The Science House

A Report of Our Activities
September 1, 2001 through August 31, 2002

The Science House
College of Physical and Mathematical Sciences
North Carolina State University
Raleigh, NC 27695-8211
Phone (919) 515-6118
FAX (919) 515-7545
www.science-house.org
Summary

Based in the science departments of the North Carolina's science and technology campus, and reaching all of the state, The Science House is a unique enterprise: a nationally-recognized model of university involvement with schools. Each year The Science House brings science learning to more schools and teachers and helps to encourage a new generation into careers in science, mathematics, and technology.

In the past academic year - September, 2001 - August, 2002 - we have:

• Continued to provide high quality science teaching workshops on hands-on learning and using laboratory teaching technology. We extended our teacher training programs to Texas, South Carolina, and Virginia. Our teaching materials are also distributed in five other states.

• Presented numerous teacher workshops and students programs that reached over 3,000 teachers and twenty thousand students in North Carolina.

• Obtained funding from the Howard Hughes Medical Institute and from the US Department of Education to support our two existing regional offices and to establish three additional regional satellite offices in the mountains, sandhills and near the coast.

• Led numerous student camps and programs that target females and students from groups underrepresented in science and mathematics careers.

• Through projects with NSF laboratories, NASA, and NOAA, facilitated the participation of scientists in enhancing K-12 education and brought exciting, cutting-edge science to classrooms.

• Continued to partner with schools, school districts, teachers, and public and private organizations to help improve science and mathematics learning.

• Published two books of learning materials and one volume of Proceedings of a Conference on K-12 Outreach from University Science Departments.

• Spread the outcomes of our work through papers and presentations at state and national education meetings, bringing recognition to NC State University as an education leader and a campus engaged with the needs of the state.

In serving the students and teachers of North Carolina schools, The Science House has adopted a three-fold strategy. Our student science enrichment activities, teacher training programs, and curriculum-related programs link the Research University to the needs of K-12 science and mathematics education.
This linking metaphor applies whether the activity is a one-day Science on the Road school physics demonstration, a two-week laboratory technology workshop for teachers, long-term loans of laboratory equipment, a summer student research program, or a presentation at a national teacher meeting. Science House programs meet real needs, follow the best research and practice in science and mathematics education, and make use of the science faculty and students at North Carolina's science and technology campus.

In the past year The Science House has continued many successful programs - such as the Imhotep Academy, now approaching its tenth year - and looks forward to new ones - such as the establishment of new regional satellite offices.

The year included successful "marker" events. Our several talks and exhibits at the North Carolina Science Teachers Association Annual Conference were very popular. The annual Expanding Your Horizons Conference again brought nearly seven hundred seventh grade girls to campus for a day of activities led by female scientists from the area. The Technology theme of this year's Conference on K-12 Outreach from University Science Departments brought talks on the present and future of how we use and share computers in our learning. The summer student camps and teacher training workshops, all thirty-five of them, went with few hitches and many happy campers.

The scope of our work as educators who link the lab to the classroom has increased. The K-12 activities for the NSF Center for Environmentally Responsible Solvents and Processes and for the NSF Fungal Genomics Laboratory now include three published teaching laboratory collections and teacher training workshops that have kept us busy in Texas, as well as in North Carolina. Eventually these projects will lead us into Kentucky, Indiana, Ohio, Tennessee, and Arizona. Our web project for the National Environmental Satellite, Data and Information Service (NESDIS) is nearing completion, and a NASA research outreach project led to an Astronomy-themed session of the Imhotep Academy. The Fall Student Science Colloquy on "Time" was held at Hillside High School in Durham and, thanks to the NC State University Physics Department, included a Nobel laureate as a guest speaker.

The effectiveness of The Science House contribution to schools is due, in large part, to the commitment of the College of Physical and Mathematical Sciences at NC State; and to the private, corporate and governmental organizations who are our partners and funders. We are fortunate to work with others who share a vision of education opportunities for young people.
We note with sadness the passing this year of Dr. Howard J. Schaeffer, who was the first President of the Burroughs Wellcome Fund. A renowned pharmaceutical chemist, Dr. Schaeffer was an early and active supporter of The Science House, whose encouragement was crucial to our beginnings.

**About Outreach from The Science House**

<table>
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<tr>
<th>Description</th>
<th>Figures</th>
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</thead>
<tbody>
<tr>
<td>Teachers reached annually</td>
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<td>External Funding</td>
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The Science House 2001-2002 4
Science and Mathematics Colloquies

Beth Snoke, David G. Haase

Science and Mathematics Colloquies at The Science House is a Student Science Enrichment Program funded by the Burroughs Wellcome Fund. The program targets high-achieving high school students to introduce them to science as an activity and to show them the vital, interdisciplinary nature of modern science.

Each colloquy consists of ten afternoon sessions during which participants learn about a topic of current interest. Approximately 20 high school juniors and seniors participate in field trips, presentations by research scientists, and hands-on activities using computer applications and probeware. During the second half of the program students conduct an original research project and present their results through a formal talk and web site (www.science-house.org/student/bw).

The Fall colloquy, "It's About Time," was held at Hillside High School in Durham. Students investigated the many ways of keeping time including physical, biological and chemical clocks. Guest speakers for the program included Nobel Laureate Dr. William Philips.

In order to reach more students across the state, the spring colloquy was held at the Education Future Center via interactive video with 14 students at five schools in North Carolina. Teams participating in "How's the Weather" joined us from Alleghany, Lenoir, Lincoln, Currituck, and Chowan counties for investigations in air quality and weather forecasting.

This program has been instrumental in exposing students to different topics and careers in science and mathematics. This is the fifth year colloquies have been held at The Science House, and the student evaluations are a testimonial to its effect on their choices regarding science and mathematics.

"It made me enroll in more science classes next year because I know I want to be working in the science field."

"I used to think that weather was not important! After this class I want to know why everything occurs."

Over 85% of the students participating in the program this year stated that they hope to pursue a career in science and mathematics. This program is certainly reaching its goal of increasing student interest in science and mathematics.

