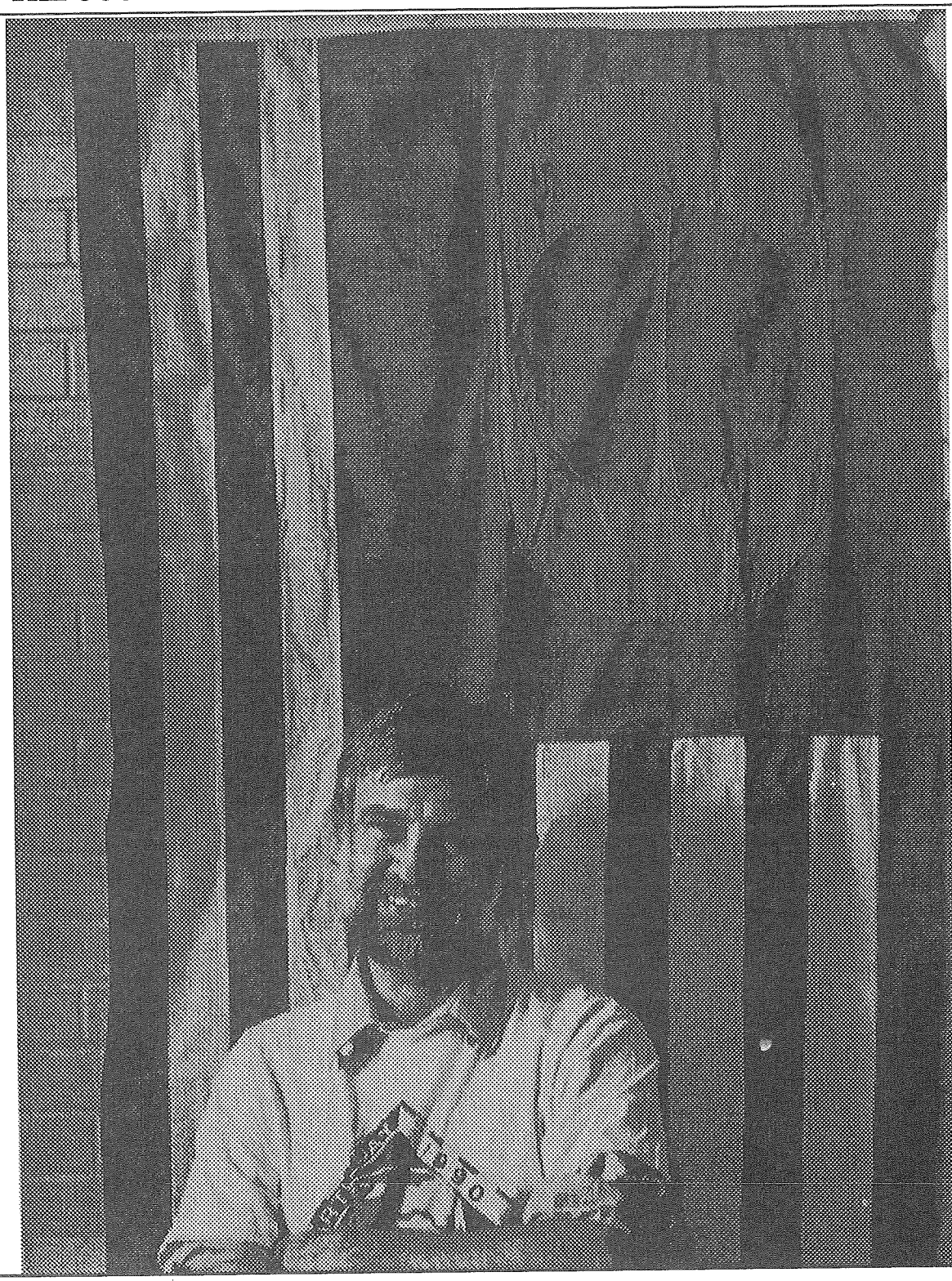
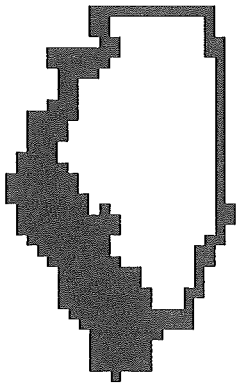
SPECTRUM

THE JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION



WINTER 1994



ILLINOIS SCIENCE TEACHERS ASSOCIATION

SPECTRUM

JOURNAL OF THE ILLINOIS SCIENCE TEACHERS ASSOCIATION
Volume 20, Number 4, 1994

SPECTRUM is mailed from the University of Illinois, Champaign.

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The Illinois Science Teachers Association (ISTA) is a state chapter of the National Science Teachers Association, 1742 Connecticut Ave. NW, Washington, DC 20009.

Typist:
University of Illinois
College of Education
Word Processing Center

Printer:
Flying Color Graphics

Cover Photo courtesy of the State Journal-Register. Story on page 17.

ISTA NEWS

PRESIDENT'S LETTER
WINTER 1994

This last week I have found myself doing what I have done so many times in the past, trying to organize and digest all of the wonderful science teaching ideas I received during the ISTA convention just held at Pheasant Run Resort in St. Charles. I am always amazed at the sheer magnitude of exciting ideas and innovative teaching strategies that are shared among educators at our annual conference. It truly boggles the mind. Plus the chance to visit and relax with old friends and new educators is something I look forward to each year.

What is different now for me as president is as I reminisce the conference, I really understand what is going on behind the scenes in all of the planning, preparation and delivery of an ISTA convention. Believe me the process requires a tremendous effort on the part of many people. So I ask each of you to take a minute or two as you read through the *Spectrum* and mentally if not physically, thank Steve..... Barry...., Phil....., and all of those behind-the-scenes players that made this year's convention the huge success that it was. I also would like to recognize the efforts of Fred Tarnow for a highly successful third consecutive preconference, this year's topic National Standards. Special thanks must go to Diana Dummitt for her perseverance and hard work, helping to make the important last minute changes and frantic efforts to make every detail come off just right. To all of you, well done.

Jenny Grogg, our site selection chairperson, has been very active and has made arrangements in advance for the next three convention sites. The 1995 convention will be chaired by Gary Butler and will take place in our state capital. The Trade Center in Chicago will be the site for the 1996 convention and in 1997 we will be downstate again in Peoria. If you are interested in being part of the convention committee for any of these conventions, contact Diana Dummitt at, Illinois Science Teachers Association, College of Education, University of Illinois, 1310 S. Sixth Street, Champaign, IL 61820. If you have an idea for a convention location for the future, please share that with Diana also.

Before I leave the topic of science conventions, there are some very interesting upcoming developments in ISTA's relationship with our parent organization, NSTA. First of all, we may very well have a regional NSTA convention in Chicago soon, if not the national. Secondly, the 1996 national convention will be in St. Louis, and if you attend we get part of your registration money for ISTA . Actually this is true for any NSTA convention you attend. There is a place on the registration form for you to request that we receive part of your registration fee. Please take this opportunity to return part of that fee to your home state organization.

Many of you have had an opportunity by now to review the ISTA task force proposed changes to science teacher certification requirements. I hope each teacher in the state has a chance to review the suggestions and to react with your written or verbal feedback. Those of us that have been teaching science in Illinois for a couple of decades or more know that there have been no major changes in these requirements for sometime. As my good friend Orrin Gould reminded me, we have been here before and not much has resulted. I am optimistic though, and I have confidence in our task force and its leader, Bob Fisher. With your additional input and support we will prevail and update the long overlooked teacher certification process.

Our Science Literacy representative at the state board, Gwen Pollack has solicited ISTA members' assistance for two very important activities. First, to develop safety guidelines for K—8 classroom teachers to refer to when conducting science inquiries and second, to organize members interested in environmental education to be part of a curriculum development project to serve as a model for an upcoming environmental curriculum in our schools. If you have particular interest for either of these efforts give me a call or drop a letter, better yet send it to Diana at her e-mail address: ddummitt@ux1.cso.uiuc.edu

Yes, ISTA is becoming part of the information highway and in the not too distant future I will be able to share some exciting technology opportunities for you as ISTA members. Good Sciencing,

David Allen II

Gwen Pollock
ISBE
N-242
100 North First Street
Springfield, IL 62777
(217) 782-2826.

DID YOU KNOW...

There is so much going on the world of science education extending beyond the bounds of Illinois and the Midwest and throughout the country. I wanted to let you know of some of the potential arenas of science interest that I have seen and learned about.

The announcement for the 1994 Illinois winners for the Presidential Awards of Excellence has not been made at the time of this writing. Beverly, Alan and Bill, the secondary nominees and Sylvia, Jim and Kathleen, the elementary nominees all deserve our applause. See the adjoining list for the names of all of our winners and their schools. These teachers have already filled valuable needs in their own local schools., but I have begun tapping this resource for 'state' needs. Several have already served as readers for Scientific Literacy grants this summer—a great experience, tied very intimately with slave labor, according to some!!! You should have received the nomination forms for the 1995 search for PAE in the mail to all ISTA members, as well as at school (sent to all public and private schools). The brochure states that the nominations were due by December 1; if, however, you still have a great teacher to nominate, call me ASAP.

Also, as of this writing, the National Science Standards are to be released around Thanksgiving. I will be responsible for the state's review of these standards. Please contact me ASAP, if you could or would like to participate in this review.

Now for some of the projects which I have special interest as a science teacher and the state's science supervisor. First, I am working on a project which plans to produce a Science Safety Handbook for Illinois Schools. ACS section members from around the state have met to design the strategy for the creation and dissemination of this handbook which will probably be ready for use next fall. Currently, the plan includes the writing of the materials (which will be presented in three-ring binder form for adding sections in the future, as well as IBM/Mac disc), ready for review in the early spring through the Educational Service Centers and revisions in the early summer. Printing and training for the resulting workshops should be accomplished in the late summer and then to the local Regional Office of Education (ROE) workshops early next fall. The sections to be included involve the storage, inventory and disposal questions and methods which face chemistry teachers almost daily, as well as the resources for general staff development and general student awareness for 'citizen science' knowledge and skills. Classroom management and emergency preparedness are also to be addressed. Chemistry professors and teachers will be writing and compiling the information which will be presented. Future sections could include 'animals in the classroom', 'science field trip planning strategies' and others. I would like to enlist your help in making this project fill the real needs in science classrooms at the review process.

Two other projects which have become special interests to me follow a general strand of similarity. This strand of similarity relates to how direct input from local teachers is of utmost importance and how active membership in professional organizations can be a genuine and valued necessity for science education.

I would like to promote the development of a "Science Triad of Illinois". At this point the dream of this triad includes a Science Leadership Cadre of exemplary K-12 science teachers and staff developers whose experience in innovation and dedication could be meaningfully used throughout the state-to-achieve systemic science education success. The second 'leg' of this triad includes an Administrators Sciencing Strand which could help the decision makers on local, regional and state levels to realize the vital potential possible in innovative science education classrooms for schools and districts. The third 'leg' is probably the most necessary and the most nebulous and the most difficult. The Science Education Continuum should investigate the philosophical, traditional, and regulatory aspects which face the decision makers in the classrooms and board rooms continuously. These aspects could involve current research about change related to minimum requirements for science certification, the need for continuing education for science teachers, as a whole, and the classroom realities which make change nearly impossible. Dr. Bob Fisher, ISU/ISTA has begun work on the investigation and recommendations for change for minimum requirements. The convention session led by Bob has opened up the avenue for our input for change. I have dubbed this dream triad the Dreamers, Decision-makers and Doers. I think their work will include deliberating, deciding and delivering the new traditions for science education in and for Illinois. (I don't usually delve into alliteration, but when the mood hits...)

MARK YOUR CALENDARS!

1995 ISTA CONVENTION

September 28—30

Prairie Capitol Convention Center Springfield

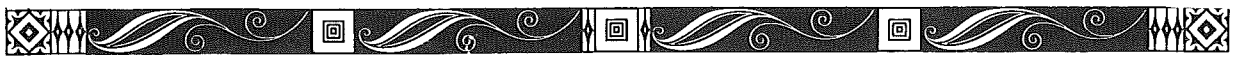
Gary Butler, Chair

(217)786-6630

Another avenue for the enhancement of science education in Illinois is the development of a strategic plan for environmental education in Illinois. The development of such a plan follows the template set in legislation in about seven states already around the country. The plan would investigate the current research in EE, make it Illinois-specific and set timelines for the accomplishment of (open) reviewed goals and objectives. The model legislation includes the components of preservice, inservice, required courses, EE centers, funding, evaluation, environmental career focus and others. Many of our current Illinois EE leaders, like Drs. John Beaver, Marylin Lisowski, Deborah (Bora) Simmons, and Carol Fialkowski, Nan Buckhardt, Mike Schneider, Kathy Andrews and others have accepted the challenge to work on the creation of such a plan. (My apologies to those who were unnamed at this point.) Environmental education, I feel, will become more and more an answer to the perplexing questions our schools and communities are and will be asking.

I would also like to see how we, as professional science teachers throughout the state, can help the many, many new teachers who have very recently joined our ranks. Remember our first year—remember all of the difficulties??? What can we do, IMMEDIATELY, to mobilize ourselves to mentor, network, (whatever) our comrades?? Let me know your ideas or contact David Winnett, Bernie Bradley or Diana Dummitt with your suggestions. Our organization can and should be of significant assistance for our 'rookies'.

Again your input on the dreams and your active participation on achieving the dreams for our kids is very necessary. It surely seems that my notes to you are constantly asking for you to work some more, but I sincerely value your expertise. Please call or write me about your ideas. Please contact me at ISBE with your suggestions or offers for assistance. (ISBE, N-242, 100 North First Street, Springfield, IL 62777 (217)782-2826) Remember the motto for the convention—'The world is my classroom'—It is true, in lots of different ways.



Carol Van De Walle
District VII Director, Illinois, Iowa, Missouri

NSTA SUMMER BOARD MEETING

The NSTA Summer Board meeting and the Chapters and Associated Groups (CAGS) meeting was held in Colorado Springs, CO on August 6-10. Sixty eight CAGS represented 39 groups during their special leadership sessions. Our district attendance included two representatives each from Iowa and Missouri (and three from Wisconsin which will join us next year). Important board action was made regarding the rebate policy for NSTA regional and National conventions. The current $2.00 per person checkoff rebate is working as anticipated. This policy for NSTA regional and national conventions was first instituted at the Anaheim Convention this spring. It was meant to replace negotiations with hosting organizations. They will report to the board at the winter meeting.

Redistricting is moving forward as planned. Our district will be reorganized into District XII, comprised of Illinois, Iowa, and Wisconsin. In 1995, Missouri will be part of District XI, joining Nebraska and Kansas. This district will be electing a new District Director who will take office in June, 1995.

Each district is planning a Leadership conference, ours is scheduled for summer, 1996. During group discussions our states preferred to meet separately from other districts, with the exception of inviting nearby Canadian representatives. Canada is becoming a separate district, but size makes holding a district meeting prohibitive.

The Safety Standards Position Paper was approved, this is directed at convention presentation safety. Each President will be receiving a copy soon and should consider it in relation to their state conventions. If a state organization is in need of adopting such a policy, these guidelines will be very useful.

NSTA Executive Director Bill Aldridge will be leaving NSTA and a Task force has been established to search for a new director. Inquiries about the position should be made to Fred Johnson, Shelby County Bd. of Ed., 120 S. Hollywood, Memphis, TN, 38112 (901)325-7900 ext 527.

NSTA President Marvin Drugger has instituted a Local Leaders project. Its basic idea is to allow a large number of members to serve NSTA at the grassroots level because committee slots are limited. Local leaders are encouraged to develop their own initiatives and will be called upon by me for assistance at state conventions or other regional activities. Increasing NSTA membership in their state is one of the goals. If you are hosting a science education meeting or a districtwide conference and would like material, feel free to contact me or your closest Local Leader. Each state president has a copy of their Local Leaders.

Membership in NSTA now included a multiyear membership which can save you money when you renew or join for the first time. There is also a 50% discount for new teachers who join, with proof that this is their first year. Watch your NSTA journals for registration or presentation forms for the following conventions:

1995 National Convention Philadelphia, PA Mar 23-26
1995 International Convention Jamaica, July 28-30
1996 National Convention St. Louis, MO Mar. 28-31

1995 Annual Meeting of Illinois Science Teachers Association

September 28-30, 1995

Prairie Capitol Convention Center
Springfield, Illinois

CALL FOR PAPERS

PLEASE COMPLETE A FORM FOR EACH PARTICIPANT (You may duplicate this form).

I can be available for: o Friday's program o Saturday's program o either day

Please print or type:

Name	Day phone
Affiliation (School or Organization)	Home phone
Address of above organization	Home address
City, State, Zip Code	City, State, Zip Code

Title of presentation (10 word maximum)_____

Program description as you wish to appear in the program book (25 word maximum)_____

Due to limited space, presentations must be limited to 50 minutes.

I. Type of Session
- o hands-on workshop
- o demonstration
- o contributed paper
- o panel
- o other_____.

II. Intended Audience
- o preschool
- o elementary
- o middle/jr. high
- o high school
- o college
- o supervision
- o general
- o teacher preparation
- o other_____.

III. Subject Area
- o astronomy
- o biology
- o chemistry
- o earth science
- o physics
- o ecology/environment
- o science/tech/society
- o other_____.

IV. Equipment Required
- o overhead projector
- o slide projector
- o other_____

Note: Convention will furnish only overhead, screen, VCR/monitor, and 35mm slide projector. All other equipment, including computers, will be furnished by presenters.

V. How many participants can you accommodate at your session? _____30-50 _____51-80

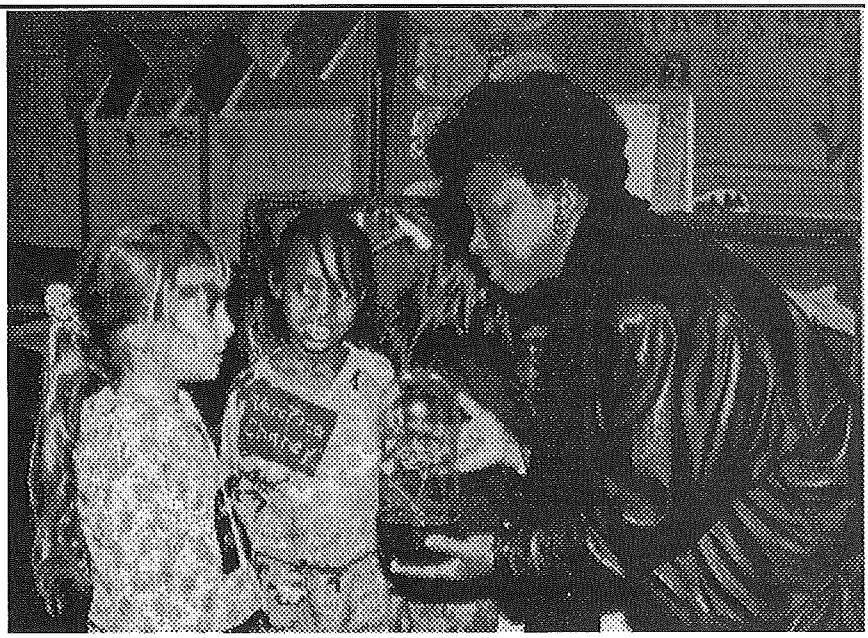
- Please attach a less than one page abstract of your proposed presentation.
- As a professional, nonprofit organization, the Association is unable to reimburse participants for travel or other conference expenses.
- ALL PARTICIPANTS, INCLUDING PRESENTERS, ARE REQUIRED TO REGISTER FOR THE CONFERENCE.
- This form is not for commercial or non-commercial exhibits. It is only for educators!

Signature _____ Date _____

Send to: **Diana Dummitt, ISTA Spectrum, College of Education**
UIUC, 1310 S. Sixth Street, Champaign, IL 61820
Phone (217)244-0173 Fax (217)244-3711

Susan Bruce, Rebecca Conrad
Hui-Ju Huang, and Bertram Bruce
College of Education
UIUC

PROJECT SEARCH: BRINGING UNIVERSITY SCIENCE RESOURCES INTO THE ELEMENTARY CLASSROOM



This fall, 45 undergraduate science majors at the University of Illinois at Urbana-Champaign are spending two to four hours each week in elementary classrooms bringing activity-based science projects, resources and expertise to local classrooms and after-school programs. They are part of a growing number of University students who have joined Project SEARCH, an outreach program of the Biomedical Magnetic Resonance Laboratory.

