machine tool Enhancements**

Contract Award – The contract for the Hypermedia Compact Disc (HCD) project has been awarded to North Carolina State University.

Hypercard – Bradley Jared, the student working on this project, has gathered the necessary hardware and software for use in the production of the HCD. He has been reviewing a variety of other HCD presentations, which were developed for similar purposes, in order to establish a workable format for our needs. A preliminary plan has been laid out for the overall HCD production; however, input from the LANL machinists will be needed to complete the detailed table of contents.

Fast Tool Servo (FTS) – Bradley has performed calculations on thermal inputs from the FTS' piezoelectric stack to determine its influence on the expected precision of the FTS. He has also been heavily involved with determining methods for reducing the electrical noise in the capacitance gauge which provides the FTS' displacement feedback signal. He has successfully reduced the noise to about 1 mV. A conceptual design of the FTS

has been completed. Bradley has been in contact with Doug Hatch, who is one of LANL's machinists, to obtain dimensional data on our diamond turning machine (DTM) so the detail design can begin.

Ken Garrard has been working very closely with Aerotec, the maker of the machine tool controller, to install the Unidex 31 controller on their DTM. This DTM and controller combination will be used to test the FTS during the development phase at NCSU.

Visit to LANL by NCSU Personnel – Bradley Jared, Tom Dow, Ken Garrard, and Don Moorfield will be coming to LANL on the week of July 17 to discuss HCD details with our machinists and to gather metrological information about our DTM so the detail designs can be completed.

### **Systems Modeling for Education (Formerly Cyberpede)**

An industrial partner (Media Garden of Austin Texas) was chosen to collaborate in developing the computer-based data acquisition and simulation educational technology. John Zahrt (CIC-3), Jerry Morzinski (TSA-9), representatives from Media Gardens, and seven teachers in the program participated in a two week workshop to develop design criteria for the educational technology. The industrial partner and the coordinator are currently negotiating a Cooperative Research and Development Agreement for the product based on the design criteria.

During the workshop (June 5 to June 16) Ellen Mandinach and Hugh Cline of Educational Testing Service and Lynn Crawford, a middle school teacher from California, presented findings from the STACI<sup>N</sup> Project. The Systems Thinking and Curriculum Innovation Network Project is a multi-year research and implementation effort that examines the impact of learning from a systems thinking approach to instruction. The systems thinking approach reinforces the notion that students need to construct their own knowledge through learner-centered activities. This constructivist approach to learning is the foundation for the Systems Modeling for Education Program and the presenters were invaluable inspirations for our participants.

The teachers met for two weeks to discuss the following relevant issues regarding the use and development of the educational technology and to agree on appropriate design criteria.

- the appropriate learning environment
- appropriate teacher behaviors in a technology-based learning environment
- graphical interface standards
- appropriate science concept for testing the first prototype
- common student misconceptions that the technology would address
- relevant activities to test the product
- appropriate evaluation techniques for students in a technology-based environment
- systems thinking exercises and activities
- visual literacy attributes of software

Laboratory scientists, area teachers, the industrial partner and the LANL science education staff are communicating electronically to prepare for the first prototype testing scheduled in late July. Each teacher is developing an activity which will test the ability of the platform to remediate a common heat transfer misconception. John Zahrt and Jerry Morzinski (TSA-9) will continue to consult with the teachers during the testing phases.

## **Science Outreach Program**

On-line Internet Institute (OII) National Project Description – During a five-week period this summer starting with a three day face-to-face session on June 28, 40 teachers from New Mexico will work with 400 selected participants from school districts around the country in a series of on-line activities and workshops designed to teach them how to identify and build successful models for using the Internet for systemic reform and curriculum development at the local level. Educators will experience what it is to learn through project-based, technology-enhanced approaches in their own learning, in order to effectively support this kind of learning for their students. In turn, each project participant will mentor at least five on-line participants in order to extend the process to the wider Internet education community.

Through these efforts, more than 1,000 teachers will return to their classrooms in the fall prepared to bring their students along into a rich environment of Internet resources. Tens of thousands of additional teachers will have access to electronic databases and models that provide a virtual instructional resource for networking in the service of curriculum development and systemic reform.