Imhotep Academy

Joyce Hilliard-Clark, Emily Morgan and eight co-teachers/session and student assistants who have graduated from Imhotep Academy.

Supporters: The National Science Foundation, NASA, Carolina Biological Supply Company and Imhotep Parent Association

Imhotep Academy is a middle school pre-college program designed to increase under-represented students’ awareness and enthusiasm for learning mathematics and science. The goals of Imhotep Academy are:
(1) to strengthen the student’s academic abilities and prepare students for matriculation in the university; (2) to expose students to and promote enthusiasm for mathematics, science and technology; (3) to provide multicultural experiences and academic enrichment activities; (4) to teach about contributions of scientists and inventors of under-represented groups; and (5) to build self-confidence and self-esteem in learning mathematics, science and technology. These goals are achieved through classes which use hands-on learning activities, projects, field trips and speakers who introduce new topics to students.

Imhotep Academy operates three sessions per year- Fall, Spring and Summer. The Fall and Spring sessions are held on Saturdays, and the Summer session is held daily for two weeks. The Academy is for sixth, seventh and eighth graders and consists of Math, Chemistry, Physics and Computer technology classes. Field trips and guest speakers are also incorporated into the program. Each semester or summer session follows a theme based on NC Standard Course of Study and the National Standards in Mathematics and Science. The Physics of Sound, Lighting the Way to the Stars and Preparing for the Journey were themes for 2001-2002.

Because it is so important for middle school students to master mathematics concepts, the Academy has developed two related mathematics programs. Algebra Camp is held daily for two weeks during the summer. In 2002, forty-three students took four classes, which focused on Algebra and applying Algebra to all aspects of life including data analysis, logic and games. The theme for the Algebra program was Investing in Your Future. Algebra Camp is directed at seventh and eighth graders who will take Algebra during the next school year. Math for Girls is a program for seventh and eighth grade girls and their parents. The program meets one night each week for six weeks and both the parents and children participate in the lessons. One session of Math for Girls is held each year and approximately 12 students and their parent attend each session.

From Fall 2001 through summer 2002, nearly 300 students from a wide variety of schools in the Triangle area (public, private, charter and home-schooled) attended Imhotep Academy. Imhotep Academy reaches a diverse student population, in which 60% of our students are African American, 20% are Caucasian, 15% are Asian or Pacific Islander, and 5% identify themselves as others. Graduates of Imhotep Academy are encouraged to enroll in other Science House programs and return as student assistants.

About 93% of the students in algebra improved one to 10 points based on pre-and post-assessment. Nearly 50% of our students and teachers return each session. Response to the program from parents, students and teachers regarding creative delivery of instruction has been overwhelmingly positive.

Expanding Your Horizons Conference

Joyce Hilliard-Clark, Beth Snoke, The Science House, and representatives from across the university and community.

The 10th annual Expanding Your Horizons Conference was held at NC State University, Tuesday, March 12, 2002. The objective of the Conference is to inspire seventh grade girls to pursue careers in science, mathematics and engineering. About 600 students from 48 schools with nearly 100 teachers and parents attended the Conference. Nearly 70 professional women from NC State University and Research Triangle businesses and universities presented 44 hands-on science, mathematics and technology sessions for the students and teachers. Increased participation has caused us to reach the capacity of our resources. We are exploring starting additional conferences at Campbell and Duke Universities.

The Expanding Your Horizons Conference is a truly university-wide project administered through The Science House and receives significant funding from The Howard Hughes Medical Institute Pre-College.
Outreach Program, the NSF Science and Technology Center for Environmentally Responsible Solvents and Processes, and the Provost Office at NC State University. Other partners include The Research Triangle Science and Mathematics Partnership, MSEN Pre-College Program, numerous presenters, guides, and behind the scenes volunteers.

The 2002 Conference keynote speaker was Dr. Kristina Johnson, Dean of the School of Engineering at Duke University in Durham. Dean Johnson is committed to investing in science education. Getting young people, especially young women, engaged in science has been a personal focus of hers. She strives to advance the engineering sciences by conducting research and other scientific and educational activities. Press coverage of the 2002 Conference included a large spread in the *News and Observer* newspaper.

The conference is evaluated in terms of its operation and the response of students and the scientist-presenters to the program. Each student was asked “What was the most important thing you learned today?” and “What is your most important question from today’s activities?” Eighty-eight percent of the students reported that the most interesting thing they learned that day was a particular science or mathematics concept. Their most important questions were related to careers in math and science. Even though each student participated in one or more scientific investigations during the day, 21% still want more hands-on science activities next year. The women presenters were extremely pleased with the students, and conference execution and plan to participate again next year.

The Expanding Your Horizons Conference is an important vehicle for demonstrating the University’s desire to increase the number of females in science, mathematics and engineering. The Conference has built a community of professionals who enthusiastically participate each year. Substantial community involvement exists through these professionals and the several co-sponsors of the Conference.

**Student Camps**

*Elizabeth Snoke, Michael Smith, Regina Barrier, Elizabeth Woolard, Chad Ogren, Jennifer Kilpatrick, Dena Bradham, Michelle Benigno*


The Science House offered three science camps for high school students in 2002. Additionally, The Science House provided instruction, curriculum, facilities and equipment for four science camps for middle and high school students.

Twelve rising high school sophomores and juniors visited NC State for two weeks to investigate environmental issues and the technologies used to investigate them during the EnviroTech Summer Camp. A grant from Progress Energy allowed students from across the state to explore issues such as water quality, urban planning, and geology. The campers gained valuable experience in the use of various scientific probeware and other technologies such as GPS and GIS. Campers also experienced real science by conducting their own research projects and presenting their results in a formal closing session. The students also learned about life on a Research I university campus by residing in a dormitory and participating in evening activities on and around NC State’s campus, in addition to their daily experiences exploring scientific issues.