Despite a general recognition that early experiences with science learning may be extremely important in forming positive attitudes toward science, familiar statistics reveal a decline in the emphasis placed on science in elementary classrooms. The National Assessment of Educational Progress reported that 40% of third graders had conducted no science experiments in the previous month. Another 19% reported never performing science experiments in school. According to Goodlad (1984), science is the most neglected of all academic subjects in elementary schools in the United States, occupying an average of only 10% of total instructional time. Although there are many promising counterexamples to these overall trends, classroom needs are still defined at the most basic level.

Project SEARCH (Science Education and Research for Children) is designed to address these problems through a collaborative model for constructivist science teaching and learning. Its overall goal is to enhance children's understanding of the meaning and excitement of science. It is hoped that children will then experience science as a way to ask questions, not just as a collection of answers to be memorized.

SEARCH works by connecting schools and other organizations in Urbana and Champaign with science departments at the University of Illinois. Through the project, which is now in its fifth semester, university science students bring activities and science expertise to local classrooms and after-school programs. Students are viewed as both teachers and learners, and receive college course credit for their work.

We are conducting a two-year evaluation of Project SEARCH. This article reports some of our early findings. (For a copy of the complete first-year evaluation, see below.) Project SEARCH is a very diverse project, which poses a challenge for drawing conclusions about attitude or conceptual change. Nevertheless, its promise for supporting science teaching and learning deserves thorough study. Our evaluation has focused on the overall impact of Project SEARCH, and the responses of students, teachers and children to participation in the project. We have gathered primarily qualitative information, which is being shared with participants as the project develops.

Overall Impact of Project SEARCH

Nearly everyone involved with SEARCH wants it to continue and expand. The enrollment of students is increasing each semester. More teachers are asking to be included. At one school, the success of an after-hours program has convinced teachers to extend the program to the regular classroom. A Boys and Girls Club has revised its own building expansion plans to include space for SEARCH. All of these suggest a project that is meeting diverse needs in a substantive way.

Project SEARCH offers an apparently unique combination of the features found in school-university collaborative programs. It supports the introduction of hands-on activities to children through materials and resource support for elementary teachers. Moreover, it adds an important dimension, in that the science activities are offered by undergraduate science majors. Pairs of students work on either a weekly or twice-weekly schedule in the classroom. They are supported by university science and education professors, post-doctoral and graduate students, and primary-school teachers. Students receive college credit, as well as valuable science experience.

The timing, format, and degree of integration of the projects with other classroom subjects is determined by the teachers. At the end of each semester the students develop original science activities for the children; these then become materials for future participants.

Communication through electronic mail (email) is an integral part of this project. All students meet together with the project director and coordinator once a month to exchange information about what they have done and to address any problems. The rest of the time, they are expected to communicate with each other via email. Each student has an email account and a discussion group is set up as a communication channel.

During the Fall of 1993 we visited all of the SEARCH classrooms. These included eight public school classrooms, three preschool classrooms, two private school classrooms, and two after-school programs (one in a public school and one in a Boys and Girls Club.) Through these observations we formed our first important impression of the project: that there was great diversity in the settings, in the roles students might play and in the content of what they might teach. We quickly began to realize how varied the students' experiences might be.

Student roles

Even among the eight public school classrooms within one school, we observed students in widely differing roles. Some were teaching an entire class a lesson they had planned and for which they took full responsibility. Others were assisting the teacher with a unit she had developed, using materials available in the classroom. In some settings, students were working with small groups as they rotated through activity centers. In others, pairs of students divided the class in half and each taught one activity. Some were working with individual children on computer programs. Many students had lengthy meetings with their cooperating teachers to plan their presentations, while others discussed proposed lessons for only a few minutes. Students based at the after-school programs planned and implemented activities without any teacher interaction. Some students told us they had found themselves working in settings very different from what they expected and were adjusting to new demands, for example, learning to communicate effectively with very young children, while others seemed immediately at home in their classrooms.

Materials used in the lessons

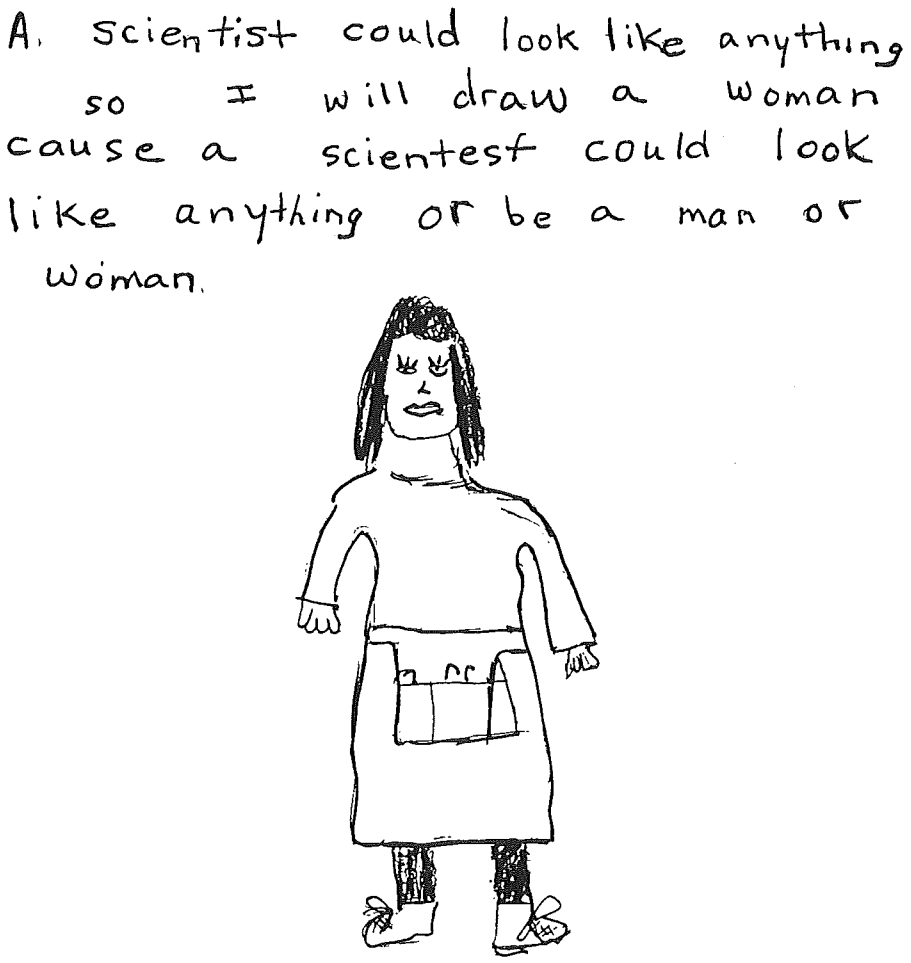
We observed some students bringing in resources to classrooms to enrich a particular unit of study that the teacher had planned. Others used materials that reflected their own interests and were not directly related to the classroom curriculum. Some teachers were very actively involved in the lessons, while others took a more peripheral role. Students drew upon a variety of resources, including materials they created themselves, science kits they found within the school, resources from the local nature center, and kits created by former SEARCH students that have become a part of the project's collection.

Science topics

We observed SEARCH students dealing with a variety of science topics, including those shown in Table 2. Activities such as building an electrical circuit or dissecting a frog offered children an opportunity to manipulate materials and equipment. They also engaged children in learning science process skills such as observation, measurement, prediction, testing, and experimenting.

Students' Responses

Students' motivations for taking the SEARCH course included an interest in working with children, the desire to help children learn about science, an interest in teaching, and wanting to gain some personal experiences such as improving communication skills or interaction skills with younger children. One student, an African-American student, hoped to help African-American children by exposing them to science.



When asked their goals for teaching science, several students said they wanted to give children a basic understanding of science concepts and to relate science to everyday life issues, to make science close to children. Others hoped to expose children to science at an early age, sparking an interest that might be maintained in the future. Several mentioned the importance of teaching processes such as observation, prediction, and hypothesizing. One student said, "The big thing about science learning is how to study science. I know a lot of things I learn are not truth. I learn them as truth, but I am sure twenty years from now they may be replaced, but that's fine, as long as I know how to find out, how to think that way, a logical way, that's more than knowing facts. Learning facts is important too, but there are a lot more things, thinking is more important."

On the whole, SEARCH students reported that children were very excited by their presence in the classroom. One related, "They seem to grow attached to me quickly and from the sounds of the general rumbling when I arrive they're happy to have me there to teach them science. I think it's partly because, while I am there to teach them, I'm also a student just like them—maybe it makes science something that I'm doing with them, not just teaching them."

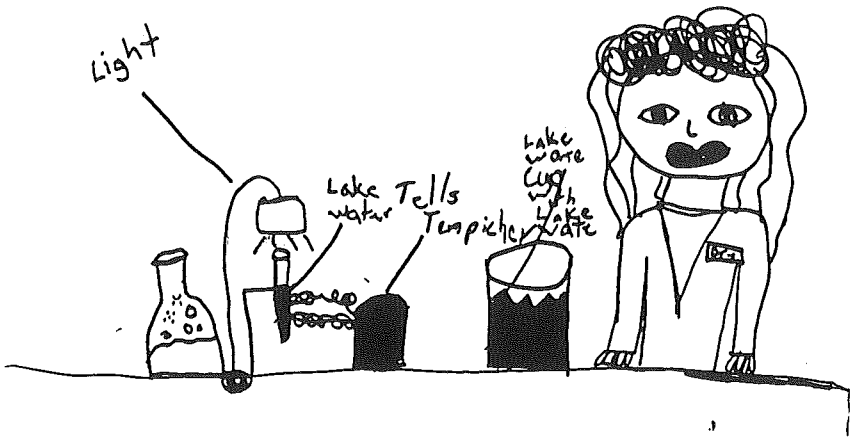
The students reported that most of the time the children were enthusiastic to learn, eager to respond to questions and to ask questions. But in some cases, children were less responsive. One student commented, "While playing a Geo Safari game with one of the children, I tried to point out some of the things that the game was trying to teach, but the child said that she didn't want to learn anything and just continued to guess randomly at questions that were asked."

Many students discovered that the children knew more than they expected. As one reported, "We have been teaching electricity to K-1 and the interest and understanding has surprised me. I guess I underestimated their ability to comprehend."

Table 2

Incomplete List of Science Topics Presented by SEARCH Students

Topic	Example Activities
Zoology	frog hatchery kits
Invertebrate Anatomy	dissecting a frog
Bacteriology	growing colonies of bacteria
Physics	making gas to inflate balloons; friction experiments
Paleontology	studying reproductions of fossils; making dinosaur models
Electromagnetism	constructing a simple circuit; working with magnets
Ecology	field trip to a natural history museum
Physiology	anatomy apron
Microscopes	studying prepared slides
Astronomy	theories of the origin of the solar system
Weather	measuring temperature
Nutrition	measuring fat and sugar content of foods
Chemistry	measuring pH; making oobleck; working with mystery powders
Computer Simulations	SimAnt; BodyWorks; GeoSafari; Carmen Sandiego



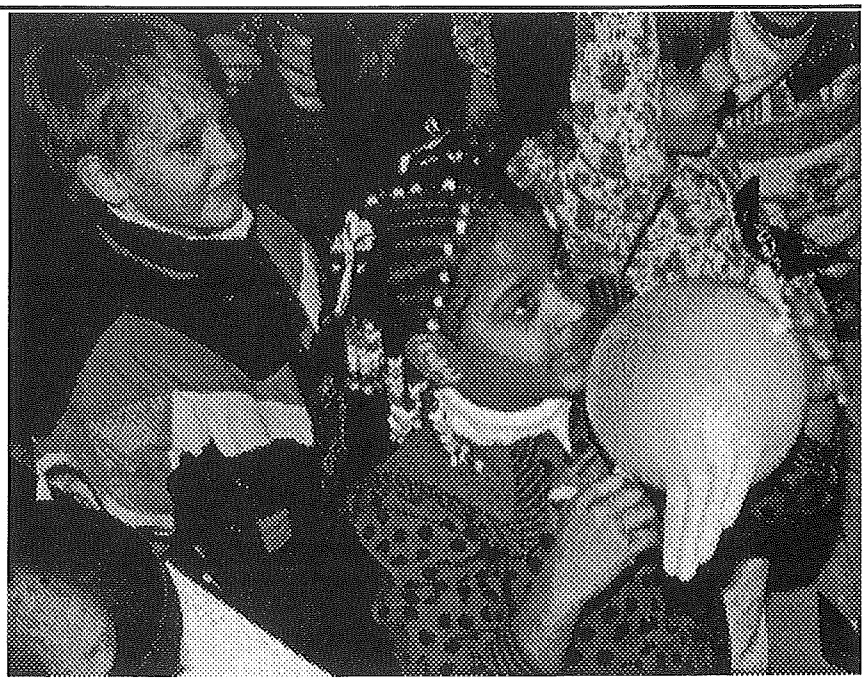
Another student observed gender differences in children's reactions, saying, "Kids, when they had troubles, especially girls, they wouldn't work on it, they just called me over, or boys sitting next to them...and they [the boys] did it for them. I tried to pay special attention to girls, get them to find out by themselves, let them know they can figure out just by working with it."

Many students saw themselves serving as role models for the children, presenting an opportunity to interact with someone who had chosen science as a career. One student described this experience: "One day, three little girls talked about what they were going to do when they grew up. They said, 'we want to be scientists or we want to be painters'....I mean that just made my day...they are thinking about being scientists later and working in a lab. I think they never thought about being scientists before I came in. Scientist may be a too large a concept. You know, you go to a doctor you see what he does, they give you an idea what you can do. Who works in research lab? That's not something you are exposed to as a little kid, unless your parents do it."

All of the students interviewed indicated that they, too, had learned from the project. They stated that they learned how to present things to young children, they gained teaching experience, communication skills, organization skills in designing activities and became more creative in developing activities. They also believed this experience strengthened their science knowledge base. One related, "I actually learned something about science...because I had to teach kids...Things like bacteria. I know about bacteria, but I never set up experiments, I never made agar...little things like that. Now I know how it's done."

Teachers' Responses

Most of the teachers interviewed reported that the students played a tremendously positive role in their classrooms. They saw that the students could provide in-depth explanations and resources, set up experiments, model the process of research, clear up incomplete information, question analytically, and cover a variety of topics in science.



One teacher commented that when children "begin to probe and ask more questions, to have those students there to really break it down and give [children] some in-depth knowledge I have found invaluable." Another said: "[Students also] attacked areas that I have not done very much with so it had been wonderful to give me ideas...there are times when they have helped us clear up things that I have been giving probably incomplete information about."

Several teachers reported that they gained experience with cooperative planning and collaboration between the university and the elementary schools and learned about the tremendous availability of materials and activities for elementary children in science. Others mentioned these benefits:

- Project SEARCH prompted reflection on information that has been forgotten and suggested teachers pursue more study in other areas.
- Students were a source of ideas for teachers.
- SEARCH provided an enjoyable opportunity to supervise students. It was interesting to observe the ways in which the students were comfortable and the ways in which they needed help.
- The presence of SEARCH students confirmed for some teachers the fact that they should feel comfortable about not having all the answers; seeking answers to basic science questions through research is an important activity to model for children.

One teacher commented, "It has all helped broaden my ideas on what's available in science and...it's exciting to see them bring in these different things that we aren't able just to run and get. I think it's a learning process both ways. They learn what it's like to be in the classroom and then they really help us out by giving us some more science experiences for the kids. So it's real joint collaboration between both the university and the classroom."

Teachers reported many ways in which they saw SEARCH making a contribution to children's science learning. Children gained an excitement about science, because of the project's novelty. They learned that planning a career as a scientist need not be not limited to any particular race or gender. (As a group, the SEARCH students reflected considerable diversity in terms of ethnicity and gender.)

Some said children have begun to see science as relevant and enjoyable. They have a better understanding about how things work and how science works. The project has helped some think more logically and analytically and broadened their vocabulary. They have been exposed to different and more hands-on experiences and the process of experimentation. SEARCH students were sometimes better able to respond to the children than the regular teachers.

One teacher commented that "the more adults children see and the more models they see of being excited about questions and trying to figure things out,...the more benefit that has to them."

Children's Responses

Many of the children's comments similarly reflected positive effects of SEARCH in terms of science concepts, attitudes towards science, and attitudes about scientists. Most children were excited by many of the activities, enjoyed the opportunity to work in small groups with their peers, and many seemed to develop more positive images of scientists.

In a third-grade class, children were fascinated by the frog dissection activity because of the firsthand, concrete observation it provided. Children's comments indicated that the activity promoted some construction of science concepts. For example, without prompting, many children made comparisons between the frog's body and their own.

Children also broadened their image of scientists. When asked to draw a scientist, several children in one fifth-grade class wrote that a scientist can look like anybody. One student simply stated: "Anybody can be a scientist, even if it is not what they do for a living, they can make things and investigate."

In a K-1 class, another child said "Does it have to be a girl?" undoubtedly reflecting the fact that a female physiology major had worked in her class for four semesters.

Questionnaire and interview results revealed that most of the children liked science, they thought it was important to learn science and they had confidence in their own ability to learn science. Results also indicated that children valued the learning of science when they were allowed to actually manipulate materials and equipment and have first-hand experiences. In instances where children were less positive about science, this attitude usually reflected less emphasis on hands-on experiences by the individual SEARCH student or classroom teacher.

Conclusion

Project SEARCH is a simple concept: Enlist the energy and expertise of university science students to improve science learning opportunities for children. Despite its simplicity, however, approaches like SEARCH are not as widely used as they might be; institutional and logistical constraints often dampen initial enthusiasm. But Project SEARCH is more than just a speculative model. Now in its fifth semester, the project is reaching dozens of university student and teachers, and hundreds of children.

Project SEARCH is, of course, not without its problems. Communication among participants is not always ideal. Time constraints prevent staff from providing the in-depth preparation for students that they might like to provide. Yet despite these and other difficulties, there is evidence that SEARCH is having considerable impact and is a model worth continuing and exploring further. Our work this year will provide a more detailed perspective on the effects on children. Confirming the impressions of teachers and students in even a partial way would mark SEARCH as an educational approach of potentially major significance.

For more information about Project SEARCH, contact Director Joan Dawson, Department of Physiology and Biophysics, University of Illinois, 407 South Goodwin, Urbana, IL 61801. For a copy of the evaluation, contact Susan Bruce, Department of Curriculum and Instruction, University of Illinois College of Education, 1310 South Sixth St, Champaign, IL 61820. Project SEARCH is supported by grant #IBN89-201-33EDOR to the University of Illinois from the National Science Foundation.

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ELEMENTARY STUDENTS' IDEAS ABOUT SPACE AND SPACE EXPLORATION

It's when there's no gravity. It's a dark place with **stars and other planets... you can't breathe** - Melody

Introduction

That "kids say the darnedest things!" comes as no surprise to teachers. Children's comments and observations, from an adult's perspective, frequently seem cute, funny, or even silly. Increasingly, however, educators are listening with renewed interest, and respect, to the things kids say.

Students' preconceptions are being taken more seriously as educators focus on instructional practices that lead to more meaningful learning in science (Watson & Konicek, 1990). The results of educational research and teachers' observations indicate that children do possess explanations "which influence the ways in which they respond to and understand disciplinary knowledge" (Driver & Erickson, 1983, p. 38). It is apparent that eliciting and considering children's ideas should be an essential step in facilitating "more effective communication" between teachers and learners (Driver & Easley, 1978, p. 80).

For the past fifteen years, science education researchers have shown an increasing interest in student ideas concerning a range of natural phenomena (Arnaudin & Mintzes, 1986; Brumby, 1982; Gunstone & White, 1981; Stepans & Kuehn, 1985). In a recent study (Nelson, 1991), thirteen Illinois sixth grade students were asked for their explanations involving several related topics in astronomy. In a series of structured interviews, the students in this study were shown videotaped segments of selected space shuttle missions. The students were then asked to interpret what they saw based on their life experiences and science knowledge. The purpose of this article is to summarize the results of the study. It is hoped that these students' explanations will offer science teachers some insight into their own students' thinking concerning the earth's atmosphere, space, and space exploration.

Atmosphere

The students, as a group, perceived the earth as consisting of a series of concentric spheres. As Jackie explained, "There's circles in the earth: core, mantle, and crust." It appeared that many of the students believed the atmosphere to be the earth's outer "circle." As such, the atmosphere was viewed as substantial in its composition and definite in its dimensions. An interesting aspect of this model was the students' contention that the atmosphere had an outer cover or "shell."