Science Outreach Program Description – Teachers and administrators from the Science Outreach program will not only serve as participants in the OII but will be responsible for leading other Outreach participants in creating effective technology plans. The plans will integrate educational technology into classroom curricula and will allow the schools to access Los Alamos National Laboratory resources and scientists. Outreach teachers will serve as mentors to other teachers and administrators back at their hub schools in order to share their experiences and extend the process to the wider Internet education community.

To begin this process, a group of four Outreach lead teachers participated in an OII national planning session at the end of the NECC '95 conference in Baltimore and returned to help in the planning of the local OII. Lead teachers will contribute to all phases of the summer OII experience, culminating in a special Science Outreach OII integration workshop in Los Alamos at the end of the summer.

## **Robotics Challenge**

In November, 1995, we brought two Canadian roboticists, Dave Hryniw and Andrew Miller, to LANL to help design elementary BEAM Robotic kits, which we could supply to interested students and competitors. On the Saturday ending their week here we conducted a workshop, in conjunction with the "Cyberpede" project, in which we tested out kit designs on students and teachers. With that information, Hryniw and Miller returned to Canada, designed and started marketing a 'solaroller robotics kit'. We subsequently purchased 100 kits to provide to interested students and teachers. In the months before the Games we provided approximately forty of the kits to schools.

We prepared a six-minute, MTV-format video of previous BEAM Games and BEAM Robot activities, and delivered more than forty copies to Northern New Mexico middle and high schools. We are still receiving requests for this video. In addition, we announced the availability of the video (to educators) on the Internet, and have received numerous requests from college level teachers. We will be making another duplication run to fill these requests.

For the four days, May 4-7, we conducted a BEAM Games and Workshop. Although our BEAM Competitor list was sparse, we did conduct workshops that reached more than 250 youth, many with their parents. In the course of the four days we gave away 120 kits ( at two students per kit ), and Solarbotics (Hrynniak) sold another fifty to adults, or for home consumption. TV Channel 4 had wonderful coverage of the Games/Workshop, and emphasized the student participation with interviews of two local high school students (both girls) who expressed how much fun and value the workshop had been.

It was heartwarming to be in the Workshop room, and see and hear the buzz of excitement as students bent over their robotic kits, soldering, gluing, and designing. Often, a parent was there, working with their child. One pleased mother said that she could hardly recognize her adopted son, who was diagnosed Attention Deficit Disorder (ADD), and who she had never seen able to focus on anything for more than fifteen minutes. He spent several hours totally absorbed in building his little solaroller!

At the end of each session we had mini-games, where interested workshop attendees could race against each other on our main competition tables.

### **GEONet/TOPS Electronic Bulletin Board**

The third quarter of 1995 focused on the preparation for linking GEONet to the Internet and the development of two features of the Bulletin Board, curriculum resources and the communication between LANL scientists and science teachers.

We upgraded the current system software and procured the equipment needed to allow Internet access to and from the Bulletin Board. This process included many negotiations and design sessions with eSoft, the maker and distributor of the required equipment.

In addition, two key areas of the Bulletin Board were targeted for development in the '95 - '96 school year. These were the mentor program and the availability of curriculum resources on the system. In the past, scientists and mentors have informally discussed issues and questions with GEONet users. This approach has been moderately successful, but we believe that the relationships developed could be enriched with more training and recommendations to the scientists as to how to encourage critical thinking skills in their exchanges. Also, a formal application and acceptance process would encourage more commitment on the part of teachers and students involved. Materials were developed for both initiatives during the third quarter.

Finally, teachers participating in existing educational outreach programs were recruited to contribute new curriculum materials to the system on a monthly basis. This will ensure that the content on GEONet is current and consistent with the teaching philosophies and subject matter of our Bulletin Board users.

### **Model-Nets: A National Study of Viable Models of Networking Technology in K-12 Education**

Throughout the months of April and May, teams from the Department of Education's ten regional educational laboratories completed their three-day visits to selected school districts across the United States. As they have completed their visits, they have submitted reports to Los Alamos for editing and formatting. In turn, we have also continued to receive teacher surveys from the 93 school sites participating in the study.