Eight high school students from western North Carolina participated in an EnviroTech day camp at Hibriten High School in Lenoir, N.C., supported by The Science House Western Outreach Satellite Office. The daily activities and experiences of this camp were similar to those of the EnviroTech Summer Camp.
held on NC State’s campus, but took advantage of the unique resources in this area. Visits to local parks such as Grandfather Mountain and Grayson Highlands National Park allowed campers to compare air, water and soil quality in different environments and altitudes.

The Science of Sports brought twelve high school students from across the country to NC State’s campus to investigate the physics and physiology behind common sports. Campers spent two weeks visiting labs on campus and participating in many hands-on activities. Campers also designed and performed their own research projects on topics such as golf, muscle dynamics and soccer, after which they presented their results in a formal closing session. Both the Science of Sports and the EnviroTech day camps are funded by the Burroughs Wellcome Fund as part of the Science and Mathematics Colloquies. The Knowles Science Teaching Foundation provided support for two lateral entry teachers with physics degrees to gain experience working with high school students by assisting with all aspects of the camp.

The Science House also provided lab space, instructor and curriculum for the daytime science activities of the Girl Scout Science Camps held on campus for the fifth consecutive year. Approximately 100 middle and high school girls attend the four sessions of this week long camp.

Each of these camps takes advantage of the resources available in many colleges at NC State through field trips and guest speakers. The camps expose potential NC State students to the programs and opportunities available at this university.

Prospective undergraduates are brought to NC State by these camps, sharing in unique experiences that furnish them with a positive perspective of NC State University, the College of Physical and Mathematical Sciences, scientific careers, and science in general. Several of the girls in the Girl Scout Science Camps this year have been to these camps every year they have been eligible, some for four consecutive years, attesting to the quality of the camps. Numerous campers over the years have been siblings of previous camp participants, confirming that campers have positive experiences in the camps.

**HHMI Precollege Collaboratory**

*Judy Day*

The Precollege Collaboratory Program is funded by a grant from the Howard Hughes Medical Institute.

Teams consisting of a high school science teacher and two rising seniors in high school apply to the program. The goals for students in this program are to introduce high school students to the nature of scientific research, create excitement for scientific research, and to expose them to careers in the science profession. Teachers obtain new information in their content areas, make contacts with University faculty members for future resources, and learn more about implementing student research into their curriculum. To meet these goals, the teams work for two weeks in an active research laboratory on the NC State University campus and produce a final report on their experiences.

The HHMI Grant provides funding for five teams each summer. Teams selected for the summer of 2002 were from Charlotte Catholic Day School in Charlotte, East Surry County High School in Pilot Mountain, Wake Forest – Rolesville High School in Wake Forest, D.H. Conley High School in Greenville, and Havelock High School in Havelock. One week prior to the program, the East Surry team withdrew from participation due to medical reasons. Faculty members were recruited to mentor each team in their labs according to the team’s stated interests in their applications and availability of mentors. Mentors and topics were Dr. Dan Kamykowski in Marine Ecology on Clone Comparisons of the Red Tide Dinoflagellate *Karenia brevis*; Dr. Char Farin in Animal Science on the Effects of Leptin and Type of Growth Medium on
Success of In Vitro Fertilization in Cattle; Dr. Richard Kotek in Textile Chemistry on Solid State Polymerization of Nylon 6,6; and Dr. Donald Brenner in Materials Science and Engineering on The Molecular Modeling of Carbon Nanotubes. In addition to their work in the research laboratories, teams visited the NC Museum of Natural Sciences exhibit on the Genomic Revolution, had weekly scientific seminars with other summer research programs, heard presentations on undergraduate programs at NC State, and visited specialized research facilities at NC State University.

Each year the number of applications for this program has grown and includes applications from outside the state. Both teachers and students have reported in evaluations that this has been one of the best experiences for education that they have had. One repeating teacher commented “Last time with the PCC Program was super – I was afraid nothing could compare! Last time was a 10. This time an 11 on a scale of 1-10!!” One student this summer stated that the experience was “very valuable! I will use the skills I learned many times in the future I’m sure! It was a wonderful experience all around!” At the conclusion of the program, three mentors volunteered for summer 2003.

**Science on the Road**

*Michael Smith, Regina Barrier*

Science on the Road encompasses exciting demonstration presentations of physics and chemistry phenomena. Physics on the Road visited 29 schools and student programs during the period of September 1, 2001, through August 31, 2002. Chemistry on the Road visited four schools near the Western Outreach Office of The Science House during the same period. Other activities of the Science on the Road programs included two demonstration presentations at the National Science Teachers Association annual meeting in San Diego, a session about chemistry demonstrations at the North Carolina Science Teachers Association (NCSTA) annual conference in Greensboro, demonstrations at The Science House’s booth at the NCSTA annual conference, training of high school students to perform chemistry demonstrations for elementary school students, and advising NC State University physics undergraduates on how to perform demonstrations at elementary schools.

The primary goal of Science on the Road is to provide high quality, exciting science demonstration presentations to stimulate student interest in science and science careers. The quality of the program is evidenced through repeat requests for school visits by teachers. Many students who are interested in science have seen Physics on the Road presentations at several locations, such as the North Carolina Science Olympiad State Competition, summer science camps, their schools, and the North Carolina Junior Science and Humanities Symposium. After thanking the presenter for the visit, students often ask questions such as “How do you get a job doing interesting things like this?” Answer: “Study science, find a field that interests you, and become a scientist.” Another question often heard after presentations with students from a mix of schools is “How can I get you to visit my school?” Answer: “Have your science teacher contact me.”

A secondary goal is to provide students and teachers throughout the state a positive view of NC State and The Science House for recruiting purposes. NC State is interested in obtaining the highest quality students, so a program like Science on the Road that excites students, stimulates interest in science and conveys a positive image of NC State helps with recruiting. The Science House works with science and mathematics teachers across the state; Science on the Road informs teachers of our programs and targets schools and teachers for other Science House programs.
Programs for Teachers

Teacher Training Workshops

Workshop Coordinator: Scott Ragan

(The following staff members participated in teacher training activities: Regina Barrier, Colleen Karl, Mary Louise Bellamy, Elizabeth Snoke, Judy Day, April Cleveland, Sharon Cooke, Terrell Russell, David Haase, and Alton Banks.)