Several of the interviewed students felt that this cover provided a protective barrier that was essential to human survival. They indicated that the atmosphere's cover made life possible on earth by keeping in oxygen and gravity as it kept out "space," "orbit," and "nongravity." The students indicated, however, that such a cover could create special problems for the exploration of space. Space craft would have to find a way of moving through this atmospheric barrier without endangering the astronauts or people on the earth. Several students said that this dilemma could be avoided by the use of special openings in the atmosphere. The students referred to these openings as "windows." Anna suggested that "there's like windows and every once in a while they open. They [astronauts] go through the window with a lot of force." The opening and closing of these windows would allow the shuttle to travel out of the atmosphere without allowing gravity "out" or space "in." Students' use of the term "window" is understandable when placed in the context of the media's coverage of shuttle flights. Reporters and space officials frequently use the terms "launch window" and "window of opportunity" when speaking of the optimum time for shuttle launches or recoveries.

Even those students who did not hold the "shell" model of the atmosphere, perceived the atmosphere's edge as separating the familiar conditions of earth from the "alien" features of space. The atmosphere was thought to "contain" oxygen and gravity, while space was devoid of both oxygen and gravity. Most of the students interviewed maintained that the direction of gravitational attraction was from above the earth. It would seem reasonable to these students for the atmosphere to be the source of gravitational force. As Ramon explained, the atmosphere "helps us to keep on the ground." The students associated the force of gravity with the earth and its atmosphere while space was felt to be devoid of gravity. This view enabled the students to believe that astronauts could be "weightless" in space because they were beyond the atmosphere and, therefore, beyond gravity. According to Steven, "When you go out of the atmosphere, you're weightless because there's nothing to pull you down." This notion was carried to its logical conclusion by Rick when he stated that only those moons and planets that had an atmosphere could have gravity.

The students' understanding of the atmosphere, especially the atmosphere's relationship to oxygen and gravity, was associated with the atmosphere's role in maintaining life (especially human life) on earth. It was also apparent that their conception of the atmosphere had a significant influence on how they viewed such related space phenomena as gravity, orbit, and the condition of free fall.

Space

The students described space as a dark expanse punctuated by the sun and "tons of stars." Along with the sun and stars, the students mentioned planets, moons, comets, and galaxies as other celestial objects.

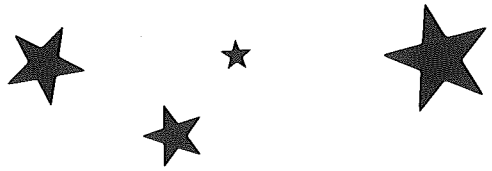
The interviewed students frequently described space in terms of what they believed it lacked, specifically, oxygen and gravity. While the students' interpretation was the inverse of the actual relationship between gravity and oxygen, their view did enable them to explain the behavior of astronauts in space. The idea that space was without gravity made it possible for a person to "float" in space. Suzy, for example, stated that space "has no gravity. You're always floating. You wear a suit so you can float and be safe." Rick maintained that the absence of gravity made space "suction-like" and that without a space suit a person would "blow up." These students' comments indicated an understanding that space was a hostile environment and that special precautions, such as space suits, were necessary. However, the students suggested that it was the absence of gravitational force that made space such a dangerous place. The lack of oxygen in space was attributed to the absence of gravity. These students did not mention extremes in pressure or temperature as safety concerns for astronauts when in space.

The Space Shuttle and Its Mission

At the beginning of the interview process, the students were shown a model of the space shuttle and asked what they knew about the shuttle and its mission. All but one of the students were able to identify the model as the space shuttle (several students referred to it, specifically, as the Challenger). All of the students expressed the belief that the shuttle's primary mission was the exploration of space.

The students explained that the shuttle had two purposes; to launch satellites and to investigate space. The exploration of celestial bodies was mentioned as the shuttle's primary mission. Most of the students mentioned that the shuttle made it possible for astronauts to visit the moon and other planets. As Suzy remarked, the shuttle went into space "so people can go to the moon and other planets. People go for science...they land, get equipment out, and walk around." Other students suggested that the astronauts visited other planets to "survey the planets' oxygen and temperature," to "find scientific stuff like rocks, or to "look for life on planets."

While these students did understand that the shuttle was involved in space exploration, they tended to associate all such ventures with the shuttle. The landings on the moon by the Apollo astronauts and the journeys to the planets by unmanned space probes were all attributed to the shuttle. The students' views are not too surprising considering that they literally grew up with the shuttle program. This strong identification with the shuttle as "the" space exploration program indicates that there is a need for science teachers to put the shuttle program in historic perspective.



Conclusions

This sample of student ideas regarding space is not intended to be a supplemental list of the "darn things" kids say. The purpose of this report is to encourage teachers to solicit actively student explanations for natural phenomena. When teachers invite their students to share their ideas, they present science learning as a "process of inquiry rather than an inventory of knowledge" (Anderson, 1965, p. 326). Science education, as a process of inquiry, should recognize the contributions of both the students and the teacher. When inquiry is emphasized in the classroom, students are viewed as active seekers of knowledge while the teacher is perceived as an educational leader facilitating learning, not be imposition, but by negotiation (Bodner, 1986). This approach gives the science teacher the opportunity to focus on the similarities and the differences between the students' ideas about space and the perspectives of scientists. Students can then evaluate, for themselves, the usefulness of these competing ideas for interpreting their experiences (Gilbert, Osborne & Fensham, 1982).

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DOES IT MATTER HOW WE TEACH SCIENCE?

As we move through another school year that age-old question may be nagging you. Does it really matter how I teach? The effectiveness of different teaching strategies is a debate that seems to heat up every few years. Educational researchers may debate the impact of a new instructional approach while administrators and school board members may express concern about teaching strategies that require the purchase of "more than the usual" amount equipment or materials. As a teacher you're always concerned about what methods will be of most value to your students.

The purpose of this article is to review some of what is known about the effectiveness of various strategies for teaching science. Is discovery learning better than expository teaching? Is individual project work more effective than group lecture? Are thought provoking questions better than those aimed at factual recall? After decades of asking and attempting to answer these kinds of questions what do we know?

What is a Teaching Strategy?

The first step in thinking about teaching strategies is to define what one is and give an example. In this article a teaching strategy is defined as a method or technique for organizing and conducting some aspect of a class for the purpose of achieving an instructional goal or objective. For example, you might be planning to teach your earth science class about the phases of the moon. Perhaps the objective is to have students be able to identify these phases. To illustrate this concept you might decide to supplement your class discussion with a series of videodisk images portraying each phase in the lunar sequence. You've chosen a "visually enhanced class discussion" as your teaching strategy over other possible strategies like a lecture only, a reading or library assignment, an observation activity or assignment, or working with a computer simulation. As you may have learned in a science methods course or through experience there are many techniques or combinations of techniques possible. For each lesson you must consider the alternatives and choose the teaching strategy to be used.

How Do We Choose Teaching Strategies?

Are questions about the effectiveness of the teaching strategies we choose trivial? Should we trouble ourselves to find out if some strategies are more effective than others? Perhaps teaching strategies are only a matter of preference. If they are, each teacher simply chooses strategies based on how

they like to teach. Choosing teaching strategies is not a trivial or preferential matter if there is evidence that students learn better when certain of them are used.

If we decide that information about teaching strategies would be valuable then another question arises: Is it possible to find out whether a particular teaching strategy is better than its competitors? Some teachers say that educational research in this area in inconclusive. One study will show that student achievement is better when strategy "X" is used and another study of a similar strategy will show no difference or even an opposite result. Although a particular strategy may not have the same effects given two very different sets of schools, teachers and students it is possible to find an overall, *average* effect by looking at a large number of studies of teaching strategies rather than just a few. Perhaps when choosing teacher strategies you will want to first consider those that have been shown to usually be effective. While planning and teaching lessons has never been a precise science it doesn't have to be a guessing game.

Analyzing Teaching Strategies

This article is based on an analysis of one hundred and sixty quantitative investigations of the effects of science teaching strategies. These studies were found in journal articles, doctoral dissertations and ERIC reports selected from nearly three thousand documents initially considered. Each study compared an "experimental" teaching strategy with a traditional teaching "control." The studies included middle through secondary school students and covered all science areas. Results from these studies were averaged using a statistical method called meta-analysis to determine if some categories of science teaching strategies were more effective than others or more effective than traditional methods. The scope of these investigations while not exhaustive allows for reasonable inferences to be made about the effectiveness of different science teaching strategies. Studies of the effects of science curricula and computer-based instructional systems were not included.

Categories used to classify the science teaching strategies tested in the various investigations were given general names. These categories included: (1) wait-time/questioning strategies, (2) focusing strategies, (3) manipulatives strategies, (4) inquiry/discovery strategies, (5) teaching-testing strategies, (6) modified presentation strategies, and (7) audio visual strategies.

What Are the Effects of Kinds of Teaching Strategies?

On the average each of these categories of science teaching strategies was more effective in terms of resulting student achievement than traditional lecture oriented science teaching. Whatever the measure of performance these categories yielded an overall improvement in student scores of about 13 percentile ranks. Some categories resulted in higher mean and some in lower scores. We may infer that based on this evidence that the answer to the question "Does it Matter How We Teach Science?" is yes!

Lets get more specific and identify some examples of teaching strategies within these "effective" categories that are discussed below in order of relative effectiveness:

(1). The **wait-time/question category** included strategies where teachers increased the wait time after asking questions, added pauses at key student response points, used more high cognitive level questions, stopped films at key points and asked questions, or posed comprehension level questions to students at the start of a lesson or assignment. This category of strategies was the most effective in promoting student achievement.

(2). The **focusing category** included strategies where teachers did something to alert students to the intent of the instruction. These were strategies like providing or reinforcing objectives at the beginning, middle, or closing of lesson, or using advanced organizers.

(3). The **manipulatives category** included strategies wherein teachers asked students to work or practice with physical objects. This included operating apparatus, developing a skill, drawing or constructing something.

(4). The **inquiry/discovery category** included strategies that were given this label by the researchers and that were verified as being student centered or inductive. Teachers facilitated inquiry activities of all types, guided discoveries, and inductive laboratories. Forty two studies were included in this large category.

(5). The **teaching-testing category** included strategies wherein tests became an integral part of instruction. Teachers incorporated immediate or explanatory feedback, diagnostic testing, formative testing, re-testing and testing to mastery as instructional strategies.

(6). The **modified presentation category** included strategies where teachers worked with students in different organizational schemes. The strategies in this broad category included field trips, group discussions, self-paced learning, games, or simulations. This category of strategies covers forty two studies.

(7). The **audio-visual category** included strategies where teachers used media-based instruction including films, videos, teacher audio-taped directions for students, and supplemental use of pictures, photographs, or diagrams.

What Then is the Overall Picture?

When considering the examples in these categories of effective science teaching strategies a definite pattern emerges. Although only one of the categories was explicitly labeled as "discovery/inquiry" this category included more than forty studies. Further, it is easy to picture how the spirit of discovery/inquiry oriented teaching was well represented by strategies throughout the other categories. Posing high level questions at the start of lessons, increasing wait-time, pausing at key response points, giving objectives at the middle or the end of lesson, having students work with physical objects or construct things, incorporating formative evaluation, taking field trips, having group discussions and using simulations are some of the many examples. Effective science teaching usually involves the use of strategies that promote

inquiry. This theme has been at the core of science education for more than three decades. Is it at the core of your decision making when you select science teaching strategies?

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LEARNING CYCLES, PIAGET, AND KUHN'S SCIENTIFIC REVOLUTIONS

Science teachers are always searching for more effective ways to teach science. There is a body of evidence that one of the most effective methods of teaching science is the teaching model known as the learning cycle. Learning cycles work because they are based on the way people learn and the way science is done. The question is what is the theoretical basis that makes learning cycles so effective? To answer these questions some aspects of epistemology, psychology, and the sociology of science will be examined.

The Learning Cycle

A learning cycle is made up of a three step process. The first step in the learning cycle is called the exploration phase. In this phase the student is given a simple problem related to the concept to be examined. If mineral identification is being taught students can be given a set of minerals and asked to think about what properties of the minerals could be used to identify them and into what groups the minerals could be placed. Two things can be accomplished during this phase. First, students are given an opportunity to think about the concept before any formal instruction takes place. The exploratory activity provides an opportunity to place the formal instruction in context. Second, the teacher can listen to student discussion to see what the students are thinking. Misconceptions and previous knowledge can be assessed. This assessment allows the teacher to tailor instruction to the needs of the students.

After the exploratory phase the concept development phase begins. The concept development phase contains most of the aspects of instruction that we think about as normal teaching. Reading is assigned, class discussions are held, various media are used to illustrate the concept, and certain types of labs are done. For example concept development on minerals could include reading and discussion on mineral properties, video tapes on mineral properties, and labs in which students explore the properties of various minerals.

During the final phase of the learning cycle the students apply what they have learned in some way. To follow the previous example a student might apply a knowledge of mineral properties to the identification of minerals in a collection. The learning cycle can also be used to relate one concept to another. The application of identifying minerals can lead to an exploratory activity on rocks. At Woodstock High School the science faculty has had considerable success with enhancing student learning by using learning cycles. To understand why learning cycles are so effective it is important to remember that they are based on sound learning theory.

The Theoretical Basis: Piaget

The learning cycle model is based on the work of Jean Piaget. Piaget described himself as a genetic epistemologist. He was interested in, observed, and described the way the learning process takes place. Many people are aware of Piaget's stages of mental development from psychomotor development to formal operations, but Piaget also described the processes that students go through to grow mentally. Piaget bases his ideas on what he called mental structures. All new information from the environment interacts with a person's mental structures. The new information must be made to fit into the existing mental structures or the mental structures must be changed. As mental structures change intellectual development proceeds (Muuss, 1975).

When new information is encountered the individual tries to make it fit existing mental structures. Piaget refers to this process as assimilation. By observing a student during the exploratory phase the teacher can get some understanding of the students existing mental structures. Teachers may see students looking for ways to test the hardness of minerals because they had incorporated that idea into mental structures from previous learning (Muuss, 1975).

Existing mental structures can also lead to misconceptions or incorrectly remembered information because information must fit into existing structures. It is not unusual to see a student try to use a streak plate for a hardness test during an exploratory activity on minerals (Muuss, 1975). There comes a time when the existing mental structures can no longer make sense of new information. At this point the mental structure itself must be changed. Students who have had little experience with the identification of earth materials will sometimes see all minerals as being the same during the exploratory phase of the learning cycle. By the time the application phase of the cycle is completed the student has undergone a change in the way they think about the variety they see in minerals and other earth materials. By the two processes of accommodation and assimilation the

Table 1.

Kuhn	Piaget
Normal Science	Mental Structures Equilibrium Assimilation
Scientific Revolutions	Reorganizing Mental Structures Equilibration Accommodations

person maintains mental equilibrium. When new experiences are encountered which disturb the equilibrium the process of equilibration begins. Either the new information must be changed to fit existing mental structures or the mental structures must be changed (Muuss, 1975).

So the learning cycle works well as a teaching model because it makes use of the ideas proposed by Piaget. Piaget's ideas were based on many careful observations and thus give a valuable insight into human learning. But why are they particularly valuable in science? One thesis of this article is that science as a social institution mirrors what Piaget described in the development of mental structures in individuals.

Kuhn- Structure of Scientific Revolutions

Thomas Kuhn has written that science does not move from one idea to another in a smooth step by step way. Science deals with one generalization at a time. The training of students entering scientific fields is designed to teach them what set of generalizations are held by people in the field. Kuhn believed that there were two different aspects to science. The first is what he called normal science. During times of normal science there is a theory that works for most evidence. During this time there are three types of activities which take place in scientific laboratories and offices: (1) those facts which make the theory a more useful tool; (2) investigations of esoteric facts which have no value except the confirmation of the theory; and (3) clearing up ambiguities and solving problems with the theory or paradigm (Kuhn, 1970). Genetic engineering today is an example of normal science at work. This process seems to be similar to Piaget's assimilation process.

Kuhn says that eventually facts start to build up which do not fit with the existing theory. As these observations build up it become evident that a new theory must be proposed. This situation begins a process of casting about for new ideas until one is found which will explain the new observations (Kuhn 1970). This process happened during the Copernican revolution. The number of epicycles needed to explain planetary motion had become burdensome. The new observations did not fit the old theory. This situation seems to be similar to Piaget's process of accommodation. Note there is a similarity here between Piaget's ideas about how mental structures change and Kuhn's ideas about the change of theories that takes place within the scientific community. Assimilation of information resembles normal science, and accommodation, the altering of mental structures, resembles the process the scientific community undergoes when it experiences a scientific revolution.

Implications

This relationship between learning cycles, Piaget, and Kuhn is more than just an intellectual curiosity. It goes to the very heart of how science is done and how it is taught. There are several things that become apparent if these ideas are true. (1) Scientific discovery follows the same pattern as human learning. (2) Learning cycles can be designed to follow the normal human learning process and the scientific discovery process. (3) The history of scientific discovery can be used as method of designing learning activities since there are elements of learning cycles in scientific discovery. (4) Student who are taught using learning cycles can become more comfortable with scientific reasoning processes because they have obtained experience in the way people and the scientific community deal with new ideas.

Conclusion

Learning cycles work because they are based on the ideas of Piaget, which gives them a sound base in learning theory. The ideas of Thomas Kuhn about the processes of science exhibit striking similarities to Piaget's theory of learning, so learning cycles also follow the same process as science. By using learning cycles and the theories mentioned teachers can design very effective learning activities.

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SPECIAL INTERESTS

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Springfield, Illinois

ORIGINAL EARTH DAY SYMBOL SOUGHT BY NATION'S MUSEUM

After 24 years, Lanphier High School chemistry teacher Ray Bruzan is going to miss his Earth Day flag. Bruzan and about 70 students rallied around the green and white ecology flag back on April 22, 1970, as they celebrated the first Earth Day with a march to the state Capitol. Now the same flag is headed to the Smithsonian Institution in Washington to be part of next year's celebration of Earth Day's 25th anniversary. The flag will then become part of the Smithsonian's permanent collection. "I'm very excited," said Bruzan. "I don't know how many high schools can say they have something in the Smithsonian."

The flag (on the cover of this issue) has been a fixture in Bruzan's science classes since the mother of a student first sewed it together nearly a quarter-century ago. The flag sports green lines to symbolize a clean Earth, white lines to show clean air and the Greek letter theta, a warning of death.

"It was quite a big thing," said Bruzan. That's figuratively and literally—the flag measures 61 inches by 36.5 inches. Unfortunately, Bruzan, who had a total of 200 students pass through his classes in 1970, has forgotten the name of the woman who actually made the flag. "Therein lies the mystery. I remember I was so thrilled to get the flag that I wrote a thank-you note to the parent, but I forget who it was," said Bruzan. "I'd be thrilled to find out because I'd like to send that name into the Smithsonian with the flag."

On April 22, 1970, the Lanphier High School students were just some of the millions across the country who gathered for sit-ins, teach-ins and even sing-ins to draw attention to the need to clean up planet Earth. After a funeral march to mourn the "dead Earth," a hearty rendition of "This Land is Your Land" and several spirited student speeches, Bruzan and a group of about 70 students began their march to the state Capitol with the Earth Day flag at the head of the procession. According to the student newspaper, The Lanphier Light, "Mr. Ray Bruzan's conservation classes and members of the student council marched to the Capitol building, collecting trash on the way, to present a petition to Governor (Richard) Ogilvie protesting any environmental change that will alter the lives of man." On page two of the same edition, the words to "America the Beautiful" were reprinted followed by the question: "How long will it be before this song will be a joke?"

Gaylord Nelson, who originated the idea of Earth Day as a senator from Wisconsin, would be proud. Bruzan said Ogilvie couldn't make the ceremony, but the students were met at the Capitol by then-Lt. Governor Paul Simon, to whom they presented their petitions.

Some of the '70s symbolism is gone, but Bruzan still stresses protecting the environment in his chemistry classes at Lanphier. And he still celebrates Earth Day each April 22. However, it was a news release from the Smithsonian last fall that brought the groovy 1970 memories rushing back. "They were searching for artifacts of the original Earth Day. I told them we did Earth Day in a big way here," said Bruzan. "I was very excited to hear about this artifact and think that it would make a wonderful addition to the History of Earth Day exhibit," wrote Patricia Gossel, curator of biological sciences for the Smithsonian.