To date, we have received 1,283 surveys. Upon coding, the surveys are being forwarded to Pam Aschbacher at the UCLA's Center for the Study of Evaluation. The Center is overseeing the data entry and analysis process, and a graduate student from the Center has been assigned to read site visit reports and assist in correlating the reports with the teacher survey data from each of the sites.

In May, together with the Center, we compiled a design brief describing the stage II pattern analysis of the site visit reports and accompanying teacher surveys. Stage II will involve a four-day meeting in Santa Fe, July 24-27, 1995. In advance of the meeting, experts in K-12 networking technology will read each of the site visit reports, and then, during the meeting, they will use a series of expert decision making processes to distill characteristics of, obstacles and barriers to, and catalysts for effective integration of networking technology in K-12 schools. These features will become the basis for a template which can be used by federal agencies and school districts in planning, implementing and evaluating network models. During the pattern analysis meeting, we will also explore lessons learned from the site visits and the pattern analysis process and we will look at how the site visit and pattern analysis protocols and instruments can be used for future training, assessment and evaluation activities.

In early June we identified nine individuals to participate in the pattern analysis process. The individuals were selected based on their expertise in one or more of the three following areas: network infrastructure, network policy and planning, or network integration with teaching and learning. They also represent different geographic regions across the country. The team consists of the following:

| <u>Infrastructure and Learning</u> | <u>Policy</u>  | <u>Integration w/Teaching</u> |
|------------------------------------|----------------|-------------------------------|
| Buddy Dennis                       | Don Holznagel  | Patsy Wang-Iverson            |
| Mike Wesley                        | Ray Ramirez    | Seymour Hanfling              |
| Jeff Sun                           | Shirley Crehan | David Rainey                  |

In late June we prepared a set of instructions and tools for the advance reading and pattern analysis to assist our experts and guide the process. We also prepared outlines and timelines for the final report, expert summary and associated appendices.

We have continued to add to our Model-Nets WWW pages and are currently working on web pages describing each of the sites participating in the study and associated references and research.

## **PUBLIC UNDERSTANDING OF SCIENCE**

### **Perspectives on Science Newsletter**

*Perspectives on Science* is now accessible from the World Wide Web (URL: <http://education.lanl.gov>). The magazine can be accessed in PDF format and soon will be accessible in HTML format and downloadable in its original Pagemaker format.

We are sending out a monthly one-page, double-sided newsletter, *Eyes on Science*, to Northern New Mexico educators. Written and edited by Charles Poling, the newsletter apprises educators of events, opportunities and resources available to them at the Laboratory. The newsletter will be mailed throughout the nine months of the school year.

The next issue of *Perspectives* will be mailed in late August and followed up by another issue in early October.

Although we continue to look to innovative methods of using the World Wide Web for distribution of *Perspectives* and other resources, a LANL graduate research assistant has completed the updating and expansion of the mailing database. The database now includes New Mexico's elementary, middle & high school teachers, LANL staff, collaborating education organizations, libraries, museums & science education centers, political dignitaries, press contacts, and federal agencies.

### **Practical Applications for Young Scientists (PAYS)**

The Practical Applications for Young Science Communicators (PAYS) program drew to a close on June 30. Fourteen high school students presented a computer-based multimedia presentation entitled, "Always Was, Always Will Be: Radiation" to the staff of the Bradbury Science Museum. The students began research and audience analysis for the presentation in twice-weekly sessions during April and May and completed the presentation itself during the month of June. The presentation, in addition to being part of a larger exhibit on radiation at the Bradbury Museum, will be mailed to schools in Northern New Mexico and will be made available on the Internet.

### **Science Education Information On-line**

The World Wide Web (WWW) server for the Science and Math Education Program at Los Alamos has been very active over this quarter. The initial redesign of the server has been completed. Refinement to this new design is on-going. New materials from many of the programs have been added to the server.

We have been working with the LANL WWW server team to incorporate the education server into a prominent position on the new LANL homepage. The server will then represent all education efforts at the Laboratory.