The teacher training and professional development opportunities that we offer are a vital part of our mission of working with K-12 teachers to promote the use of hands-on learning activities in mathematics and science. Since the birth of The Science House in 1991 and our original workshops of Physics from the Junk Drawer and Counter Top Chemistry, the scope of our offerings has grown significantly.

We produce quality professional development activities that assist K-12 mathematics and science teachers in the classroom. All of our workshops are tailored to the curriculum needs of North Carolina’s math and science standards, as well as the national standards. We seek to recognize areas of need in the classroom and provide the teachers with the curriculum and technological support they need to succeed.

During the past academic year The Science House delivered 49 teacher training workshops. The workshops encompassed 108 days of professional development. Our offerings included: Physics from the Junk Drawer, Counter Top Chemistry, calculator-based laboratories, computer-based laboratories, Geographic Information Systems (GIS), GLOBE, internet, laboratory safety, astronomy, environmentally responsible solvents and processes, and fungal genomics. An estimated 985 teachers took part in these workshops, not including the teachers reached at workshops or presentations at several professional conferences.

One goal of The Science House is to support schools and teachers from the mountains to the coast of North Carolina. The workshops mentioned above took place in 22 different counties in North Carolina, as well as one each in the states of Georgia and Virginia. We expect to increase the number of North Carolina counties we serve in the coming year, especially with the addition of three new satellite offices. We also plan to expand our service outside the borders of North Carolina as opportunities arise.

In the past year new workshops on laboratory safety, GIS, and fungal genomics were developed. For the coming year new workshops are already planned in the growing area of handheld computers in the classroom. The Science House will continue to stay on the cutting edge of K-12 mathematics and science professional development needs. We constantly seek new tools and methods of delivery to assist educators.

K-12 Outreach from the NSF Fungal Genomics Laboratory

April Cleveland, Brenda Wojnowski, and Ralph Dean, Thomas Mitchell, Elizabeth Fichtner, and Joyce Hoyt, from the Fungal Genomics Laboratory.

The NSF Fungal Genomics Laboratory is a multicampus research initiative that applies genomics research to problems that affect the world’s food crops. The K-12 outreach program of the Laboratory seeks to increase student awareness of the outcomes and applications of genomics research as well as enhancing the teaching and learning of science in high school classrooms. The current activities include the compilation, publication, and distribution of a laboratory activities manual, which focuses on genetics for the high
school biology classroom; the distribution of activity kits; and the training of Laboratory graduate students
and teachers in the use of the activity kits.

The activities manual “Relating Genetics to Everyday Life: A Collection of Activities for the High School
Biology Classroom,” was assembled from exemplary learning activities, often produced by national
curriculum projects, that are linked to the state science curricula in North Carolina and Texas. The activities
are aligned with the national and state standards for science. The laboratory activity manuals are distributed
in response to requests to The Science House web site, at teacher meetings and conferences, and through a
mass mailing to each high school science department in North Carolina. Approximately 20 lab activities
manuals were mailed to each of the Fungal Genomics Laboratory campuses for distribution in the
following states: Texas, Kentucky, Arizona, Ohio, and Indiana.

We have also written and distributed a brochure that explains the research in Fungal Genomics and its
importance to the world’s food supply.

In addition to the development and distribution of learning activities, we have produced and distributed
hands-on demonstration kits to support the learning activities. These kits demonstrate the research being
done by the scientists in the area of Fungal Genomics. We have authored a workshop toolkit to be used for
instruction of graduate students on teaching techniques, that are appropriate for high school teachers. A
teacher workshop was conducted in North Carolina in June, 2002. Teacher rotation schedule for research
activities kits were set up on the closing day of the teacher workshop.

In the coming year we will disseminate information and introduce our activities at state and national
meetings for science teachers, including CAST 2002 (Texas), NCSTA (North Carolina), and the National
Science Teachers Association.

We are compiling evaluation data on the usefulness of the workshop, the lab activities manual, and the
research activities. To date, the feedback on the workshop, lab activities manual, and research activities
have been positive.

K-12 Outreach from the NSF Center for Environmentally Responsible
Solvents and Processes (CERSP)

Mary Louise Bellamy, CERSP K-12 Outreach Coordinator; Science House staff, Sharon
Cooke and Terrell Russell, and CERSP Graduate Students and Faculty

The K-12 outreach activities from the NSF Center endeavor to help K-12 students and teachers become
more knowledgeable about science and engineering and to show how these fields contribute to a cleaner
environment. The outreach activities involve the faculty and students of the Center in K-12 education (1) to
recruit future scientists and engineers, and (2) to enhance K-12 education. The two major thrusts of the K-
12 outreach have been to develop and disseminate curriculum materials related to Center research, and to
plan and implement teacher workshops and student programs. In addition, hands-on demonstration kits
have been prepared and graduate students have been trained to demonstrate CO₂ related science in
elementary and middle schools. The Center has an extensive education and outreach web site containing
additional information about CO₂ research and learning activities.(www.nsfstc.unc.edu)

In the past year the Center carried out a coordinated K-12 education outreach program. Through teacher
workshops and student presentations, this program directly reached 536 teachers and 1338 students in
North Carolina and Texas. Through distribution of exemplary learning materials, this program indirectly
reached an estimated additional 1800 teachers and 234,000 students in these states.* Among the exemplary
learning materials being distributed is a new Environmental Science laboratory book for middle school grades, aligned with the North Carolina and Texas state science curricula. Center faculty and staff participated in numerous teacher and student programs. Through the distribution of educational materials, teacher training programs and an educational web site, the Center K-12 outreach is achieving national visibility. The Center has partnered with several other education organizations to increase its reach and, especially, to increase access to students from underrepresented groups.

* The indirect numbers of teachers and students reached was obtained by dividing the estimated number reached over the last two years by two.