So far, Bruzan has sent a photograph of the flag, reprints of photographs his wife took of the original Earth Day events and copies of the Illinois State Register with stories and pictures of original Earth Day activities. He is still waiting for word from the Smithsonian to forward the flag. and when that word comes, Bruzan knows he'll feel some emotion as he packages up the flag. "I sort of feel like I hate to lose this," said Bruzan. "But I thought about when I retire. When I do leave, the flag probably wouldn't mean much to anyone here." Bruzan figures he'll see the flag again even after it takes up residence in the nation's capital. "My wife Pam already has said we have to go see it," he said.

Paul W. Clinebell

THE IWEA/IAWA TEN DAY WATER ENVIRONMENT CURRICULUM

Volunteers from The Illinois Water Environment Association (IWEA), a state group of the 40,000 member Water Environment Federation (WEF), and the Illinois Association of Wastewater Agencies (IAWA), a group comprised of more than sixty agencies responsible for providing wastewater collection and treatment services to eight million Illinois residents have created a comprehensive curriculum on the water cycle, wastewater treatment, and the relevance of our water environment to highlight the importance of teaching concepts related to the preservation of water.

The primary objectives include presenting the Water Environment curriculum to students in the 5th through 10th grades, working with teaching professionals who can sustain this program into the future, and integrating the classroom instruction with a site visit to a water filtration and/or wastewater treatment facility. An important aspect of this curriculum is the involvement of students with hands-on experiments, field ecological studies, and participative classroom demonstrations. The two professional organizations are committed to the advancement of science and education, disseminating technical information, increasing Public awareness, and promoting sound public policy in the water quality and water resource fields.

Program Topics

Day 1: The Water Cycle
Day 2: Dissolved Oxygen
Day 3: Drinking Water
Day 4: Wastewater Collection
Day 5: Wastewater Treatment
Day 6: Micro-organisms
Day 7: Solids Processing
Day 8: Groundwater
Day 9: Water Conservation
Day 10: Facility Tour

How the Program Works

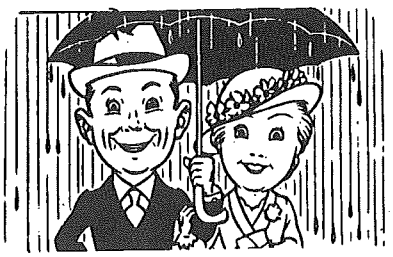
There are three important aspects of the IWEA/IAWA educational program: targeting the specific schools; supplying the guest speakers and the reference materials; and coordinating the financial requirements of the program. This educational undertaking is designed to be completely self-sufficient. These organizations support the technical aspects of classroom teaching with training aids and guest lecturers, and assist in raising the necessary funds for each program.

The IWEA/IAWA's primary target group is the junior high schools in the State of Illinois. The ultimate goal is to integrate this curriculum into all of the more than six hundred junior high schools in the state. Other levels and schools will be addressed as the need arises and the program develops.

The basic support philosophy is utilizing a "grass roots" approach. The State is divided into eighteen regions, each of which is coordinated by a local IWEA/IAWA representative. This approach facilitates the distribution of materials plus provides guest speakers who are locally well known. Regional libraries of classroom materials and a Speaker's Bureau are being developed to be able to fulfill any school's request on a timely basis.

Concurrently, the IWEA/IAWA has established a fund-raising program, designed to obtain support for targeted schools from local companies, firms, etc. The financial needs have also been subdivided into several categories, so that in many situations, it is envisioned that three or four organizations would support each school.

The final goal is to "teach the teachers" who would carry on this program by themselves, especially as the water environment curriculum is repeated year to year. At that stage, the IWEA/IAWA would provide fewer guest speakers, but would continue to coordinate the plant tours, the distribution of classroom materials, and the financial aspects of the program.



Results to Date (First Two Years)

- Curriculum utilized in 40 schools.
- More than 2000 students exposed to curriculum.
- "Total Water Cycle" concept appreciated by teaches.
- "Student Involvement" goal has become realization.
- Conduct 6 In-Service Workshops to science teacher groups.
- Approximately $10,000 raised in support of the program.
- Program is financially self-sufficient.
- Over 90% of schools using curriculum on year to year basis.
- Involvement of 40 IWEA and/or IAWA Members.
- Regionalizing is working.
- 1993 WEF Public Education Award - Member Association Category.

Immediate Goals (1993—1995)

- Expansion of program into 60 new schools.
- Maintain 90%+ Level of program reuse.
- Expand program into at least two new schools in each region.
- Conduct 10 In-Service Teacher Workshops.
- Creation of Formal Speakers' Bureau.
- Creation of Formal Facility Tour Listing.
- Expansion of Fund-Raising Component.
- Revision and Expansion of the Curriculum.

Summary

The first two years of the IWEA/IAWA Ten Day Water Environment Curriculum have been extremely successful. Success in terms of creating an educational program that can be easily integrated into most schools; and more importantly, success in terms of the large number of students who have responded well to the challenge of understanding our environment. The partnership between the local community (businesses, manufacturers, consulting engineers, and environmentalists) plus the schools utilizing our program, has been outstanding. Funds to support the program has come locally in each region; it is expected that the program will have little, if any, financial burden to the schools.

The final goal of "teaching the teachers" has become a reality. An in-service presentation can promote the program within a dozen or more schools systems at the same time. These teachers will not only teach their current (and future) students, but their endorsements will sell the curriculum to their peers. This type of program expansion will allow the IWEA/IAWA Ten Day Water Environment Curriculum to reach tens of thousands of Illinois Students. Guest speakers are available at no cost and materials can be obtained for a small cost to cover the cost of production.

For more information you may contact:
Robert T. Brummond
State Coordinator
Lake County Public Works Department
650 Winchester Road
Libertyville, IL 60048

Wayne M. Wendland, State Climatologist
Illinois State Water Survey
2204 Griffith Dr.
Champaign IL 61820, and
e-mail: wayne@uiuc.edu
ph: 217-333-0729
fax: 217-244-0220

ARTICLES ON CLIMATOLOGY AND METEOROLOGY AVAILABLE

The Illinois State Water Survey offers teachers a variety of articles on various topics designed to provide background in meteorology and climatology topics. The papers include:

setting up a weather station
severe winter storms
thunderstorms and severe weather
atmospheric circulation
hurricanes
reading a weather map
climatology
forecasting weather
The text of one of the papers follows:

CLIMATOLOGY OF ILLINOIS

The state of Illinois extends about 400 miles north-south from Rockford to Cairo, and about 200 miles east west, from Quincy to Danville. Being located in the mid-latitudes and near the center of the North American continent, Illinois experiences generally large seasonal swings in temperature and precipitation.

The climate of northern Illinois is much different from that of southern Illinois. Winter days in northern Illinois consist of high temperatures most often in the 20s and 30s, whereas those in the south are in the 40s. Winter precipitation in the north is much more likely to be snow, whereas in the south, there is little preference for snow over rain, i.e., about equal probability of each. Northern counties experience a foot or more of snowcover and ground frost for several weeks each winter, while those in the south see a few inches of snow and frost come and go several times each winter.

Summers in southern Illinois see high temperatures in the high 80s or 90s, with high relative humidities, making the environment muggy and uncomfortable. In the north, temperatures are about 10°F lower, and humidities about 5% lower. "Summer" weather begins earlier and continues longer during the year in the south than in northern Illinois. Because southern Illinois is closer to the moisture source for the Midwest (the Gulf of Mexico), it receives more precipitation (about 50 inches) than does the north (about 35 inches) in an average year.

Because of the tilt of the earth's spin axis relative to the plane on which the earth orbits the sun, winter days are longer in southern Illinois than in the north, but summer days are longer in northern Illinois than in the south.

Some common climatological statistics for northern, central and southern Illinois follow. Heating degree days (HDD) are a measure of the degree of heating required for comfort, as cooling degree days (CDD) are for the cooling season. HDD are computed by subtracting the daily mean temperature from 65°F and adding all positive residuals. CDD represent the accumulated positive residuals of 65°F minus the daily mean temperature.

Climatologies can be written using several different formats, including certain parameters and excluding others. The following table represents one such attempt at describing the atmospheric environment of three sections of Illinois.

To order a copy of this or any of the listed topics, contact Wayne Wendland at the above address

	Northern IL	Central IL	Southern IL
Length of January day	9h 05m	9h 15m	9h 37m
Length of July day	15h 16m	15h 06m	14h 43m
Mean Jan high temp (°F)	29	32	44
Mean Jan low temp (°F)	12	16	29
Mean Jul high temp (°F)	85	86	90
Mean Jul low temp (°F)	61	65	72
Annual heating degree days	6,850	6,000	3,850
Annual cooling degree days	700	1,000	1,800
Mean annual precip	36.72"	39.37"	47.12"
Wettest month	Jun	Jun	May
Driest month	Dec	Feb	Oct
Mean snowfall	35"	25"	10"
# days w/ temp > 90F	14	20	45
# days w/ temp < 32F	143	125	66
# days w/ precip/year	115	114	113
Percent possible sun	57%	57%	64%
# days cloudy days/year	169	168	147
# days partly cldy days/yr	99	99	97
# days clear days/year	96	98	121

TRITON COLLEGE CERNAN EARTH & SPACE CENTER 1994-95 SCHOOL & GROUP PROGRAM GUIDE

About the Cernan Center

The Cernan Earth and Space Center of Triton College is a unique and exciting destination for groups of all kinds, including school, scout, senior citizen, church and business groups. Our modern facility houses a 100-seat **Dome Theater**, a lobby **exhibit area** with displays on space exploration and astronomy and the **Star Store** gift shop. The dome theater is equipped to present a variety of innovative multimedia planetarium programs, C-360 films and spectacular laser light shows.

Making Your Reservation

Groups programs are usually presented hourly, 9:30 a.m. to 4:30 p.m., Mondays through Fridays. Other program times are available, and groups also can join our regularly scheduled public programs. **Reservations are required for all group programs** and should be made as early as possible by contacting the Cernan Center at **(708) 456-0300, Ext. 372.** After making your reservation, you will be sent a confirmation outlining the details of your visit. Please check your confirmation for accuracy and bring it with you on the day of your program. If you must cancel your reservation, please notify the Cernan Center as soon as possible. Groups who cancel reservations less than 48 hours before their scheduled visit may be required to pay a cancellation charge.

When You Arrive

Groups should plan to arrive at least 15 minutes prior to the scheduled program time. Buses should part at the curb in front of the Cernan Center. Visitors may park in the lot north of the Center. Refer to the map provided on your reservation confirmation.

Fees

Group program fees are provided in the adjacent fee schedule. There is a $50 minimum fee to schedule a group show. During the summer (June 19 through Labor Day), this minimum charge is reduced to $25. Small groups need not pay the minimum fee if another group joins them to see the same show. Full payment is expected at the time of the program unless other arrangements are made in advance. The Cernan Center offers a 25-cent per head discount for any weekday group reservation scheduled between Sept. 6 and Oct. 7, 1994, or between Jan. 2 and Feb. 10, 1995. Minimum fees still apply. Time slots are limited and are offered on a first-come, first-serve basis.Fees Per Show

Monday through Friday, 9:30 a.m. to 4:30 p.m.

School Groups	
In-district schools	$1.75 per student
Out-of-district schools	$2.25 per student
Supervisor adults	One admitted free for every 10 students/ additional supervisory adults admitted at student rate.
Other Groups	
Youth groups	$2.25 per child
Adult groups	$5 per person ($5.50 for laser)
Senior citizen groups	$2.50 per person ($2.75 for laser)
Supervisory adults	One admitted free for every 10 persons/additional supervisors admitted at group rate.

Thursday and Friday evenings Saturday afternoons and evenings; call (708) 456-5815 for program information.

Adult groups	$5 per person ($5.50 for laser)
Children (ages 12 and under)	$2.50 per person ($2.75 for laser)
Senior citizens (55 and over)	$2.50 per person ($2.75 for laser)
Supervisor adults	One admitted free for every 10 persons if paid in bulk/additional supervisors admitted at group rate.

Public Programs

Multimedia and laser programs change every few months. Call the Cernan Center at (708) 456-5815 **for current program descriptions, show times and admission fees. Reservations for public shows are required for groups of 10 or more.**

Dome Theater Programs

Grade-level recommendations are listed for each program. Teachers and youth group leaders may schedule any program for any grade, but should refer to the suggested grade level for an estimate of the level of the program.

Dinosaurs in Space

Preschool through 2nd grade

Hosted by an entertaining dinosaur duo, this popular show features a unique and informative look at these fascinating creatures plus a journey into space that is out-of-this-world!

Zip, Zoom, Whiz

Preschool through 3rd grade

Zip up your flight suit, zoom into space and whiz by stars and planets! Come discover how people explore space and see some of the most amazing sights in our universe.

Our Place in Space

Preschool through 3rd grade

This new children's show explores the cause of day and night, the importance of our sun, the beauty of the constellations and the variety of objects that make up the universe.

The Mars Show

Grades 3 and up

This new multimedia program describes the planet Mars from three different perspectives—Mars as depicted in science fiction, Mars as we currently understand it and the future of Mars exploration.

Mount Saint Helens

Grades 3 and up

This new C-360 film explores one of the most dramatic geological events in recent history—the explosive volcanic eruption of Mount Saint Helens in 1980. Dramatic footage of the volcano before and after the eruption illustrates the tremendous power that is contained beneath the earth's crust.

The Space Shuttle: An American Adventure

All ages, but best for Grades 3 and up. Using scenes filmed in orbit by shuttle astronauts, this C-360 film tells the exciting story of a typical space shuttle mission, from astronaut training to landing. Also included is a short, introductory program featuring the words of astronaut Edwin "Buzz" Aldrin describing his exploration of the moon. "The Space Shuttle: An American Adventure" is the closest thing to space flight that most of us will ever experience.

The Great Barrier Reef

All ages, but best for Grades 3 and up

This C-360 film will take you on a journey to the bottom of the sea to experience one of the greatest natural wonders of the earth—Australia's Great Barrier Reef! Become an underwater explorer, and witness one of the most exciting adventures ever filmed!

Discover the Planets

Grades 2 and up

From scorching Mercury to icy and distant Pluto, this show transports you throughout the solar system to see each plant up close and learn the exciting discoveries recently made by unmanned spacecraft. Spectacular photographs, video and computer animation will provide you with an exciting new perspective on each of the nine planets of our solar system.

Dinosaur!

Grades 3 and up

Millions of years ago, dinosaurs roamed the earth. "Dinosaur!" looks at recent discoveries about these prehistoric monsters and explores why they became extinct. What are the different types of dinosaurs? Were they reptiles or a completely unknown type of warm-blooded animal? Were the dinosaurs killed by a giant space rock that collided with the earth? Travel back 65 million years in or dome theater to find out.

Nature's Fury

Grades 3 and up

We all live under the threat of severe weather—tornadoes, hurricanes and thunderstorms. The Midwest especially is prone to devastating weather systems. With exciting video footage and photographs, this popular planetarium program explores severe weather and how it develops.

Exploring the Sky

All ages, but best for Grade 3 and up

In this popular show, a Cernan Center instructor introduces audiences to the many wonders of the current nighttime sky, including the seasonally changing constellations, currently visible planets, our elusive moon and more! Each show is personally adapted for audiences young and old depending on their knowledge level and area of interest. Come discover the thrill of exploring the sky!

Laser Light Shows

Grades 4 and up

Blending multicolored laser beams with music and exciting visual effects, our laser shows weave a spellbinding adventure in sight and sound. The show consists of abstract images and forms created by the laser and choreographed to a variety of musical selections. Call for the current music selection.

Genesis: The Story of Earth

Grades 5 and up

This C-360 film tells the fascinating tale of the Earth, from the creation of our planet five billion years ago to the volcanoes, earthquakes and moving continents of today.

Celestial Cycles

Grades 5 and up

This program explores the many cycles of our universe, including day and night, moon phases, ice ages and birth of stars.

Arctic Light

Grades 3 and up

This C-360 film transports you to Norway to witness the awesome beauty of the northern lights, or aurora borealis. Through breathtaking views of the northern lights and the legends surrounding them, "Arctic Light" offers a glimpse at this unique natural spectacle and what causes it.

Spaceship Earth

Grades 3 and up

This program explores the unique characteristics of our own planet earth and the environmental dangers that threaten it.

Seasons

All ages, but best for Grades 3 and up

This C-360 film celebrates the beauty of the seasons and shows how all living things, including people, orient their lifestyles to the cycle of the sun. From the growth of spring and summer to the harvest and quiet of autumn and winter, this film will surround you with exhilarating images as you learn about the seasons.

New Cernan Center Shows

The Cernan Earth and Space Center has several new and exciting planetarium programs and laser light shows scheduled to pen later in the school year. call the Cernan Center at **(708) 456-0300, Ext. 372** for updates on our school and group offerings.

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With this issue, *The Spectrum* introduces a new section (as yet unnamed). This section will be devoted to all types of activities, information, tips, and opportunities related to computers and their applications. We invite you to send/e-mail/fax your contributions so we can help each other in the exploration of this valuable and fascinating area. Because we haven't yet come up with a catchy title, you, as readers are encouraged to send suggestions for the title as well!

Gary Andersen, Editor
Excerpted from KATS
Kansas Association of
Teachers of Science

E-MAIL

E-mail is the oldest and one of the most powerful applications available on the internet. With e-mail you are connected to over 25 million users of the internet. The power of e-mail comes by connecting you to mentors, other teachers, scientists and researchers, maybe even students. It has advantages over U.S. mail ("snail mail"), being much faster and yet not as interrupting as a phone call. The person you are contacting can choose the time and place that they respond to your message, giving them the power to control their own time. They may choose to not respond to you at all, which may be a message to you in itself!

With most e-mail programs you can:

- Compose and send mail messages to anyone on the internet.
- Read or view mail messages from others.
- Delete mail messages.
- Reply to mail messages.
- Forward mail messages to others.
- File or sort mail messages by specified characteristics.
- Capture or download mail messages to your computer.
- Subscribe to internet mail lists or bitnet listservs. (This is very useful and is described in this article.)
- Send or attach text and non-text files such as programs, images or sounds to mail. You may also wish to exchange documents already formatted in your favorite word processor.

Most people on the internet have an e-mail address. My current e-mail address is GANDER@TYRELL.NET Notice that the address has three parts. GANDER is my userid with which I sign on to my computer system. The username is separated form the rest of the address with an @ sign. The middle portion of the address, TYRELL, is the name of the computer upon which I have an account. This portion may be one word or may have two or more portions separated by periods, or "dots" as they are known in "cyber lingo." Notice the dot between the name of the computer and the final portion of my address. The final portion of the address is known as the domain. The domain is usually two or three characters and indicates the type of organization with which I am affiliated in my connection to the internet. Some may be international codes representing the nation with the internet connection. In my case NET indicates that I am with a network service. Other domain abbreviations include:

COM	commercial organization
EDU	educational organization (usually universities)
GOV	government organization
AU	Australia
FI	Finland

You get the idea; there are many more.

Of all the e-mail resources available to you the most immediately useful may be the internet mailing lists or bitnet listserv lists. These are automatic mailing distributions handled by computers which allow people with similar interests to hold discussions on specific topics using e-mail. There are currently thousands of these types of mailing lists discussing everything from golf to biotechnology. I belong to several groups. For example, Kidsphere is a discussion list of K-12 educators which is rather broadly based. Over 2000 educators exchange thoughts and ideas and post and answer questions on this list. JEI-L is another list I belong to in which mostly middle school through college earth science educators talk about new resources and the latest computer imaging available to aid earth science education. Biopi-L is a list formed at KSU to talk about biology education. Once you join these lists you can sit back and wait for the mail to roll in. And roll in it does. During peak times, for example, Kidsphere may generate 30 to 50 mail messages per day.

Joining these and other lists requires a very specific procedure. While it is not overly complicated, internet neophytes often find it imposing. The important thing to remember is that there are two mailing address. One address, the commands-to address, receives specific language messages from users and is read by a machine. This is the address you send your requests to subscribe, unsubscribe or receive automatic information from the computer running the list. The command words you send to this address are very specific and rules must be followed rigidly in order to have success. An example of a commands-to address is:

LISTSERV@KSUVM.KSU.EDU

In this example, LISTSERV is the name of the mailing program you are corresponding with and the rest of the address is the computer and domain name.

The other mailing address is known as the mail-to address. This address is sued when you actually want to post a message to be read by humans belonging to the list. When you send a message to this address it is mailed to all the subscribers on the list. As you might imagine...this is a bad place to send an errant message as your mistake will be published to potentially thousands of people. Here is an example of a mail-to address:

In this example above BIOPI-L is the name of the list and the rest of the address is the computer and domain name.