Several areas of new material have been added. These include:

- New Mexico On-line Internet Institute (OII) information.
- Changes to the *Science at Home* pages
- Additional Science Education publications, including the new brochure.
- Addition/links of material from other education efforts.

Work is still continuing in several areas. These include:

- Integration with the new LANL WWW design.
- Continued design review of the WWW pages.
- Assistance to several projects to add their resources to the server.
- New capabilities to find information by keyword searches.
- Planning for the upgrade to the server hardware.

From March 6 through July 3 over 1200 different sites outside of Los Alamos and from more than 27 countries visited the server. These visitors transferred more than 17,500 files representing more than 105 million bytes of data. Detailed statistics on access to the server are kept and summaries are available for viewing on the server.

The uniform resource locator (URL) for the WWW server is: <http://education.lanl.gov>.

## **Family Math**

Spring 1995 Recruitment – Applications from six schools in Northern New Mexico were received and processed. Letters of acceptance were mailed to each site, with a form for them to report the dates of their sessions and home addresses of their parent and teacher instructors.

Planning for Instructor Training – Arrangements were made with the Math Learning Center in Santa Fe to host the Family Math instructor training session on August 7, 1995 from 9 a.m. to 4 p.m. Arrangements were made for the session to be conducted by Mary Ann Martinez, an accredited Family Math trainer. Family Math Program teacher and parent instructors were sent mailings informing them of the details of instructor training.

## **Science at Home**

The Science at Home monthly newsletter has been mailed to all team members. This newsletter is used as a support mechanism for Science at Home training participants. Newsletters include educational information, extension activities to enhance the activity book, and information about Laboratory activities that demonstrate real world applications of the concepts covered in the Science at Home curriculum.

Phase 3 of the program, implementation of the program at various national sites, has begun. This phase started during the last quarter and will continue into FY96. During this phase, a train-the-trainer workshop will be delivered to the other national laboratories and interested sites. Training sessions have been held in Los Alamos with schools from Northern New Mexico and with the NTEP program.

Other dissemination efforts include:

- Publication and dissemination of the Science at Home activity book are being explored with the Industrial Partnership Office.
- Plans are being established to do a Train-the-Trainer Workshop in Goodrich, Michigan in September.
- Letters and a fact sheet have gone out to publishers announcing that we are interested in having an industrial partner for the publication of SAH.

## **OTHER**

### **Assessing Middle School Students Understanding of Science**

During this quarter, we scheduled and completed data collection in the seventh and eighth grade science classes of TOPS teachers in five schools. The data has been coded and entered into the computer. We have begun data analysis. These analyses will be completed on seventh graders first and replicated on eighth graders (when possible; unfortunately, we were not able to collect data from eighth grade Native American students). Our current analysis plan includes the following steps.

- Identify and eliminate non-participants (students who did not complete at least half of the items on each measure).
- Determine the consistency (reliability) of each measure's scores by calculating their internal consistencies; evaluate these and determine whether the scores can be used.
- Identify and eliminate univariate statistical outliers (students whose scores are very different from their peers).
- Evaluate the usefulness of the three types of possible scores that can be obtained from the fill-in concept maps; determine which to use in subsequent analyses.
- Examine the relationships among scores from the fill-in concept maps and the multiple-choice achievement measure (and perhaps students' attitude scores).
- Test for gender, ethnicity (Hispanic, Navajo, Anglo), and "order" effects (whether it made a difference on students' achievement if they completed the concept map or the multiple-choice measure first) and their interactions on concept map and multiple-choice scores; evaluate results.
- If possible, at the classroom level, examine the relationships among students' achievement and attitude scores with their teachers' confidence in their students' understanding of the concepts included in our achievement measures.

### **K-12 Equipment for Education Program**

Last quarter, the Laboratory provided computers to 293 schools through participants in 10 Science Education Programs. The total cost of these items was \$639,156. There were 301 items converted from K-12 education loans to gifts to schools totaling \$464,424. The total number of gifts provided to K-12 schools by the Laboratory between April and June, 1995, was 594 worth \$1,103,917.