**Northeast Regional Satellite**

*Colleen Karl, Northeast Regional Satellite Coordinator*

The primary goal the Northeast Science House outreach program is to raise awareness and understanding of the methods of science and mathematics teaching. The Northeast Science House Regional office is located in Edenton, NC, is sponsored by a Howard Hughes Medical Institute grant, and is hosted by the Albemarle Learning Center. The introduction of technology into the curriculum strands is a key component of our service to the school and community. The sharing of ideas and teaching strategies among teachers and schools is difficult in Northeast North Carolina where there is commonly only one high school and one middle school per county. One purpose of this satellite office to develop networking strategies among the teachers in this region that promote leadership growth for these educators. The Science House has a strong involvement with the community in Northeastern North Carolina and has developed many collaborative projects to enhance the science and mathematics experiences for the Northeast teachers and students.

The Northeast Regional Science House was established in Edenton in 1999, and has provided four years of support for the area middle and high schools. To accomplish the above goals, the Science House has provided a diverse array of services to teacher teams in the Northeast. These services include teacher training with an emphasis on technology, ongoing support with equipment loans and in-class assistance, and classroom presentations. The extended contact support model with a team approach to planning and presentation of the classroom lesson was successful during the 2001-2002 year for 12 teachers and over 1000 middle school and high school students.

The presentation of workshops in the northeast and other parts of the state have continued to extend the impact of the program sponsored by HHMI. During 2001-2002, 14 workshops/conference events were presented reaching 239 teachers. The Northeast Science House also presented a two-week technology integration program to middle school teachers in Gates and Chowan County – this session was funded by a Eisenhower grant. The majority of our workshops focus on the use of data collection technology such as CBL and MBL. We have expanded the types of workshops for Northeastern North Carolina to include GLOBE and GIS workshops. The Science House in the Northeast has been successful in helping students and teachers prepare for local and state science contests such as Science Olympiad and National Ocean Science Bowl, and in mentoring candidates for National Board Certification. Our community involvement ranges from 4-H workshops to special events such as the Heritage Corn Festival at the Albemarle Learning Center in the spring of 2002. For this festival, local middle school students designed, implemented and displayed their projects about genetically engineered corn.

The involvement of students and teachers with the Northeast Science House program continues to be very favorable, as evidenced by the number of teachers that request our services. Most of the students in eastern North Carolina have had little lab experience in general, therefore the level of technology supplied by our program provides them with the opportunity to be active learners of science. The genuine excitement for
science exploration needs to be cultivated in our teachers as well as in our students. When a teacher commits to an enhanced science curriculum including technology-based labs, we will begin to see more creative and extended use of these program materials. The Northeast Science House is committed to encouraging teachers to learn new technology skills and to provide them with the needed support for implementation into their classroom objectives. Through these models of sustained interaction with the HHMI participants and other grant programs, we are building a leadership network of dynamic science and math teachers in the Northeast.

**Western Regional Satellite**

*Gina M. Barrier, Western Regional Satellite Coordinator*

The Western Regional Satellite Office is a partnership with Caldwell County Schools and is housed in the Education Center in Lenoir, NC. The office operates two Rural Schools Equipment Loan Programs for high schools in Caldwell, Catawba, Alexander, and Burke counties and for middle schools in Henderson, Polk, and Transylvania, and Buncombe counties. The equipment loan program provided technical support, workshops, and demonstration classes for 40 teachers in 11 Caldwell, Burke, Catawba, and Alexander county schools.

In addition, the office offers technical support for teachers and curriculum development assistance; teacher workshops in the areas of technology, science safety, and the GLOBE program; and *Chemistry on the Road* shows for schools.

This past year, the Western Satellite Office offered a two-week technology workshop for middle-school teachers in Henderson, Polk, Transylvania, and Buncombe counties; and Advanced Aquatic WILD workshops taught in conjunction with The Wildlife Resources Commission as well as a LabPro workshop for NC wildlife educators. Technology workshops were presented for the Regional ACS meeting in Savannah, GA and NCSTA in Greensboro.

There has been new activity in face-to-face and on-line laboratory safety courses. Our safety training has been developed in collaboration with the NC Department of Public Instruction and dovetails with their statewide school safety projects. Our safety workshops were presented at Union, Henderson, Caldwell, and Camden counties, and The Science House. We also provide an on-line safety workshop that is used in tandem with the face-to-face programs. The on-line course has attracted attention from teachers in other states. e.g. New York, and we are refining the course to meet their needs.

Two different *Chemistry on the Road* shows were presented at six sites in Burke, Caldwell, and Catawba counties and presented in conjunction with the NSF Center for Environmentally Responsible Solvents and Processes (CERSP) at the 2001 NCSTA meeting. A two-week Envirotech summer camp for high school students was presented in the western area. The regional office assisted in extra-curricular science activities such as county and regional science fair judging, poster and essay contest judging for the Natural Resources Office, a science and technology expo, an interactive science display, and school science clubs. We also helped teachers to write small grants for the GLOBE program and other science activities.

The Western Satellite Office is promoting the use of hands-on learning in science and math by supplying classrooms with instructional technology. Teachers are excited about the free equipment loaned to schools and often comment on how much the students enjoy using it.

Teachers and students both enjoy the demonstration shows and some schools have offered them as incentives for their Accelerated Reading program. Evaluation responses indicate that teachers appreciate
the safety information provided and the assistance that they receive with the development of safety programs. In addition, successful collaborations with other organizations are magnifying our success.

Conferences, Curricula and Other Programs

Conference on K-12 Outreach from University Science Departments

*Brenda S. Wojnowski, David G. Haase, and all Science House personnel*

*Sponsored by the Burroughs Wellcome Fund*

The first goal of the annual Conference on K-12 Outreach from University Science Departments is to establish a continuing avenue for communication among scientists, mathematicians and engineers in the state about compelling issues in K-12 science, mathematics and technology education (SMET). We seek to seed collaborations among members of this group for substantive programs to support K-12 SMET education in North Carolina. In addition, we publish Proceedings of the Conferences which will serve as academic publications that increase the visibility of K-12 outreach as a part of university service and serve as a forum for reports and discussions about K-12 SMET education.