Here are general instructions on how to subscribe to a mailing list.

- At your mail program's TO: prompt type the commands-to address in this format:

  program name@commands-to address

If it is a Bitnet list the program name is LISTSERV. Alternatively, if it is an internet mailing list the program name is usually in this format: [some name]-REQUEST

The commands-to address is the address of the computer serving the list. Here are two examples:

* Internet list example 1:

  AI-ED-REQUEST@SUN.COM

* Bitnet list example 2:

  LISTSERV@BROWNVM.BITNET

(Note: You can find some of these listnames, commands-to addresses, and mail-to addresses in many places on the internet itself...but that is another lesson. I have listed some on the following pages.)

- Press "return" on subject line (do not put anything on this line)
- At the body of the letter type: SUBSCRIBE (space) listname[space]Your first name[space]Your lastname

Example: SUBSCRIBE GIS-L Gary Andersen

- Send the mail—Control-X or Control-Z or whatever your mail program takes as the "send" command.
- In order to "unsubscribe" from a list you follow the same procedure as above, but place the following in the body of your mail message:

  signoff[space]listname

  Example: SIGNOFF GIS_L

There are many more commands you can execute using a listserv mailing machine. In order to view some of these command send another message to the commands-to address with one word in the body of the message—HELP. Sending this will return a simple list of commands which can be sent to the listserv program. Alternatively, a message with the words "Info Refcard" can be sent to obtain a more detailed list of listserv commands.

On the next page is a list of e-mail addresses you may be interested in. This list represents biology, chemistry and physics.

Biology Related Lists

Mail to Address	Commands to Address	General topic of discussion
2BNFCC@SEARN.SUNET.SE	LISTSERV@SEARN.SUNET.SE	Ecology of Nitrogen Fixing Bacteria
alife@cognet.ucla.edu	alife-request@cognet.ucla.edu	Artifical Life
BATLINE@UNMVMA.UNM.EDU	LISTSERV@UNMVMA.UNM.EDU	Bat Research Information Exchange N
BEE-L@UACSC2.ALBANY.EDU	LISTSERV@UACSC2.ALBANY.EDU	Discussion of Bee Biology
BIODIDAC@ACADVM1.UOTTAWA.CA	LISTSERV@ACADVM1.UOTTAWA.CA	Electronic Discussion Group for Biology teac
biodiv-l@bdt.ftpt.ansp.br	listserv@bdt.ftpt.ansp.br	Biodiversity
BIOMAT-L@NIC.SURFNET.NL	LISTSERV@NIC.SURFNET.NL	Biomaterials Mailing List
Biomch-L@nic.surfnet.nl	listserv@nic.surfnet.nl	Biomechanics
BIOPI-L@KSUVM.KSU.EDU	LISTSERV@KSUVM.KSU.EDU	Secondary Biology Teacher Enhancement PI
BIRDCHAT@ARIZVM1.CCIT.ARIZONA.EDU	LISTSERV@ARIZVM1.CCIT.ARIZONA.EDU	National Birding Hotline Cooperative Expands Again
BIRDCNTR@ARIZVM1.CCIT.ARIZONA.EDU	LISTSERV@ARIZVM1.CCIT.ARIZONA.EDU	National Birding Hotline Cooperative Expands Again
BIRDEAST@ARIZVM1.CCIT.ARIZONA.EDU	LISTSERV@ARIZVM1.CCIT.ARIZONA.EDU	National Birding Hotline Cooperative Expands Again
BIRDTRIP@ARIZVM1.CCIT.ARIZONA.EDU	LISTSERV@ARIZVM1.CCIT.ARIZONA.EDU	NBHC Birding Trip Reports
BIRDWEST@ARIZVM1.CCIT.ARIZONA.EDU	LISTSERV@ARIZVM1.CCIT.ARIZONA.EDU	National Birding Hotline Cooperative Expands Again
BISC1603@VM1.UCC.OKSTATE.EDU	LISTSERV@VM1.UCC.OKSTATE.EDU	OSU BISC1603 Animal Biology
BROM-L@FTPT.BR	listserv@FTPT.BR	Bromeliaceae plant family
BUGNET@WSUVM1.CSC.WSU.EDU	LISTSERV@WSUVM1.CSC.WSU.EDU	Insect Education
CELLWALL@VM1.NODAK.EDU	LISTSERV@VM1.NODAK.EDU	Plant Cell Wall Discussion Group
CLASS-L@CCVM.SUNYSB.EDU	LISTSERV@CCVM.SUNYSB.EDU	Classification, clustering, and phylogeny estimation
CONFOCAL@UBVM.CC.BUFFALO.EDU	LISTSERV@UBVM.CC.BUFFALO.EDU	Confocal Microscopy List
CONSBIO@UWAVM.U.WASHINGTON.EDU	LISTSERV@UWAVM.U.WASHINGTON.EDU	Conservation Biology
CONSGIS@URIACC.URI.EDU	LISTSERV@URIACC.URI.EDU	Biological Conservation and GIS
CRUST-L@SIVM.SI.EDU	LISTSERV@SIVM.SI.EDU	A Crustacean Biology Discussion List
cryonics@whscad1.att.com	kqb@whscad1.att.com	Cryonic Life Support
CTURTLE@NERVM.NERDC.UFL.EDU	LISTSERV@NERVM.NERDC.UFL.EDU	Sea Turtle Biology and Conservation
CZE-ITP@VM.ICS.MUNI.CZ	LISTSERV@VM.ICS.MUNI.CZ	CZE-ITP Discussion on Problems of Capillary
DEEPSEA@UVVM.UVIC.CA	LISTSERV@UVVM.UVIC.CA	Hydrothermal Vent Biology
DIS-L@IUBVM.UCS.INDIANA.EDU	LISTSERV@IUBVM.UCS.INDIANA.EDU	DIS-L, a list of Drosophila workers to receiv
FISH-JUNIOR@SEARN.SUNET.SE	LISTSERV@SEARN.SUNET.SE	Marine Scientists -- High School Student Exchange
GSA@IUBVM.UCS.INDIANA.EDU	LISTSERV@IUBVM.UCS.INDIANA.EDU	GSA - Genetic Stock Administrator's Discussi
HUMBIO-L@FAUVAX.BITNET	MAILSERV@FAUVAX.BITNET	Human Biology Interest Group Discussion List
HUMEVO@GWUVM.GWU.EDU	LISTSERV@GWUVM.GWU.EDU	Human Evolutionary Research
INHIB@VM1.MCGILL.CA	LISTSERV@VM1.MCGILL.CA	Growth inhibitory molecule theme research gr
killie@mejac.palo-alto.ca.us	killie-request@mejac.palo-alto.ca.us	Killifish
LIVE-EYE@VM1.YORKU.CA	LISTSERV@VM1.YORKU.CA	Color and Vision Discussion Forum
LPN-L@BROWNVM.BROWN.EDU	LISTSERV@BROWNVM.BROWN.EDU	Laboratory Primate Newsletter List
MARMAM@UVVM.UVIC.CA	LISTSERV@UVVM.UVIC.CA	Marine Mammals Research and Conservation Dis
MOLBIO-L@MIZZOU1.MISSOURI.EDU	LISTSERV@MIZZOU1.MISSOURI.EDU	Molecular Biology Discussion

TEACHING ASSISTANTSHIPS - OUTDOOR/ENVIRONMENTAL EDUCATION

Northern Illinois University, Lorado Taft Field Campus, Oregon, Illinois. 12-14 positions yearly in residential program for elementary education majors and elementary schools. Must be accepted and enrolled concurrently in M.S. Ed. degree program, major in Curriculum and Instruction and specialization in outdoor teacher education. Leadership development, curriculum, and instruction focused graduate program. Room, meals, $390 stipend per month for nine months. Begins August 1995 through May 15, 1996. Tuition waiver fall and spring, and summer semester either prior to or following the assistantship. Call or write immediately for details: Faculty Coordinator, NIU/Taft Campus, Box 299, Oregon, IL 61061; Phone (815) 732-2111, FAX: 815.732.4242.

Dr. Jose D'Arruda
Department of Physical Scinece
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Reprinted from *Journal NCSTA*

USING COMPUTERS FOR DATA ACQUISITION, GRAPHING AND DEMONSTRATION IN THE PHYSICS CLASS

Most high school physics laboratory programs are taught with experiments which were designed to reinforce the student's basic scientific understanding. This has been the tradition and will remain so. However, the laboratory experience can also play a dual role as well, namely introducing students to modern data acquisition and instrumentation. Over the past few years the need for students to have proficiency in computers has been accelerated with the availability of microcomputers and their continuing price erosion. Laboratories must keep abreast of technological advances. Experience indicates that the target high school students are interested in experimentation that, to them, simulates "real world" situations, and a laboratory utilizing microcomputers for gathering real-time data would be attractive and exciting to most students. It would enhance their interest in science by establishing a more efficient means of conducting experiments, and gathering and analyzing data, than the traditional methods. Data handling is at the heart of doing science, and for handling data in today's modern labs, the computer is at the heart of data gathering, organizing, and analysis.

In this paper we will describe such a laboratory program which has been "created" here at Pembroke State University and in use since 1986. The laboratory program was the result of an NSF funded proposal submitted by the author titled "Interfacing Computers to Physics Experiments". The laboratory experiments were designed to teach necessary facts and to develop the students' ability to use modern equipment. The rapid data handling of the computer and its ability to graph data immediately helps students develop formal reasoning ability. Experiments were chosen that bring the "real-world" to the academic laboratory. Although this paper is concerned basically with the physics lab, computers can be adapted to any discipline in science where students will be gathering and manipulating data.

The objectives of our proposal were to:

1. Develop and strengthen formal reasoning abilities of physics students.
2. Stimulate physics students into becoming familiar with contemporary data gathering methods.
3. Enhance the lecture demonstration of basic concepts in physics through immediate computer calculations and real time graphs, projected in overheads.

EQUIPMENT

For our laboratory we chose 286 IBM compatible computers with a monochrome monitor, one floppy disk drive, serial port, game port, and standard parallel port. These computers have 640K of memory and no hard drive. Since these computers were purchased over five years ago, they are not very powerful by today's standards. However, they are still more than adequate for use in the laboratory. Used computers matching these specifications can be obtained for about $400 or less. For each computer we chose interface modules developed by *Pasco Scientific. These are fairly well designed interface, which have presented few problems over the years. These simple 2 device interface modules plug into the game port card and cost around $35. If your computer does not have a game port card, you can pick one up at your local computer store for around $20. Now you will need the timing software which can be obtained from Pasco. This is the well known Vernier "Precision Timer" software. Easy to use, it provides MSEC resolution and automatic data collection in up to 13 timing modes. Precision Timer software is included in all Pasco computer photogate timing systems.

For each of our computers we purchased two accessory photogates, one free fall adapter, one smart pulley, and one smart pulley accessory kit. The smart pulley is a low friction, well balanced pulley with ten spokes mounted between a photogate. As the spokes cut the beam, the computer is able to calculate the angular speed of the wheel, and from that the tangential speed of the string as it moves around the pulley.

TEACHING SUGGESTIONS

With this equipment we are able to perform some of the following experiments:

1. Free fall can be studied with the with free fall adapter. This adapter is essentially a switch which times the interval from when the metal ball breaks contact between two metal plates to when it hits the switch plate located on the floor beneath the ball. The free fall adapter is connected to the game port. The students can drop the ball ten times within a couple of minutes. The computer then calculates the acceleration of gravity for each drop and averages the results on the screen for the students. If a printer is attached to the computer, each student can get a complete data sheet for the experiment. The results for gravity from this experiment are very good with very small error, compared to tabulated values for our location. Using balls of different mass the students can repeat the experiment several times during a standard laboratory period. The value of g is calculated for each ball. This demonstrates that g is independent of the ball mass. Students enjoy this experiment, and it is a good one to begin the semester.

2. Speed and acceleration can be done with the photogate connected to the game port. Air tracks work well with this type of experiment, but are not necessary. Pasco has some really nice "dynamics carts" which are low friction and low price (around $55 each). In addition with the precision software this experiment can be used to graph the data, and if a printer is available, these graphs can be printed for the student's lab report.

3. With the smart pulley apparatus, several experiments using Newton's Second Law can be performed. The Atwood machine with two weights hanging over the sides of the pulley works remarkably well. When the weights are released, the spokes of the pulley begin breaking the beam between the gates, and as the wheels spin faster, the computer keeps track of the speed as the weights fall. Next with the smart pulley software, the computer lists all the times and calculates the speed at each time. Finally after plotting on the computer the speed vs time, the slope of the line and hence the acceleration are calculated. The software has several options. One allows the student to delete bad data points caused by not stopping the timing before the weight hits the floor. This experiment works very well.

4. We were also very happy with the Rotational Dynamics Apparatus from Pasco which allows us to do several experiments on rotational motion, moments of inertia, and conversation of angular momentum. This apparatus includes the necessary Vernier software. For these experiments you will need a good source of dry air.

5. Pasco also has a very neat Geiger-Muller tube with software, that enables the students to do some basic nuclear experiments like radioactive half-life, radiation shielding, and inverse square law dependence. The half-life, in particular, shows a beautiful exponential decay on the monitor and students can watch this decay taking place in real time. The computer plots the results and a printout is available.

Summary of Experiments Performed

In summary, a list of these experiments and others that we have performed with this equipment follows:

A. Time, Velocity, and Acceleration Experiments. Measure distance and speed of cars on the air track using photogates, connected to the computer, to record time intervals and display real time graphs.

B. Free Fall. Uses photographs, connected to the computer, to measure time of fall and determine the acceleration due to gravity.

C. Study Newton's Second Law.

1. Measure the acceleration of a glider which is being pulled by a hanging weight on the air track, with the help of photogates.

2. Measure acceleration and find tension in string for an Atwood machine.

D.Conservation of Energy Experiments. Study the conversion of potential energy to kinetic energy as a glider moves down a tilted air track using photogates to read data into the computer.

E. Pendulum.

1. Uses photogates and computers to record and calculate the period of the pendulum.

2. Measures velocity of pendulum when it passes through the equilibrium position, and at other position along its path.

F. Conservation of Momentum - Inelastic & Elastic Collisions. Measure and graph speed at several points on air track for:

- one car at rest and the other moving
- both cars moving in same direction
- both cars moving in opposite directions
- both cars sticks together after collision
- both cars at rest and firecracker set off between them

G. Study Motion of Bouncing Ball.

1. How does the "bounce" vary in various tennis balls?
2. How quickly does a racquetball lose its bounce?
3. Calculate the coefficient of restitution.

H. Rotational Motion. Uses rotational motion apparatus with the computer to measure:

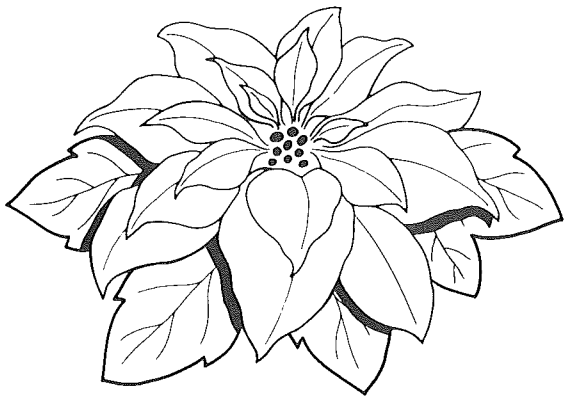
- moments of inertia of various shapes
- conservation of angular momentum
- angular acceleration

I. Spreadsheet Analysis. The computer is also used for making calculations utilizing spreadsheet analysis of recorded data.

In conclusion, we have described only a small amount of what teachers can do in the physics lab with computers. All the equipment listed here is available at very reasonable prices. Costs of used computers are way down, and with a little checking around you can easily find some companies that would be more than happy to donate old computers to schools. These companies are replacing old 286 systems with 386 or 486 systems. Usually a letter from the school is all that is requested by these companies for tax purposes.

Today's high school science laboratory needs to be equipped with modern and sophisticated equipment and data acquisition methods in order to exemplify contemporary methods of data gathering and analysis. Such experiences are necessary for students whether they plan to attend a college, university, community college, or go directly into many of today's occupations that deal with data acquisition.

*Pasco Scientific Co., 10101 Foothills Boulevard, PO Box 619011, Roseville, CA 95678-9011, 1-800-772-8700



University of Illinois Summer Program for High School Students

ILLINOIS AEROSPACE INSTITUTE

PROGRAM DATES: July 9-15, 1995

WHERE: University of Illinois at Urbana-Champaign

PARTICIPANTS: Students who will enter 9th, 10th, 11th, or 12th grade in Fall 1995

PROGRAM DESCRIPTION:
Explore the areas of aeronautical and astronautical engineering, propulsion and aviation technology. Activities include:

- •Study and experiment in Dept. of Aeronautical and Astronautical Engineering labs and computer simulators.
- •Talk with NASA astronaut and aerospace engineering specialists.
- •Visit an FAA control tower and learn about aircraft navigation during flights at University Institute of Aviation.
- •Design, build and fly a model airplane and a model rocket.
- •"Fly" in a flight simulator.

CONTACT PERSONS:
Diane Jeffers, Dept of Aero/Astro Engineering, 306 Talbot Lab, 104 S. Wright St., Urbana, IL 61801
Phone: 217/244-8048
David Powell, Illinois JETS, 207 Engineering Hall, 1308 W. Green St., Urbana, IL 61801
Phone: 800/843-5410

SPONSORS: UIUC Dept. of Aero/Astro Engineering and Aerospace Illinois Space Grant Consortium

APPLICATION DEADLINE: April 15, 1995

COST: $700. FINANCIAL AID AVAILABLE BASED ON NEED.

MINI IDEAS

David Franz
Lycoming College
Williamsport, PA
Reprinted from *Iowa Science Teachers Journal*/Spring 1994

ICE CREAM: AN EDIBLE EXPERIMENT IN THERMODYNAMICS

Ice keeps things cold because it absorbs energy from its surroundings, melting as it does so. The temperature at which a solid melts, called its melting point, is the same temperature at which the liquid form freezes. For pure water, this is 0° or 32°F. However, if some other substance, such as salt, is added to the water or ice, the freezing/melting point temperature is lowered. Thus, you can use salted ice to freeze liquid water.

In this activity, salt is added to ice in a large plastic bag. A second, sealed plastic bag containing the ingredients for ice cream is placed into the bag with the salty ice. The large plastic bag is then sealed. The bag assembly is kneaded until the ice cream mixture freezes.

The energy in the ice cream mixture is transferred to the salted ice, which melts as a result. The temperature of the ice cream mixture is lowered to the temperature of the ice brine, and this is cold enough to freeze the ice cream.

Precautions

Hands can become painfully cold during this activity. Students should use gloves or mittens, or the bags must be wrapped in thick towels or placed into coffee cans. Towels may be most useful in case it is necessary to mop up spills.

Materials per class of 30

-at least 5 1/4-cup-measure scoops or cups
-at least 5 plastic measuring cups
-5 sets of measuring spoons
-1 gal milk (2% and reduced lactose milk will also work)
-1 gal whipping cream or non-dairy creamer
-8 cups sugar
-1 bottle vanilla (at least 3 oz.)
-30 1-quart or sandwich-sized zipper lock bags (freezer weight suggested)
-30 spoons
-3 gal crushed ice
-10 lb food grade salt (this is much cleaner than rock salt)
-nuts, fruit or chocolate syrup, as desired
-ski mittens/gloves, thick bath-size towels, or 1 lb. coffee cans (1 pair or 1 per student)
-paper towels

Procedure

1. Measure 1/4 cup of sugar. Transfer the sugar to the small plastic bag.
2. In a separate container, mix 1/2 cup milk and 1/2 cup whipping cream. Add 1/4 tsp. vanilla (Younger students may need assistance with this step.)
3. Add milk mixture to the small plastic bag with the sugar. Close the bag securely, squeezing out most of the air before closing. There is no need to stir the contents.
4. Place the small plastic bag inside the large plastic bag.
5. Surround the smaller bag with a few cups of crushed ice.
6. Pour 1/2 to 3/4 cup of salt over the crushed ice and seal the larger bag securely.
7. Put on mittens or wrap the bag in the thick towel, or place the bag into the coffee can. Knead or roll back and forth on a table or on the floor. Be careful not to put too much pressure on the bags.
8. After 10 minutes, check to see if the mixture is frozen. If not, continue kneading and rolling.
9. When the mixture is frozen, remove the smaller bag. Wipe the brine from the zipped edges of the bag, then eat the ice cream directly from the bag. Add nuts, fruit or chocolate syrup if desired.