We have now held three conferences and published two proceedings volumes. The third should be ready for distribution by the end of September 2002. The proceedings are in print form and are on-line in pdf format on both The Science House and the Burroughs Wellcome Fund web sites. We have held two luncheons for participants at NCSTA and have a third scheduled for November 2002. The conferences and luncheons have been well attended and well received.

With over 200 participants, the evaluation responses from conference attendees have been extremely positive.

The Science House Web Site www.science-house.org

*Beth Snoke*

The purpose of the Science House web site is to communicate information about Science House programs and workshops and to provide access quality curriculum materials to science and math teachers in North Carolina and across the country.

A major addition to the web site this year is the K-12 Outreach Directory (www.science-house.org/k12-directory/). The directory consists of a searchable database of outreach programs for teachers and students. Users may sort by type of program, time of year and location. Any program in North Carolina may be added to the database including field trips, student programs, teacher workshops, guest speakers, university courses, special events and more.

Other additions to the site include the Fungal Genomics Outreach web site and the Middle School Physical Science Resource Center. The Fungal Genomics Outreach site (www.science-house.org/fungal) provides information on the outreach activities provided by the NSF Fungal Genomics Laboratory. The Middle School Physical Science Resource Center (www.science-house.org/middleschool/) provides reviews of middle school science texts and is funded by the David and Lucille Packard Foundation. The site arose out of the 2000 review of texts by Dr. John Hubisz.
Use of the web site continues to grow. Over the last year there has been a 58% increase in page views and a 47% increase in user visits. Approximately 500 users visit the web site each day and we hope to see that number grow as more resources are added to the site.

**Participation at Science Education Meetings**

**Judy Day**

Beyond teacher training workshops and student programs, to reach more educators and more geographic regions, The Science House gives presentations and exhibits at state and national education professional meetings. The two largest efforts are at the Annual Conference of the North Carolina Science Teachers Association (NCSTA) and the national meeting of the National Science Teachers Association (NSTA).

There was a strong Science House presence at the 2001 NCSTA meeting in Greensboro on November 14-16, 2001. The Science House assisted in recruiting Colleges and programs from NC State University to mount displays in the exhibit hall. The NC State University booths covered most of the back wall of the large exhibit hall. The Science House occupied a prominent position with a large booth representing The Science House, Fungal Genomics Outreach, CO₂ Outreach, and Science Junction. Staff members alternated working at the booth and giving presentations for the meeting. A total of nine presentations were given during the three day conference. In addition to presentations and the booths, The Science House sponsored a reunion luncheon on Friday, Nov. 16, at the NCSTA meeting for participants in the Burroughs Wellcome K-12 Outreach Conference.

Science House staff members Mary Louise Bellamy and Judy Day attended the National Science Education Leadership Association (NSELA) Conference on March 25 in San Diego prior to the NSTA Conference on March 26-30, 2002. The NSTA Conference was attended by five members of The Science House: David Haase, Brenda Wojnowski, Mary Louise Bellamy, Mike Smith, and Judy Day. A total of five presentations were given during the conference by these attendees.

References to particular talks at these and other education meetings are listed in the Appendices.


**NESDIS Web Curriculum Evaluation**

**David G. Haase, Lundie Spence, Scott Ragan, Colleen Karl, and Beth Snoke**

The National Environmental Satellite, Data and Information Service (NESDIS) web site project was established as a result of a two-day conference held in November, 1998, at North Carolina State University. The conference was attended by various scientists and educators from throughout the United States. One of the items discussed at the conference related to the NESDIS research and state-of-the-art environmental education. It was noted in the report that NOAA/NESDIS contains a rich source of scientific data that can be a great environmental resource for K-12 students and teachers. However, in its current state, it is difficult to access and is not tailored for K-12 use. The two major multi-tasked recommendations from the conferences were to: (1) learn what materials are presently on the NOAA/NESDIS web sites and how to access them, and (2) identify how to modify certain NOAA/NESDIS web sites for access and use by educators.
As a result of these recommendations, The Science House and NC Sea Grant proposed to assist NOAA/NESDIS in improving their web site to make it more easily accessible and usable for K-12 science and mathematics teachers.

We have undertaken an exhaustive and methodical investigation of the web sites maintained by units of NESDIS and provided guidance to NESDIS as to how these resources can be made most available and usable to K-12 science and mathematics teachers. Some subsets of the NESDIS web based materials have been correlated with the National Science Education Standards. We are completing the project by developing and testing several web lessons that make use of NESDIS materials. The lessons will be tested with teachers and made available via our web site.

**NASA Chandra X-Ray Observatory Education and Public Outreach Project**

*David G. Haase, Stephen Reynolds, Rosemary Stallings Russ*

In the past year the Astronomy programs at The Science House were emphasized through the collaboration of Dr. Stephen Reynolds, an astrophysicist in the Physics Department. Dr. Reynolds’ NASA-supported research program using the Chandra X-ray satellite observatory included an Education and Public Outreach component which produced several outcomes. In the Spring the Imhotep Academy took on "Lighting the Way to the Stars" as its guiding theme. All of the classes in physics, chemistry and mathematics involved some aspect of Astronomy and the concluding activity was a field trip to Jamestown’s Astronomy Day and to the Morehead Planetarium. In the Spring ten elementary and middle school teachers participated in a ten-hour Hands-On Astronomy workshop in which they tried out new activities, which could be done during the school day, and received books and materials to carry out those activities with their students. The Science House web site Astronomy pages, which are correlated to NASA materials and to the NC Standard Course of Study, were updated. Finally, three complete classroom activity kits were assembled on the subjects of "Light and Its Properties," "Technology Used to Explore and Study Space," and "Rotation and Cycles in the Solar System." The topics were chosen because they are part of the NC sixth grade science curriculum. The kits are being loaned to area teachers and will be used in student programs at The Science House.

**A Web based Course for Advanced Placement Physics Teachers**

*David G. Haase, Beth Snoke, and Rosemary Stallings Russ*

In the Fall of 2001 the web based course Advanced Placement Physics for Secondary School Teachers was taught to nine teachers from North Carolina and Virginia. The course, which carried graduate credit in Physics, is a restructuring of the Advanced Placement Physics summer institute that was offered several times in the eighties and nineties. The intent is to use the internet to make the course more accessible to teachers in need of substantial learning experiences, but who are unable to spend five weeks in Raleigh in the summer. The course included a full review of the AP Physics B curriculum material, home laboratories, homework sets submitted via Webassign, and readings and discussions of papers in physics education research. The course was in general successful in meeting the needs of the teachers, but demonstrated the challenges of facilitating true conceptual understanding through electronic communications. We are refining the course to address both experienced and inexperienced physics teachers and look forward to offering it again in Fall, 2003. The course was developed with the support of a grant from the NC State University Distance Education and Learning Technology Applications (DELTA).
Partnership Development

Brenda S. Wojnowski, David G. Haase, all Science House personnel

Partnerships are essential to maintaining K-12 education, and to facilitating change and improvement in K-12 education. This fact is reflected in the mission of The Science House, which is to work in partnership with K-12 teachers, schools and school systems to enhance science and mathematics education. If we are to develop the role of The Science House as a national leader in translating the research of a science and technology campus into curriculum and program support materials for K-12 schools, we must work hard on building and nurturing partnerships.

Our partnership development focuses on collaboration on specific programs and finding strategic connections to build an infrastructure for our long term service to schools.

Some of our partners are internal to the university. The Science House is the K-12 outreach agency of the College of Physical and Mathematical Sciences at NC State University. The Science House has significant partnerships with the College of Education and the College of Agriculture and Life Sciences. In addition, The Science House has smaller, but very important, partnerships with many other colleges on the campus of NC State.

Some of our partners are on other campuses and in other states. The Science House has working relationships with many other major universities including UNC Chapel Hill, UT Austin, Texas A&M, University of Arizona, University of Kentucky, Purdue, Ohio State, and Colorado State.

The collaboration with the K-12 schools is crucial. The Science House works in close partnership with the NC Department of Public Instruction and with many schools and school systems across NC. For example, three regional offices of The Science House are being or are slated to soon be hosted by school systems. School system partnering leads to our serving approximately 3,000 teachers and 20,000 students each year.

Finally, we are fortunate to have a large number of supporting public and private partners, including the National Science Foundation, the US Department of Education, the National Oceanic and Atmospheric Administration, and the Burroughs Wellcome Fund. Those partners who support us through grants, contracts, services, and materials are critical to our success, as without them we could not maintain our current level of activity, nor aspire to a future of service to K-12 education.


**Appendices**

**Important Numbers**

- Teachers reached annually: 3,000
- Students reached annually: 20,000
- Number of North Carolina counties reached: >50
- Full time teaching and administrative staff and students: 17
- Associated Faculty: 14
- Part time teachers, assistants and helpers: 33
- Presentations at state and national education meetings: 43
- Teacher training workshops (one day to two weeks in length): 49
- Service to schools (UNC Office of the President report): ~$600K/year
- External Funding: ~$600K/year

**Staff and Faculty**

- Dr. David G. Haase, Director and Professor of Physics
- Dr. Brenda S. Wojnowski, Associate Director
- Michael C. Smith, Assistant Director
- Regina Barrier, Coordinator for Western Regional Satellite
- Dr. Mary Louise Bellamy, Coordinator of K-12 Outreach for the NSF Center for Environmentally Responsible Solvents and Processes
- Dr. April J. Cleveland, Coordinator of K-12 Outreach for the NSF Fungal Genomics Laboratory
- Judy B. Day, Howard Hughes Medical Institute Precollege Coordinator
- Dr. Joyce Hilliard-Clark, Coordinator of the Imhotep Academy
- Colleen Karl, Coordinator for Northeast Regional Satellite
- N. Scott Ragan, Teacher Workshop Coordinator
- Elizabeth R. Snoke, Camps Coordinator and Webmaster
- Cherrie Tchir, Administrative Assistant
- Emily Morgan, Student Assistant
- Rosemary Stallings Russ, Student Assistant
- Annie Lloyd Wallace, Student Assistant
- Terrell Russell, Graduate Assistant from the NSF Center for Environmentally Responsible Solvents and Processes
- Sharon Cooke, Graduate Assistant from the NSF Center for Environmentally Responsible Solvents and Processes
**Associated Faculty and Staff**

Dr. Alton J. Banks, Professor of Chemistry  
Dr. William Switzer, Professor of Chemistry  
Dr. John C. Park, Associate Professor of Mathematics, Science and Technology Education  
Dr. Lisa Grable, Director, Center for Learning Technologies, College of Education  
Dr. Charles Lytle, Professor of Zoology and Director of Biology Outreach  
Grace Martin, Administrative Assistant, Biology Outreach  
Dr. Edward Stoddard, Professor of Marine, Earth and Atmospheric Sciences  
Dr. David Eggleston, Professor of Marine, Earth and Atmospheric Sciences  
Dr. Ralph Dean, Professor of Plant Pathology and Director of the Fungal Genomics Laboratory  
Dr. Thomas Mitchell, Research Assistant Professor of Plant Pathology, and Senior Research, the Fungal Genomics Laboratory  
Dr. Stephen Reynolds, Professor of Physics  
Dr. Joseph Desimone, Professor of Chemistry (UNC-CH) and Professor of Chemical Engineering (NCSU), and Director of the NSF Center for Environmentally Responsible Solvents and Processes  
Dr. Ruben Carbonell, Professor of Chemical Engineering and Assistant Director of the NSF Center for Environmentally Responsible Solvents and Processes  
Dr. Lundie Spence, Marine Education Specialist, North Carolina Sea Grant  
Dr. John Hubisz, Visiting Professor of Physics