The Oregon Science Teacher
Barabara Bannister
Edwards Elementary
Reprinted from *The Oregon Science Teacher*

FORCE IN MATH

There are many great geometry activities that help to introduce this concept to children. A connection between math and the concept of force can be made with symmetry and balance.

On the Straight and Narrow?

Classify letters-straight, curved, or both,
One last activity that deals with the familiar shapes of letters. In this one, children classify letters: straight, curved, or both.
Collect: worksheet
Procedure:
1. Make a list of upper case block printed letters.
2. Classify them according to straight only, curved only, or both straight and curved.
3. Make a venn diagram of them
Extensions:
Try this with lower case letters.
Try this with numbers.

Name: _____

Straight and Narrow

List each letter under its proper classification. Is it straight only, curved only, or both?

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

straight	curved	both

Can you write words that are only straight or only curved?

_____
_____
_____
_____
_____

Does It Hold Water?

To identify letters that have closed-in areas and letters that are open. Changing focus on letters from their symmetry to their interior regions, this activity asks children to look at letters that have insides and letters that don't
Collect: worksheet
Procedure:
1. Make a list of upper case printed block letters.
2. Record them on your worksheet. If the letter was actually one inch high, would it hold water?
Extensions:
Make a list of cursive capitals that hold water. Make a list of printed lower case letters that hold water.
Would any numbers hold water?

A B C D E F G H I J K L M
N O P Q R S T U V W X Y Z

Does It Hold Water?

Yes, it does	No, it doesn't

Blind Person's Bluff

Construct a simple geometric shape with pattern blocks and try to describe it to someone else. Erect a barrier and see if you can describe an object so that someone else can construct it.
Collect: attribute blocks, barrier (file folder or cut off end of a cardboard box)
Procedure:
1. Erect the barrier.
2.Build a simple 2 dimensional design with attribute blocks.
3. Describe your design to your partner and have him/her construct it on his/her side of the barrier.
Extensions:
Build something that is 3 dimensional. Use other manipulative materials.

Cut Paper Predictions

To predict the appearance of cut paper after it has been folded and cut along the fold. Is it easier to predict with one fold, or in a particular direction? Use small squares of soon-to-be recycled paper to predict the shapes made when a few cuts are made with scissors.

Collect: recycled paper, cut into 2" squares, scissors, worksheet, glue

Procedure:

1. Fold the paper in half vertically.
2. Make a few simple cuts along the fold. predict what the paper will look like unfolded. Unfold the paper and glue onto your worksheet.
3. Fold the paper in half horizontally.
4. Repeat 2
5. Fold the paper in half diagonally.
6. Repeat 2
7. Fold the paper in half in two different directions.
8. Repeat 2

Extensions: fold a snowflake (six sections), cut and predict the pattern before unfolding.

Name: _____

PAPER CUTOUTS

Guess	Real Thing	Answer!

Guess	Real Thing	Answer!

Guess	Real Thing	Answer!

Cut Me Up: Use a rectangular mirror and a list of letters to find the symmetry in the A, B, C's.

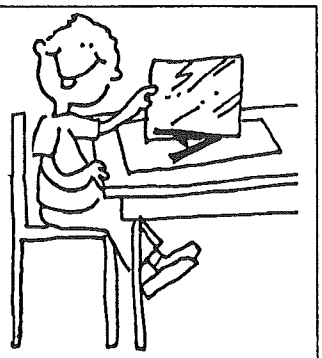
Collect: small mirror per child (plastic mirrors are available, break less often, and do not have the same sharp edges as glass), paper and pencil

Procedure:

1. Print out in block letters the alphabet from A-Z.
2. Use your mirror to find out if each letter has vertical, horizontal, or diagonal symmetry. Sometimes, a letter has more than one!
3. List your letters on the worksheet provided below.

Extensions: Does this work with printed small letters? Is there symmetry in any of the numbers? How about cursive letters?

Name:_____



Cut Me Up

List each letter under the type of symmetry it has. Remember, some letters have more than one type of symmetry.

It helps if you list the letters as capital block printed letters, so you can see the patterns more easily.

vertical	horizontal	diagonal	none

Do you see a pattern in the letters?

_____

_____

_____

_____

Robert Duncan and John A. Miller
Western Washington University
Reprinted from Washington Science Teachers Journal

THE CONE HEAD LAB

A seventh grade student stands with a cone covering her eyes while telling her partner to move until she can see him in the mirror. What is going on? The students are doing an experiment to gather data which they can use to develop an operational definition of the law of reflection for a plane mirror. The use of the old experiment with pins and a plane mirror or a more modern version using a laser or some other procedure to teach students the concept that the angle of reflection equals the angle of incidence for a plane mirror has been common practice in both middle and high schools in the past. In the old experiment the students may learn the concept but it is questionable whether or not they make any connection between the classroom experiment and a mirror in a department store or on the outside of the car. In contrast our "Cone Head Lab" has them learning the concept in a manner that more closely reflects how we apply the concept in an everyday situation outside the classroom.

Prior to beginning the lab the teacher needs to prepare at least two viewing cones from construction paper. The apex of the cone has an opening approximately 1.0 cm in diameter allowing the student to see only a mirror mounted on a wall and not additional background. The base or large open end of the cone must have a diameter large enough to fit over a student's face. In practice, we had the cone edges of the large open end taped to the front of safety glasses making the cone easy for a student to put on, keep in place and remove.

In addition, the experiment requires a clear space in front of a wall that is at least eight meters across, although a space of ten meters is even better. See figure on next page. A mirror, of the approximate size 10 cm x 15 cm, is taped to the wall in a horizontal position at a height of 1.3 meters from the floor. A vertical red line is drawn bisecting the mirror. At a distance four meters from the wall and directly in front of the red line on the mirror a mark is made on the floor which is the zero point of the base line for the experiment. One metric tape measure, if available, is then laid out on the floor starting at the zero point and parallel to the wall to form a base line that is 4.0 meters from the wall. The metric measuring tape is attached to the floor at the beginning and at several other points with masking tape. A second metric tape is also laid out on the floor in the same manner but in the opposite direction starting form the zero point. Meter sticks placed end to end can be used too in place of each of the measuring tapes. Label cards for the 100 cm, 200 cm, 300 cm, and if possible the 400 cm distances on each side of the zero point are also taped to the floor to provide an easy reference for the students.

The students must work in teams of two to carry out the following experiment. One member of each team takes a position in a line along the left wall of the classroom while the partner takes their corresponding position in a line along the right wall and well behind the base line. One line is initially designated the viewer line and the other the subject line. The first student in the viewer line steps up to the base line at some point between 100 cm and 400 cm from the zero point and puts on a viewing cone. Positions less than 100 cm from the zero point tend to have unacceptable errors associated with the measurements. For convenience the viewers were also asked to pick points that were in 10 cm increments (150 cm, 160 cm, 240 cm, 280 cm). The viewer's partner, the subject, steps up to the baseline on the opposite side of the zero point. The viewer then looks at the red line on the mirror and has her partner slowly move back and forth along the line until she can center the red mark on the mirror in the center of his chest. Shorter students, or one confined to a wheelchair, may need to hold their hands above their heads to provide a taller target for the viewer to see. Once the experimental action is completed the subject records both the viewer and the subject's distance from the zero point. The viewing cone is passed to the next viewer and the partners switch lines. Each of the students thus becomes both a viewer and a subject in the experiment.

Following completion of the data gathering phase a class discussion of the two trials of each partnership and the class data as a whole illustrates that within experimental error the viewer's and the subject's distance from the zero point was always the same but on opposite sides of the zero point. If possible use strings or different colors of chalk to make lines directly on the floor connecting a viewer's and a subject's locations on the base line to the point directly below the red line on the mirror. You may wish to extend the red line on the mirror all the way to the floor using colored chalk or a string to emphasize the angles formed by the lines from each viewer-subject partnership. Do this operation for several of the partnerships. The angle of incident light can be shown to equal the angle of reflected light within experimental error. If it is impossible to show the actual lines on the classroom floor, then scale drawings can be made to represent the data on both the board and by the students in their reports.

To complete the study have the students discuss how we see this concept exhibited in stores, at home, by the mirrors on our cars and even on highways where convex mirrors are mounted at sharp corners.

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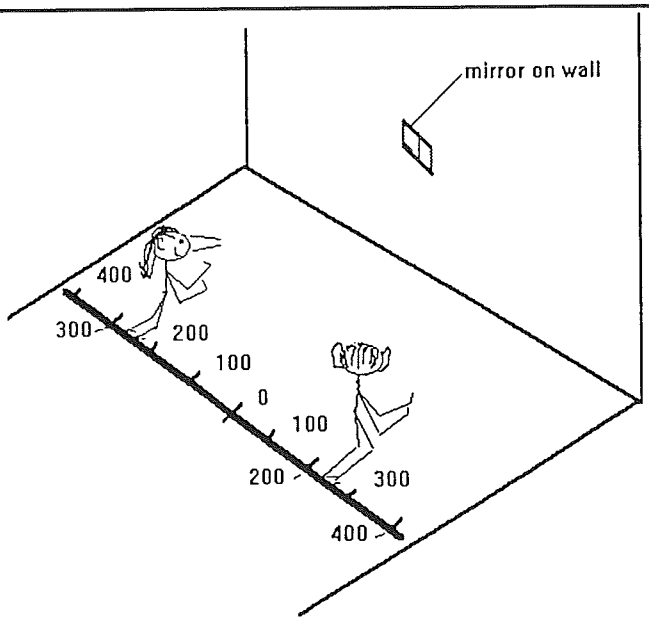
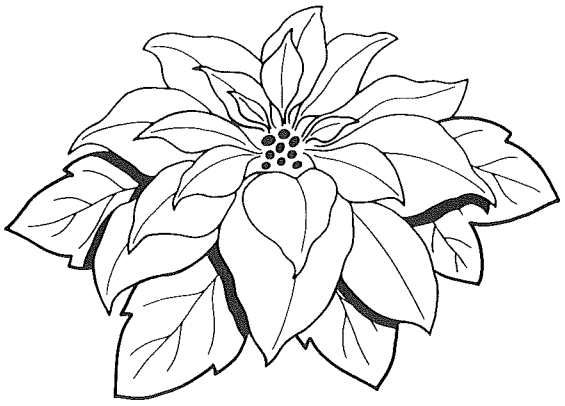




Conehead lab: Diagram of classroom with two students standing on the baseline which is 4 meters from the wall. The center point of the baseline is in line with the center line marked on the mirror on the wall.

OPPORTUNITIES

Paula Resk
John G. Shedd Aquarium
1200 S. Lake Shore Drive
Chicago, IL 60625

1995 HIGH SCHOOL MARINE BIOLOGY PROGRAM

Section I

Classroom sessions: June 26-July 2, July 21, July 24-25
Trip July 5-11

Section II

Classroom sessions: June 26-July 2, July 21, July 24-25
Trip July 13-19

Section III

Classroom session: July 12-14, July 17-19, August 7-9
Trip: July 23-29

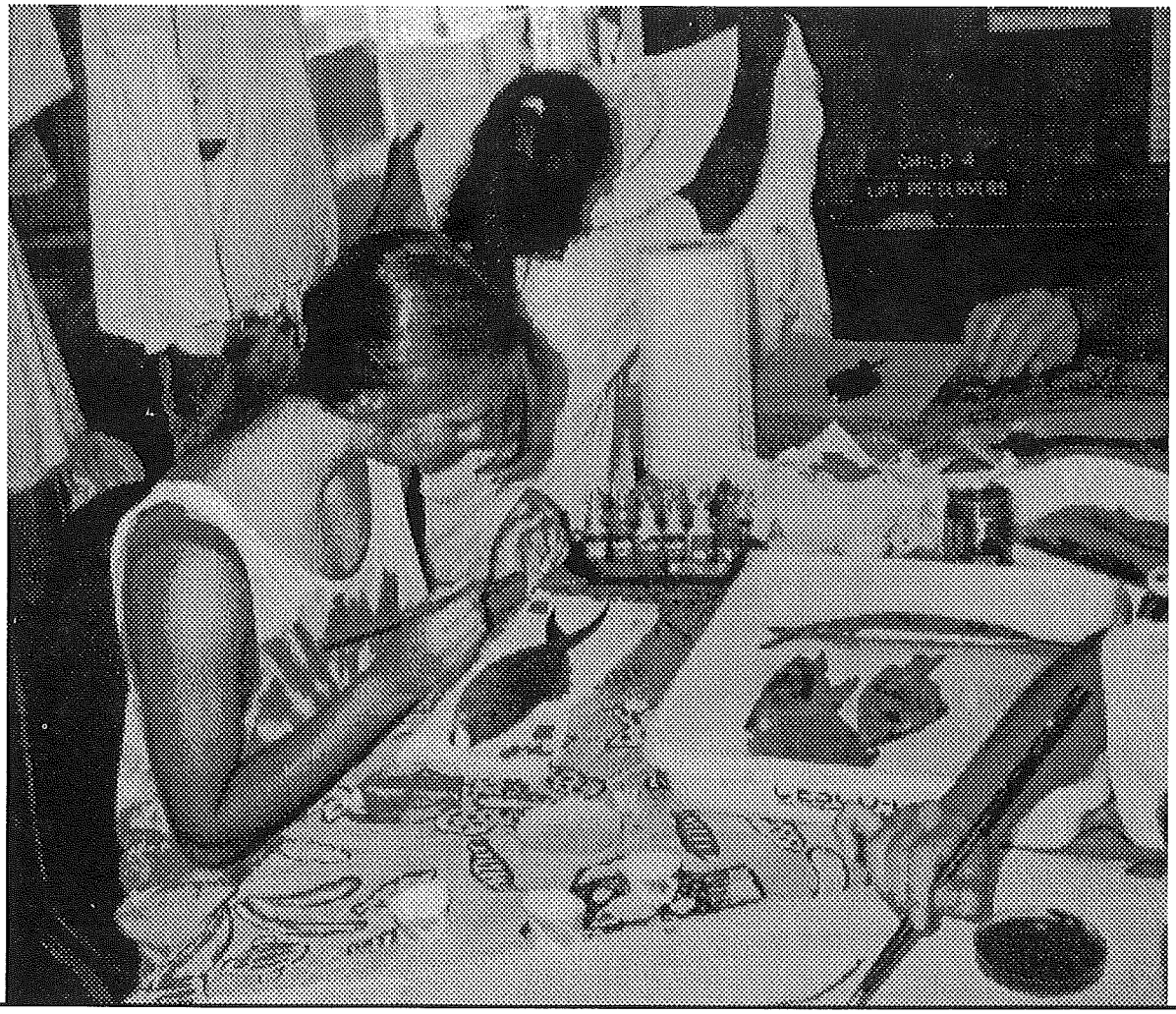
Section IV

Classroom session: July 12-14, July 17-19, August 7-9
Trip: July 31-August 6

Next summer, the John G. Shedd Aquarium will be offering a High School Marine Biology Program, open to high school students with at least one year of high school level biology. The program includes one week of marine biology classroom and laboratory work at the Aquarium and one week of field study in the Bimini Islands, Bahamas. Field work takes place on the Aquarium's research vessel and focuses on fishes, coral reefs and island ecology. Following the trip, students spend three days back in the classroom organizing field data and preparing comprehensive reports. The results are presented in a seminar on the last evening. Ten students will be selected for each session on the basis of interest, overall student performance and maturity.

Cost is $1090, exclusive of airfare to and from Miami. Scholarsh assistance is available. Academic credit may be arranged through individual high schools.

For more information, please write or call:
Education Department
High School Marine Biology
John G. Shedd Aquarium
1200 South Lake Shore Drive
Chicago, IL 60605
(312) 939-2426, ext. 3367



UNIVERSITY OF ILLINOIS PHYSICS DEPARTMENT 1994-95

Saturday Physics Honors Program

Interested science teachers are welcome to this series of exciting and accessible presentations on current research in physics. The series is designed for talented high school seniors interested in science. 200 students registered this year, up from 120 in 1993. Sessions are from 10:15-11:30 am in room 141, Loomis Laboratory of Physics, 1110 W Green Street, Urbana, IL. Parking is available on the East side of the building in lot B-21. Contact: Prof. David Hertzog or Penny Sigler (Program Secretary) at 217 333-3190. The program is supported by the Physics Department of University of Illinois in Urbana-Champaign. Admission is free.

Jan. 28 ***"No Escape from Block Holes"*** **Professor Ed Seidel**

Feb. 25

"Magnetic Resonance Imaging: from Physics to Medicine"

Professor Paul Lauterbur

Mar 25

"What is Mass"

Professor Scott Willenbrock

Apr. 29

"The Collision of Quantum Mechanics withSupercomputers"

Professor Philip Phillips

Physics Department Physics Van Program

The University of Illinois Physics Van project is designed to spread the word that science is fun and interesting, We travel to area elementary and middle schools providing support for their science programs by demonstrating and explaining fun and educational experiments, answering questions, and providing follow up. Contact Dr. Regina Neiman (217) 333 2596 or Prof. Mats Selen (217) 333 4173 to find more about the the program. The program is supported by the Physics Department of University of Illinois in Urbana-Champaign and is free to schools.

Physics Department In-Service Workshops

The Physics Department of the University of Illinois in Urbana Champaign will participate in the Urbana School District 116 Midwinter In-service Conference on Feb. 16 1995 at Urbana High School. Teachers from other districts are welcome to participate in these workshops, subject to the availability of space. Please direct inquiries to the Urbana School District (217) 384 3680. Following workshops will be offered:

Modern Physics Tutorial

"The Particle Zoo and Who Is Behind the Bars"

Professor Tony Liss will present an accessible history, up to the present, of elementary particles.

Operation Physics Workshop

"Electricity"

Mr. Tom Holbrook from the University High School in Normal will review physics concepts and provide hands-on lessons on electricity for teaching grades 4-7.

Physics Van Workshop.

The University of Illinois Physics Van project is designed to spread the word that science is fun and interesting, We travel to area elementary and middle schools providing support for their science programs by demonstrating and explaining fun and educational experiments, answering questions, and providing follow up. The workshop will introduce and explain the Van demos.

EARTH PROCESSES INSTRUCTIONAL CENTER (EPICENTER) A SUMMER PROGRAM FOR MIDDLE LEVEL TEACHERS

July 9 — August 4, 1995

A new opportunity form middle level teachers of Earth Sciences is being offered at Purdue University, West Lafayette, Indiana. The program is designed to improve the background of Earth processes science content, to assist teachers in applying earth science content in their classrooms through training in use of Earth processes science teaching materials, and provide support for the participants to return to their schools in leadership roles via opportunities in grant writing and modeling skills. Travel, subsistence, stipend provided plus 6 semester hours of tuition-free graduate credit.

For further information:

Dr. Gerald H. Krockover, Co-Director
EPIcenter Program for Teachers
Purdue University
1397 Civil Engineering Building
West Lafayette, IN 47907-1397
Phone: (317)494-0272
FAX: (317)4691210
E-mail: Internet
xvp2@sage.cc.purdue.edu
Addresses: Prodigy GMDW68A
Compuserv 72623,1751
Ideanet GKROCKOV

Deadline: February 20, 1995

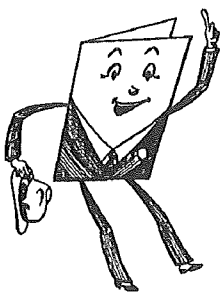
AUSTRALIA TRAVEL NOTICE

Explore the rich natural history of the Island continent of AUSTRALIA. Visit with Australian teachers and observe the unique flora, fauna, and geography of this ancient land. Sponsored by Southern Illinois University and lead by Rivers Project Director, Dr. Bob Williams.

June 21 to July 13, 1994 with extensions available to Fiji and New Zealand.

For more information copntact Robert Williams, Australian Study Tour, Box 2222, Southern Illinois University, Edwardsville, IL 62026, 618-692-3788, Fax 618-692-3359

e-mail: rwilliams@eville.uiuc.fred.org



CALL FOR NMLST INTERACTIVE POSTER PANEL PRESENTATIONS

NMLSTA is looking for innovative teachers to present their best activities at the NSTA's national conference. Poster sessions are an integral part of many scientific meetings, as it is realized that posters are a very effective means of communication. Posters provide the opportunity for individual contact and extended dialogue between the author and the participants. Maps, charts, photographs, and computer output may be presented on the boards. In addition, the author may include prepared statements on the objectives, techniques, results, and conclusions of the activity.