**The College of Physical and Mathematical Sciences, North Carolina State University**

Dr. Daniel L. Solomon, Dean of the College of Physical and Mathematical Sciences  
Dr. Jo-Ann Cohen, Associate Dean of the College of Physical and Mathematical Sciences  
Dr. Raymond E. Fornes, Associate Dean of the College of Physical and Mathematical Sciences  
Anita C. Stallings, Executive Director of the Physical and Mathematical Sciences Foundation

**Participating Teachers and Teaching Assistants**

Numerous teachers and graduate students help carry out our many teaching programs. Without their efforts, advice and enthusiasm, we could not reach the schools and students that we do. These contributors include:  
Akinyi Edmonds, Jeff Robinson, Todd Gunsher, Toyce Cotton, Sharon Young, Sherry Ballentine, Saptosa Foster, Joy Clark, John Bedward, Kweku Addae-Mensah, Heather Graff, Goldwyn Parker, Karen Mosley-Lyon, Alok Matapurkar, Jared Motley, Courtney Jones, Katie Siomacco, Alex Ortiz, Katie Park, Ken Nears, Elizabeth Woolard, Dena Bradham, Lowell Ziegler, Anna Switzer, Chad Ogrin, Jennifer Kilpatrick, Michelle Benigno, Donna Boyce, Julianna Stout, Kartik Bhavsir, Teresa Poe, Joyce Hoyt and Elizabeth Fichtner.

**Current Grants and Contracts**

“Phase II Howard Hughes Initiative,” Charles Lytle and David Haase. The Howard Hughes Medical Institute.  
“NSF Science and Technology Center for Environmentally Responsible Solvents and Processes (Kenan Center-NCSU-UNC project)” D. G. Haase and B. S. Wojnowski, Education Co-PI’s. NSF Cooperative Agreement CHE-9876674.

“A Continuing Conference on K-12 Outreach from University Science Departments,” D. G. Haase and B. S. Wojnowski. The Burroughs Wellcome Fund.

“Enhancement of the NESDIS Web Resources for Utilization by K-12 Mathematics and Science Teachers,” Lundie Spence and David Haase. NESDIS/NOAA.

“Bringing PY 660 Across North Carolina – A Course Development Project,” D. G. Haase. NC State University Distance Education and Learning Technology Applications.


“Integrating Instructional Technology into Middle Grades Science and Mathematics Classroom: Chowan and Gates Counties,” Brenda S. Wojnowski and Colleen Karl, Dwight D. Eisenhower Professional Development Program.

“Integrating Instructional Technology into Middle Grades Science and Mathematics Classroom: Henderson County,” Brenda S. Wojnowski and Regina Barrier, Dwight D. Eisenhower Professional Development Program.

REU Award for Whole genome analysis of pathogen-host recognition and subsequent responses in the rice blast patho-system—Brenda Wojnowski, Education Subaward PI—National Science Foundation—2002 (subaward) (NSF No. BDI-0115642)

Whole genome analysis of pathogen-host recognition and subsequent responses in the rice blast patho-system—Brenda Wojnowski, Education Subaward PI—National Science Foundation—2001-2005 (subaward) (NSF No. BDI-0115642)

“Astronomy in the Schools: Outreach to Middle School Teachers and Students,” Stephen P. Reynolds and D. G. Haase. NASA Education and Public Outreach.

Publications


**Colloquia and Presentations at Professional Meetings**


“K-12 Education Resources from the NSF Center for Environmentally Responsible Solvents and Processes”, M. L. Bellamy, 116th North Carolina American Chemical Society (ACS) Sectional Conference; April 13, 2002; NC School of Science and Mathematics; Durham, North Carolina


“Environmental Science Hands-On Lab Activities,” M. L. Bellamy, Science Teachers Association of Texas (STAT) annual meeting, the Conference for the Advancement of Science Teaching (CAST); Austin, Texas, November 1-3, 2001.

“Trainer of Trainers Workshop on K-12 Education Resources from the NSF Center for Environmentally Responsible Solvents and Processes,” M. L. Bellamy, Workshop held prior to the Science Teachers Association of Texas (STAT) annual meeting, the Conference for the Advancement of Science Teaching (CAST); University of Texas at Austin; Austin, Texas, November 1-3, 2001.


“Achievement and Success: Closing the Gap” Joyce Hilliard-Clark, VI Annual Closing the Achievement Gap Conference: Improving Minorities and At-Risk Students Achievements, Greensboro, NC, April 9, 2002.


“The HHMI Precollege Collaboratory Program,” Judy Day, NSF-Research Experiences for Teachers Conference (Invitational), San Francisco, CA, April 18-20, 2002;


“The Preparation of Alternative Licensure Teachers: Bringing Technology into the Classroom through Distance Education,” Cleveland, A., Park, J. Flynn, L., Conference on K-12 Outreach Burroughs Wellcome Fund Center, February 13, 2002

Awards, Recognitions, Offices in Professional Organizations

Joyce Hilliard-Clark received the 2002 North Carolina State University Award for Excellence from the College of Physical and Mathematical Sciences.

Brenda S. Wojnowski was elected the President-Elect of the North Carolina Science Education Leadership Association.

Judy Day served as the District 3 Director for the North Carolina Science Teachers Association.


Brenda S. Wojnowski was elected to the NC State University Academy of Outstanding Faculty Engaged in Extension and received an Alumni Association Award for Excellence in Extension.

Brenda S. Wojnowski served as Chair of the NC State University Faculty Extension Committee and on the University Extension Operations Council.

Cherrie Tchir was nominated for the College of Physical and Mathematics SPA Award for Excellence.

David G. Haase received the George R. Pegram Award for Excellence in Physics Education by the Southeastern Section of the American Physical Society.

David G. Haase received the Distinguished Service Award of North Carolina Science Education Leadership Association.

Contact Information for The Science House

The Science House
College of Physical and Mathematical Sciences
North Carolina State University
Raleigh, NC 27695-8211
Phone (919) 515-6118
FAX (919) 515-7545
www.science-house.org
Email: science_house@ncsu.edu

Address:
Suite 1200, Research Building IV
909 Capability Drive
NC State University Centennial Campus
Raleigh, NC