Deadline for submissions: January 5, 1995 Philadelphia

POSTER PANEL GUIDELINES.

Guidelines must be followed. No exceptions!

- **Absolutely no hand-lettered material will be accepted.** Your presentation is a professional statement of your work.
- **Place the title of the presentation on the header provided by SHOWBOARD.** It is recommended that you use 1 1/2 inch letters for the title. It is recommended that the author's name be placed beneath the title in **1 inch letters.** Subtitles should be **3/4 inches.** Use boldface or double-striking techniques to highlight key features. Placing titles on raised cardboard will make that part appear 3-D. Graphs, curves, and tables should have crisp lines and good contrast. Information being presented should be quickly discernible to the viewer. Flow diagrams and schematics should be kept simple. Use color, graphs, charts, and photos. When using color, make sure the colors are bright. If you need to use text, use key words in large type. Select only key figures, or parts of the equation, to illustrate the point you are trying to make. Avoid using pages of text, very few people will read the copy. This format is also too confusing to the participants. They do not have the time to assimilate the information.
- Make sure the presentation has a logical flow, from the statement of the activity to conclusions. Don't tell the whole story on the panels; save some interesting or key points for your presentations.
- By all means keep the information simple and short.

SHOWBOARD will provide a slit scored-self supporting display board containing 3 boards each being 48" by 48" for all the presenters at the Minneapolis and Philadelphia NSTA conferences. A **header card** will be used for **the title** and provide additional support for the panels will be provided by SHOWBOARD. The header card will be used for the title of the activity. For a better idea about the display boards we will be using, please call 1-800-323-9189 and ask for SHOWBOARD's Science Fair Resource Catalog.

On Site Presentations

Poster sessions incorporate both an activity presentation and a poster. Our goal is to provide ready to use activities for the participants. These sessions are mini workshops. Participants are provided a "feel" for the activity.

- Pick up your poster panel and set up the material 15 minutes before your scheduled presentation. We will designate an area where you can work on your panel. Stay with your panel until the conclusion of our session.
- Tables will be set up for use during your presentation.

Participants will be equally divided amongst the presenters. The poster session will last 2 hours. Presenters will have 10 minutes to present their poster and to answer any questions. Participants are encouraged to have a presider who is responsible for distributing the handouts. Handouts will be given only to participants who stay for the entire presentation. Every 10 minutes the participants will all move to their next presenter. This format will continue for all the presentations. The last 15 minutes will be a free session. Participants can return to posters of particular interest and discuss informally the activity with any presenter.

Materials per Participant

One Table and one folding display board containing 3 panels each 48" x 48." All other materials are the responsibility of the presenter.

A limited number of presentations will be selected. All participants will be acknowledged in the conference book. Please send a 100-200 word abstract explaining your activity.

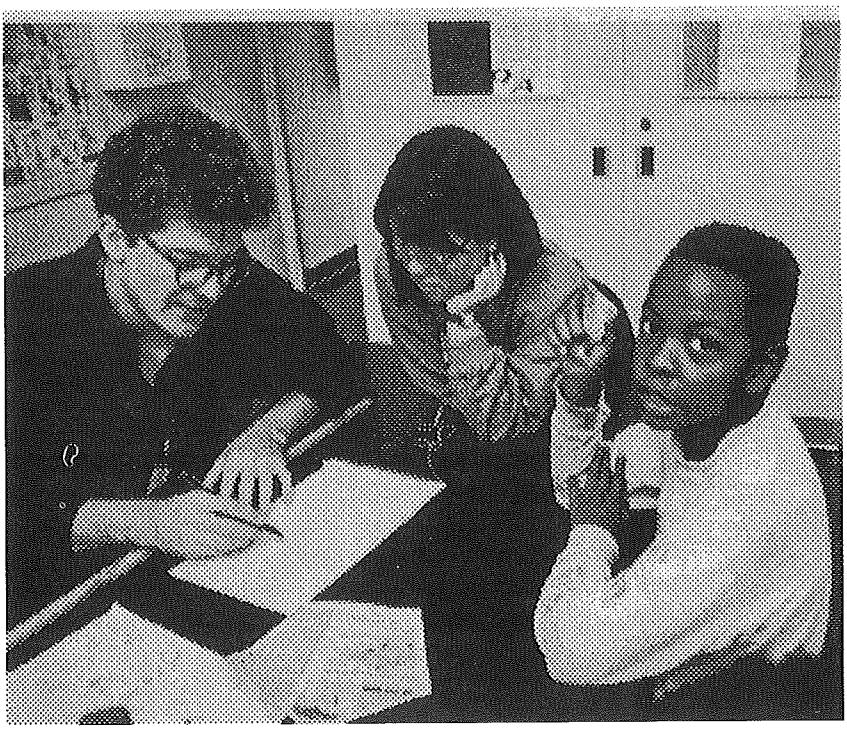
Hector Ibarra
1940 Rohret Ct. SW
Iowa City, IA 52240
FAX and home phone: 319-337-3590
e-mail: hibarra@umaxc.weeg.uiowa.edu

The Wright Center is inviting applications for its year-long fellowship in residency for secondary science teachers. This fellowship offers teachers time to pursue projects related to their fields. A $35,000 salary plus benefits through Tufts University is also included. Teachers are also given a moving stipend. The dates for the fellowship are September 1, 1995-June 30, 1996.
Contact:
The Wright Center for Science Education
Tufts University
4 Colby Street
Medford, MA 02155
617-628-5000 x 5394.

Wayne M. Wendland, State Climatologist
Illinois State Water Survey
2204 Griffith Dr.
Champaign IL 61820, and
e-mail: wayne@uiuc.edu
ph: 217-333-0729
fax: 217-244-0220

The American Meteorological Society has announced the 1995-96 Minority Scholarship program. The intent is to encourage and support minority college students in the atmospheric sciences. This two-yr scholarships is for $3000 per year. Three such scholarships will be made in 1995. Entering freshman are eligible to apply. Minorities include American Indian, Alaskan Native, Asian or Pacific Islander, Black, Hispanic and other. Application must include an official school transcript of last 3 yrs, copy of student's SAT scores, a letter of recommendation from school official, and a 500 word essay on a stated theme.

The application deadline is 27 Jan 1995.
Apply to:
American
Meteorological Society
45 Beacon St.
Boston MA 02108-3693.



TEACHING SCIENCE: THE EUROPEAN APPROACH

A Comparative Field Study
Experience Abroad
Offered by Elmhurst College

- **Earn 4 Semester Hours of Credit**
- **18 Days: June 16-July 5, 1995**
- **Pretravel Discussion and Orientation Sessions**
- **Observation in German, Swiss, and Austrian Schools**
- **Elementary, Middle, and High School Levels.**
- **Meetings with Students Teachers and Administrators**
- **Munich, Bamberg, Rhine River Area, The Black Forest and Bavaria in Germany**
- **Zurich, Switzerland, and The Salzburg, Austria areas**
- **Experienced Bilingual Program Leaders who have visited and selected the European Schools and educators to be visited**
- **Course work conducted in English**
- **Strong Science Education Focus with Foreign Cultural components**
- **Cost: $3,200 includes lodging, air and land transportation costs, as well as all instructional and other educational fees, including tuition for 4 semester hours of graduate credit, entrance fees to selected museums and other sites, and some meals. Spouses or friends of participants are welcome to take part in a separate noncredit cultural program at a reduced fee of approximately $2,700.**

For Further information contact:
Elmhurst College Office of Continuing Education
190 Prospect Avenue
Elmhurst, IL 60126-3296
(708)617-3300

ACCESS EXCELLENCE PROGRAM

Access Excellence is a national education program that provides high school biology teachers access to peers, scientists, and critical sources of new scientific information via the Information Highway.

Here's how it works:

Under the auspices of the National Science Teachers Association (NSTA), 105 of the most motivated high school biology teachers from every state and Puerto Rico were selected as Access Excellence Fellows. An additional 100 people will be selected by NSTA in 1995 and another 100 in 1996. Each of the teachers will receive a free laptop computer, printer, and a subscription to America Online, an interactive computer network.

In addition, the teachers will attend the Access Excellence Summit in San Francisco. At the Summit, the teachers will become acquainted with one another, learn how to use the laptop computer and online network. In addition, these teachers will be able to work with one another to create innovative teaching ideas beginning with the areas of evolution of disease and immunology.

One of the most important aspects of the program is its ability to disseminate the innovative work of these highly motivated teachers to the universe of high school biology teachers nationwide. To that end, printed versions of selected lesson plans and other information from Access Excellence will be regularly distributed to the more than 50,000 high school biology teachers nationwide.

A support center located at Genentech's South San Francisco headquarters will be staffed by specially trained professionals and volunteer Genentech scientists to assist the teachers.

Genentech, Inc., sponsor of Access Excellence, is a leading international biotechnology company that discovers, develops, manufactures and markets human pharmaceuticals for significant unmet medial needs.

Access Excellence reflects the company's commitment to improving science education in America. Teachers who are interested in participating in the program should contact the Access Excellence staff at 415-225-8070 for a disk of sample lesson plans (specify Macintosh or DOS). Applications will also be available in The Biology Teacher, The Science Teacher and through America Online (keyword: excellence). This is an incredible opportunity. Four Illinois teachers were part of this pioneer community. If you have any questions, please contact one of us and we will provide additional information. Good luck.

Pamela S. Duncan
Mundelein High School
Carl F. Koch
Riverside/Brookfield High School
Mary Jo Osborn
Sacred-Heart-Griffin High School
Shelly Peretz
Thornridge High School

ELECTRONIC FORUM

The Access Excellence Forum on America Online provides teachers with a constantly expanding source of scientific information that can be used in the classroom. This interactive computer-based service allows teachers to engage in an ongoing dialogue with their peers and scientists. Additionally, instructional materials will be available online for rapid access by teachers as needs arise.

ELECTRONIC FORUM FEATURES

ACTIVITIES EXCHANGE: Entering this area allows users to download lesson plans created by the Access Excellence teachers and staff. Users can also post a lesson plan they've created by sending it electronically to the Access Excellence Center. Special features enable users to comment on the lesson plans to Access Excellence Center staff and to search for plans pertaining to specific subjects.

VIRTUAL LIBRARY: Resources from Access Excellence and other organizations dedicated to biology and biotechnology can be found in the Virtual Library. In addition to the Internet, users can also access various books, papers, periodicals and networks including TIME, SCIENTIFIC AMERICAN, and CNN. A search option allows teachers to locate information about specific subjects. A special "reference desk" feature allows users to converse directly with the Access Excellence Center, a group of expert staff who manage the program with a national network of consultants.

TEACHER-SCIENTIST NETWORK: Here users can participate in "live" professional conferences, forums and science events, including "virtual tours." Special functions provide the user with conference handouts and the ability to send comments directly to the presenter via the computer. Transcripts and handouts from previous presentations are archived under "past events."

VIRTUAL TOURS: Recreate the experience of touring a research lab - in person! Hosts for each tour are drawn from the community of AE Fellows, from the Genentech research staff, and from a variety of collaborating research and education oriented facilities. When you join a virtual tour you will receive online information from each host regarding his or her background, professional experience and involvement with the focus of the lab which you are touring. In addition, you will receive - in downloadable format - information on the background, development, and application of the lab focus, along with materials which are aimed at bringing research laboratory activities into the classroom. Depending on the tour, you might receive classroom protocols, essays on technique applications, descriptions of the theory involved in the research and/or a wide variety of other materials.

TEACHERS' LOUNGE: Clicking on the Teachers' Lounge icon accesses a message board where teachers can pose general science education questions to which others, including the Access Excellence Center staff, can respond. Teachers can interact with each other in the Teachers' Lounge, or can adjourn to private conference rooms for separate discussions.

WHAT'S NEWS: It can be quite a challenge to keep up with all that is happening in the world of biological research. "What's News" is a resource designed to help you do just that. In "Science Update" you will find regular reports on new and interesting developments from all areas of biology gleaned from a variety of sources including journals, conferences and the Internet. "News Maker" will feature interviews with prominent researchers in which we delve into issues and controversies in science in an attempt to find the story behind the story. "Media Watch" is a weekly update of science programs and events on television, radio and in cyberspace. "Factoids" will lighten the mix with unusual facts and statistics with which you can amaze your friends and stimulate your students.

ELIGIBILITY

Public and private high school teachers in the U.S. during the 1994-1995 school year who teach with a focus on the biological sciences are eligible to apply. Each teacher applicant must submit the following:

* Completed application form
* Resume with details on the applicant's education (including inservice education and experience), teaching experience, professional activities, relevant credentials and certification (not to exceed three pages)
* Responses to the two personal questions (see below)
* One letter of support from a student or administrator addressing your effectiveness as a teacher.

Access Excellence is making special efforts to include biology teachers who are members of under-represented minority groups or who teach significant numbers of minority students from under-represented groups. The National Science Teachers Association (NSTA) will appoint a judging committee, which will review applications and select the winning entries. Selection for participation in Access Excellence will be based on your responses to the two personal questions, your resume, and the letter from a student or administrator, including evidence of:

* Commitment to quality science teaching and learning
* Professional involvement and leadership potential
* Creativity, feasibility and scientific accuracy of the activity/learning experience

APPLICATIONS MUST BE RECEIVED AT NSTA BY 5:00 P.M., TUESDAY, FEBRUARY 7, 1995.

Note: Materials sent by FAX or received at NSTA after the closing date and time will not be accepted. Materials that do not meet the rules outlined above under eligibility will be disqualified. Applicants will be notified by mail whether or not they have been selected to participate in the program by March 27, 1995.

To receive application materials contact:
Access Excellence Competition
NSTA
1840 Wilson Boulevard
Arlington, VA 22201-3000

AWARDS AND RECOGNITION

Science Education for
Public Understanding Program
Lawrence Hall of Science
University of California
Berkeley, CA 94720-5200

ANNIE WATKINS COMPLETES SEPUP PROGRAM

The Science Education for Public Understanding Program (SEPUP) at the Lawrence Hall of Science, University of California at Berkeley held its ninth annual 1994 SEPUP *National Fellows Conference* in August. The program is designed for teachers and other educational leaders who are in a position to introduce middle/junior high school and early secondary school teachers to using SEPUP materials to their local program.

The goal of SEPUP is to develop greater awareness, knowledge, and understanding about chemicals and how they interact with our lives. To accomplish this goal, SEPUP has developed hands-on, issue-oriented, experience-based instructional materials and strategies highlighting chemicals and their role in technology and society.

The Fellows Conference provided participants with an extensive week of training from August 1-10, 1994. The participants received 40 hours of instruction and selected SEPUP kits, learned how to train others in the use of SEPUP materials, reviewed newly developed materials, and contributed ideas to the further development of new SEPUP activities. We are delighted to verify Annie Watkins successfully completed the program and we look forward to her continued involvement in SEPUP.

ILLINOIS SECTION AMERICAN ASSOCIATION OF PHYSICS TEACHERS

Congratulations to Wes Johnson of Moline High School for being selected as the Illinois Section of the American Association of Physics Teachers (ISAAPT) recipient for the Outstanding High School Physics teacher award. Respectfully submitted by Roger E. Malcolm, ISAAPT Reporter, Kewanee High School

MEETINGS AND CONFERENCES

Lee R. Marek
Naperville North High School
899 N. Mill
Naperville, IL 60540
e-mail lmarek@aol.com
Phone: 708-420-6513

FROM CHEM WEST

The next Chem Ed is at Old Dominion University August 5-10 in Norfolk Virginia. This is a great place to take the family and learn some chemistry—REALLY. They encourage the whole family to go and provide something for every one. This is for chemistry teachers of all levels. The worlds largest Periodic table is being constructed. People or groups get and element and construct an individual panel of fabric, etc. CHEM WEST has Radium. If you have any creative ideas for putting together a bedsheet size panel with Ra on it let me know. Glow in the dark??

If you are going to Washington, DC and get to the Smithsonian you might look to look at the "Science in American Life" exhibition at the National Museum of American History. This exhibit was funded by the ACS to the rune of over $3M. It has a hands on components, the first at the Smithsonian I believe.

Do you have public domain video material to share? Why not bring it to a CHEM West meeting or contract me. I am trying to put together two hours of materials for a video to be given out to teachers. These could be student generated. We may be able to find some small amount of grant $.

209th ACS National Meeting in Anaheim, CA April 2-6. You might be able to combine your Spring Break with the meeting [there is an education day which is cheap to attend and has some good tax consequences!] Contact ACS, 1155 16th St., N.W., Washington, D.C. 20036-4899 or 202-872-4396.

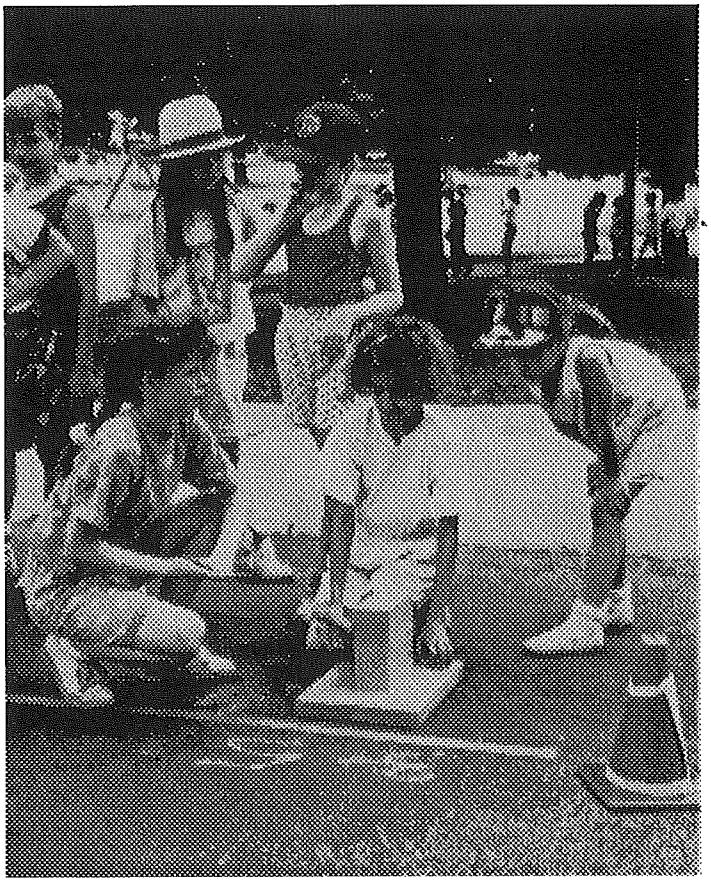
CICI, Chemical Industry Council of Illinois, Presents it's 21th **Annual Chemistry Career Conference for High School Students** at the Museum of Science and Industry, March 16-17. Students can see chemical company exhibits and examples of jobs utilizing a chemical education. There will be practical chemistry demos and college/Univ. admissions & Chem. department representatives. For more information and registration contact: Mike Moss, Chemical Industry Council, 9801 W. Higgins RD., Suite 515, Rosemont, IL 60018 708-823-4020.

ACS 28th Great Lakes Regional Meeting June 6-8 at LaCross, WI. A chemical education program is planned for in conjunction with Univ. of WI, LaCross. For infor on program contact M. Collins, Dept. of Chemistry, 609-791-0244.

CESI MEET, GREET, MAKE AND TAKE PHILADELPHIA WORKSHOPS

The Council for Elementary Science International will be conducting its popular workshops during the NSTA National Convention in Philadelphia, March 23-26, 1995. These sessions provide teachers with the opportunity present informally elementary science teaching activities. If you would like more information about sharing your favorite activity at one of these workshops, contact:

Mary Stein
CESI Workshop Co-coordinator
Room 283 Education
Wayne State University
Detroit, MI 48202
(313) 577-6382



WORKSHOPS AND FIELD TRIPS

Susan Fisher
The Chicago Academy of Sciences
2001 N. Clark Street
Chicago, IL 60614

FREE RECYCLING WORKSHOP FOR CHICAGO PUBLIC SCHOOL TEACHERS

Solid waste management has become one of the most important issues in the United States today. Did you know that each day in the City of Chicago enough waste is generated to fill Soldier Field? That measures out to about five pounds of garbage per person a day! On top of that, the amount of waste collected each day is steadily growing. All over the country landfills are filling up fast, making it necessary to find ways to reduce the amount of waste we needless generate!

There are things we can do to reduce the amount of waste we make such as paying more attention to the way things are packaged, and avoiding over-packaged items. Also by checking on the bottom of plastic containers for recycling code (1's and 2's are most easily recycled in Chicago) we can avoid purchasing things that cannot be recycled. Starting a compost pile at home is a good way for the earth to reclaim valuable nutrients to the soil while reducing vegetable and yard waste. Bringing along a bag to the grocery store, and carrying a personal cup for coffee or soda reduced needless consumption of Styrofoam, plastic and paper. Just think how much waste we can make from one take-out lunch! Environmental forethought will change our habits. It will take a little extra effort, but in the end it's beneficial for everyone.

The City of Chicago Department of Environment's Public Education Division has come up with an environmental education program specifically designed for teachers in Chicago. This unique and progressive program presents current issues in solid waste management in a hands-on environmental science curriculum which introduces teachers to Chicago's many recycling programs. Teachers engage in animated discussions on current environmental topics and are exposed to constructivist techniques of presenting new material.

The program, which is officially called The City of Chicago Solid Waste Management Training Programs, has been nicknamed "Train the Trainer" because the chief goal of the program is for each participating teacher to present the material to their colleagues in an informal inservice, thus preparing every teacher of every public school in Chicago to integrate environmental education into existing programs. If enough teachers participate this program has the potential of reaching 400,000 students in the Chicago Public School System. It is important that we reach the youth of this country with a message that will help to form positive attitudes and behaviors toward the environment.

The Chicago Academy of Sciences has been selected to present this program to Chicago Public School teachers in after-school and weekend workshops. The program is free of charge and teachers have the option of receiving Lane or Graduate credit. The curriculum is provided to every teacher, who upon completing the course is prepared to serve as a leader in environmental education in his or her school.

The curriculum was designed for and by Chicago Public School teachers, and contains hands-on lessons in environmental issues exploring subjects such as alternatives to landfills, composting, recycling and energy recovery. It is intended for use in grades K-8, and teachers can choose to focus on the curriculum for grades K-3, 4-6, or 7-8. It also meets State of Illinois Goals for Learning in Social Studies, Health and Safety, Language Arts, Science, and Mathematics, making it easy to integrate into existing programs, and a welcome addition to school improvement plans!

For more information please call the Chicago Academy of Sciences at (312) 549-0606, extension 2021 or 3052.

HUMAN GENETICS UPDATE WORKSHOP FOR LIFE SCIENCE/BIOLOGY TEACHERS

March 31, 1995
Mattoon High School
Mattoon, IL

Tentative workshop agenda includes participation in Human Genome Project-related activities, a patient panel consisting of families and individuals afflicted with a number of different conditions and presentations dealing with genetic counseling and nontraditional inheritance.

For more information please contact:
David Stone
University High School
1212 W. Springfield Ave.
Urbana, IL 61801
e-mail: dstone@ncsa.uiuc.edu

ILLINOIS STATE GEOLOGICAL SURVEY FREE, ALL-DAY FIELD TOURS

Every year, you are invited to join scientists from the Illinois State Geological Survey on four field tours—two scheduled in the fall and two in the spring. Each trip is designed to acquaint you with the geology, landscape, and mineral resources of a different part of the state. Along the route, the caravan stops frequently to give you time to explore a special area, discuss features described in your guidebook with an expert, or simply admire the view. You'll also find some opportunities to collect rocks and fossils.

People of all ages are welcome, but each grade school student must be accompanied by a responsible adult, and high school sciences classes should be supervised by at least one adult for each ten students. The trips are especially helpful to teachers planning earth science classes.

A field trip guidebook, describing and explaining the geology and topography along the route and at the stops, is given to each participant. A list of previous field trip guidebooks is available for use in planning your own class tours or private outings.

On the day of the field trip...

Assemble at the starting point to register before 8:15 a.m. No preregistration is necessary. You can sign up *only* on the morning of the field trip. You'll park your vehicle in line so that the caravan can start out immediately after registration. The day-long trip ends about 4:00 p.m. Each participant must sign an indemnity waiver to permit entrance to pits, quarries, and mines. Private property owners request this procedure for their protection.

Tours are held rain or shine. Wear comfortable clothing and walking shoes. Bring a hard hat and safety glasses, if you have them. Sometimes they are needed. Bring a packed lunch and drinks and arrange your own transportation. Drivers should begin the tour with a full tank of fuel. For safe travel on some roads and bridges, only mid-sized (12,000 lb) or smaller school buses are permitted.

The Illinois legislature established the Illinois State Geological Survey (ISGS) in 1905 to study and report on the geology and mineral resources of Illinois. The ISGS conducts basic and applied geological research aimed at:

- locating mineral resources and providing information related to the evaluation, optimum development, and use of these resources,
- providing basic geologic data to citizens and agencies charged with formulating sound policies for land use, waste disposal, pollution, and construction.

The ISGS also collects and stores great quantities of basic geologic information to maintain a data base for current and future research. For more information about ISGS services or details about the 1994-95 field trips, call, write, or visit the Illinois State Geological Survey.

Phone: (217)244-2427 or 333-4747
TDD (217)785-0211

Upcoming Field Trips

April 22, 1995
Salem
Marion County

The Salem area is in the northern part of southern Illinois astride the boundary between the almost level Springfield Plain on the northwest and the low, subdued topography of the Mount Vernon Hill Country on the southeast. For the most part, surface topography reflects an eroded bedrock surface covered by glacial drift of Illinoian age of varying thickness deposited 250,000 to 200,000 years ago.

Bedrock of Pennsylvanian age (the Coal Measures) underlies this area and is exposed in some stream valleys, road cuts, and quarries. A variety of fossils can be collected from Pennsylvanian strata in the area. The oil fields in this area have yielded several hundred million barrels of oil from rocks older than the Pennsylvanian. If we are fortunate, we may see an oil well being drilled.

Meet at Salem Community High School, approximately 0.7 mile north of the intersection of Broadway (IL 37) and Main Street (US 50) on the east side of the street, before 8:15 a.m.

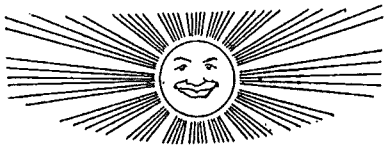
May 20, 1995
Pekin
Tazewell County

The Pekin area in central Illinois lies at the scenic boundary between the Bloomington Ridged Plain formed by Wisconsinan glaciers nearly 22,000 years ago and the Springfield Plain formed by Illinoian glaciers about 200,000 years ago. The Shelbyville Morainic System of Wisconsinan age rises sharply to nearly 150 feet above the gently rolling Illinoian till plain to the south.

The Illinois River valley is much younger here than to the north and south. Part of the interesting geologic history of the Ancient Mississippi River and present Illinois River is revealed in the field trip area. Bedrock belonging to the Carbondale Formation of mid-Pennsylvanian age is exposed along the valley walls of the river and its tributaries. Coal was formerly mined in this area.

Bedrock exposures along streams and in road cuts and glacial deposits in gravel pits will afford good specimen collecting in this central Illinois scenic area.

Meet at gazebo adjacent to the lagoon in Mineral Springs Park, Pekin, just north of Court Street (IL 9) and east of 14th Street, before 8:15 a.m.



Cheryl Mell
John G. Shedd Aquarium
1200 S. Lake Shore Drive
Chicago, Illinois 60605
312/939-2426, ex. 3371

SHEDD AQUARIUM TEACHERS' WORKSHOPS

The Aquarium is a wonderful resource for a unique educational experience. Take advantage of Shedd Aquarium's expert teaching staff by attending any of our thirteen teacher workshops offered this spring!

All Grades

Beluga Whales
Are you intrigued by Shedd Aquarium's beluga whales? This workshop looks at the physiology, behaviors, habitat and conversation of this arctic denizen. Find out where Shedd's belugas came from and the status of wild populations. Meet our belugas and learn about research projects here which may benefit wild populations.
Wednesday, April 26, 1995, 4:30 - 7:30, (code 010WE)
Workshop fee: $5

An Aquarium in Your Classroom
We'll introduce you to basic aquarium-keeping through discussion and give you a take-home packet on aquarium care. Find out how to integrate aquatic animal behavior and physiology into your curriculum using non-invasive experiments and observation skills.
Wednesday, August 2, 1995 9:30 - 12:30, (code 015WE)
Workshop fee: $5

Using Shedd Aquarium as a Resource
Become familiar with the variety of programming the education department offers and comfortable using this aquatic resource. An overview of classes, labs and self-guided visits will be presented along with a chance to touch a sea star or urchin in our labs. Take a short behind-the-scenes tour of the Aquarium galleries to see where the aquarists work.
Wednesday, February 8, 1995, 4:30 - 7:30, (code 006WE)
Workshop fee: $5

New! Aquatic Arts and Crafts
Bring the underwater world to your classroom! Learn how to make fish kites, anemone hats, piranha pencil puppets and more. Visit the Aquarium galleries for aquatic animal rubbings and designer fish crafts. Join us for a morning of fun and take home an "ocean" of ideas.
Saturday, February 25, 1995, 9:30 - 12:30, (code 007SA)
Workshop fee: $5

Project Wild Aquatics
An interdisciplinary approach to teaching about aquatic wildlife and habitats, this collection of K-12th grade activities includes both freshwater and marine environments. Participate in Project Wild Aquatics activities, share ideas with fellow educators, and take home a PWA activity guide. Bring a brown-bag lunch.
Saturday, March 4, 1995, 9:30 - 3:30, (code 008SA)
Workshop fee: $5

Fashion a Fish
Become one of Mother Nature's helpers as you design your own fish and learn how to interpret adaptations (anatomy) and behaviors. Through a variety of activities, explore Shedd's global collection of fish and find out how to use aquarium fish in science and interdisciplinary studies.
Wednesday, May 15, 1995, 4:30 - 7:30, (code 009WE)
Workshop fee: $5

Oceanarium Workshop
Explore this unique exhibit and the diversity of the Pacific Northwest coast it portrays. Become familiar with whales, dolphins, otters and seals; temperate rain forests, rocky tide pools and volcanic geology. Investigate the philosophy behind this exhibit and how you can use the exhibit with your students. Workshop includes a tour through the exhibit and support materials for curriculum developments.
Saturday, April 29, 1995, 9:30 - 12:30, (code 011SA)
Workshop fee: $5

Grades 4-8

New! Physics of the Sea
Looking for a new approach to teaching physical science? How about an aquatic twist! Explore the streamlining of cetaceans, effects of pressure on deep sea animals, communication through sound, and more. Look for examples of aquatic physical science in the Aquarium and Oceanarium, participate in hands-on laboratory activities and take home some great new ideas.
Saturday, May 6, 1995, 9:30 - 12:30, (code 012WE)
Workshop fee: $5

Discover Lake Michigan
You can tour Lake Michigan for top to bottom and through 200 years of ecological change by exploring the Aquarium's Great Lakes Gallery. Besides the exhibits, the workshop uses slides and discussion to review the lake's ecology and management. Teachers will also do a study of the shoreline, bringing animals and plants back to the lab for closer study.
Wednesday, July 12, 1995, 9:30 - 12:30, (code 013WE)
Workshop fee: $5

Wetlands!
Tree's knees, a mummy, carnivorous plants, and quaking peat have something in common—they all can be found in a wetland. Investigate the diversity and importance of wetlands and participate in hands-on activities as you become familiar with these productive ecosystems. Take home some great new ideas to share with your students.
Tuesday, August 15, 1995, 9:30 - 5:30, (code 016TU)
Includes field trip to local wetland in afternoon!
Workshop fee: $22
(You may wish to purchase additional materials.)

Teachers' Workshops

Chicago Science Explorers

The special programs listed below use Bill Kurtis' videotapes to encourage students to consider careers in science. Through classroom activities developed by fellow classroom teachers and Shedd Aquarium, each of these programs gives students a new perspective of people working in the field of science. Each teacher accepted to participate in this program will receive:

- a full-day teachers' workshop
- a copy of the videotape "Why is This Dolphin Smiling? or "Creating an Ocean
- ore- and post-visit activity curriculum"

Grades 6-8

"Why is this Dolphin Smiling?"

How do scientists study animal behavior, animal senses and animal communication? How does the knowledge that they acquire help us understand and manage our world? This videotape and curriculum illustrate the concept of animal communication. The coordinated field trip includes hands-on items, borrowed on the day of your visit, to help illustrate various animal communications found in the Aquarium.
Saturday, January 7, 1995, 9:00 - 4:00, (code 004SA)
(lunch provided.

Grades 9-12

"Creating an Ocean"

Find out how the Oeanarium was designed and why this Pacific Northwest coast exhibit was created, how the animals for this exhibit were acquired, and look at the science-related careers involved in building and maintaining an exhibit of this size. The coordinated field trip includes a visit to the Oceanarium and a chance to talk with an animal care specialist.
Saturday, January 21, 1995, 9:00 - 4:00, (code 005SA)
(lunch provided)

Sleep with the Fishes—For Teachers Only

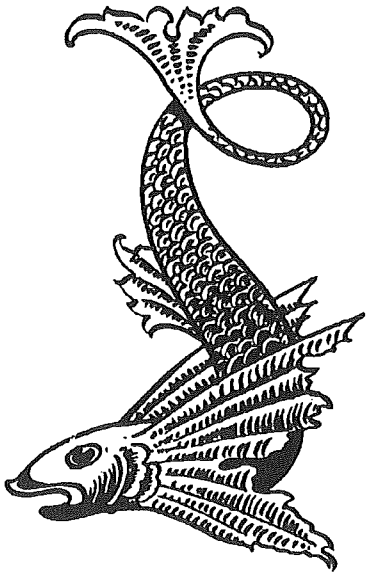
An overnight teacher's workshop at Shedd Aquarium! The evening will begin with dinner in the Bubble Net and continue with the Pacific white-sided dolphins featured in a marine mammal presentation just for you. Rotate through workshops on bioluminescence, rain forests, plants and geology of the Pacific Northwest, aquatic art, plankton, fish adaptations and more, 'til the cowfish come home.' A midnight snack, then snuggle in your sleeping bag and sleep with the galleries of fishes! Wake up early, say good morning to the belugas, breakfast at 7:00, then participate in more workshop opportunities. Take home a t-shirt to prove YOU slept with the fishes. Departure is at 10:30 a.m. Register by filling out teachers' workshop form.
Friday, February 17, 6:00 p.m. - Saturday, February 18, 10"30 a.m.
Cost: $35.00 (code 017FR)

Teachers' Inservices

We are occasionally asked to present workshops for teacher inservices. If you would like to arrange an inservice for your school or school district at the Aquarium and you have at least 10 interested teachers, please call the School Program Coordinator at 312/939-2426, ex. 3371 to make arrangements. Any of the above workshops can be requested. Limited dates and times available.

From time to time, we call on teachers to help us in program development or as facilitators for teachers' workshops and special programs. If you would be interested in participating in this creative outlet, write and let us know what grade level and areas of expertise you can offer.

For more information or a workshop registration form write to the above address.



CHICAGO ACADEMY OF SCIENCES
TEACHER WORKSHOP
Teacher Preview and Workshop
Nature's Fury
Wednesday, February 1, 1995
4:00 to 7:00 pm

You're invited to an afternoon of natural disasters at our Nature Museum! Join us for a special Educator's Preview of our new exhibit *Nature's Fury*, open January 28 through August 6, 1995. We will highlight the best ways to plan your class visit and give you a free packet of science activities and a copy of our *Nature's Fury* Discovery Tour. Please RSVP by **January 13, 1995.** There is no fee. To register, call 312-549-0775 Monday, Wednesday or Friday between 2-4 pm.

EDUCATIONAL MATERIALS

DISCOVERING WOMEN - A PBS SERIES THAT BREAKS SCIENCE STEREOTYPES

WGBH, Boston's public television station, is presenting an exciting new six-part series called DISCOVERING WOMEN, featuring the professional and personal stories of notable women scientists. Scientists featured in the series include: Melissa Franklin, a high-energy physicist; biochemist Lynda Jordan; Misha Mahowald, a computational neuroscientist; geophysicist Marcia McNutt; molecular biologist Lydia Villa-Komaroff (in photo below); and archaeologist Patty Jo Watson. The series is narrated by Michelle Pfeiffer and is scheduled for national public television broadcast in March and April, 1995.

To accompany the series, WGBH is launching a comprehensive and integrated outreach project targeting youth leaders, as well as social studies, English, and science teachers and the students they serve. Central to the national outreach campaign, is the S.O.S.—SEEK OUT SCIENCE initiative. This motivational project will spark junior high and middle school students' interest in science, broaden their understanding of what science is, and create connections between young people and the women working in the sciences in their own communities. Through the process of researching and interviewing women scientists, students will learn about the lives, work, and struggles of these women.

A 16-page, multi-disciplinary S.O.S. Activity Guide will provide information about the television series and will offer how-to information for teachers and youth leaders about the S.O.S. project, which will run through April, 1995. All students participating in the initiative will receive a recognition award from WGBH for their work. More importantly, their work may be included in a DISCOVERING WOMEN/SEEK OUT SCIENCE exhibit at one of eight demonstration sites. Sites will be located throughout the nation, primarily at science and children's museums. Each demonstration site will create a unique display of the students' work, including an interactive database of every student's findings, and generate publicity around the exhibit in the summer and fall of 1995.

The S.O.S.—SEE OUT SCIENCE Activity Guide will be available through many PBS stations around the country, and will also be directly mailed to middle school social studies, English, and science teachers. If you have not received a copy by the end of December and/or your local PBS station does not have copies, write to:

WGBH — S.O.S. Activity Guide
Box 2222 - SOS
South Easton, MA 02375

For a Spanish language version of the S.O.S. Activity Guide, please write to:

S.O.S. Spanish
Educational Print and Outreach
WGBH
125 Western Ave.
Boston, MA 02134

For more information about DISCOVERING WOMEN and the SEEK OUT SCIENCE initiative, call Amy McMahon at (617) 492-2777 x 4346.

FREE TEACHER PACKET FROM THE MINERAL INFORMATION INSTITUTE

The latest free **teacher packet** from the Mineral Information Institute contains a 48-page Teacher Guide and Student Pages for primary and elementary grade and a 16-page *Sources for More Information*. The Teacher Guide is adaptable to your style and the abilities and learning styles of your students; activities are suitable for individual, group, or full-class presentations; and there is easy remediation for kindergarten, first graders and special-needs students. For the free packet, contact Mineral Information Institute, Inc., 475 17th St., Suite 510, Denver, CO 80802; (303) 297-3226.

The Mineral Information Institute also provides an ever-changing selection of **pamphlets, activities, maps,** and more from federal and state agencies involved in education; answers to questions; access to classroom speakers; tips on developing mentors for tours; and references to experts and other sources. Contact Mineral Information Institute, Inc., 475 17th St., Suite 510, Denver, CO 80202; (303) 297-3226.

National Science Teachers Association
1840 Wilson Blvd.
Arlington, VA 22201

Perpetual Science Calendar Helps Teachers and Parents Engage Children

Teachers, parents, and children now have at their fingertips a perpetual calendar with numerical dates but without days of the week, *Every Day Science* gives you a glance at important historical science-related events, every day of the year—from Einstein's birthday to the invention of the toilet to the first transcontinental jet flight or the beginning of the Human Genome Project.

The calendar also features fun interdisciplinary activities. Suggested activities draw upon themes and topics associated with the important events of each month. The activities call for common household materials, if any, so children can do the activities at home, in school, community or science centers, afterschool clubs, and more!

On the date of George Washington Carver's death, children can make peanut butter; on the date the first gas station opened, children are asked to measure their family car's gas mileage and weekly fuel consumption; on the date Michael Faraday discovered electricity, children try to generate electricity using copper wire and a magnet; and on Universal Children's Day, children learn now to initiate a science pen-pal exchange.

Historic events were selected based on their potential meaning and relationship to a child's everyday life. This includes events meaningful to girls and children from minority groups. Some scientific discoveries were intentionally left out because they seemed to have little significance to a child.

Because the calendar is intended for use year after year, it is made to last—with sturdy laminated pages, a reinforced hole to hand the calendar, and numerous color photos and illustrations.

Copies of the calendar are $24.95 plus shipping and handling. To order, contact NSTA Publications Sales, 1840 Wilson Blvd., Arlington, VA 22101; 800-722-NSTA (6782).

YES, I WOULD LIKE TO CONTRIBUTE TO THE ISTA SPECTRUM

I have a good idea that I'd like to share!

Name: _____

School or Business:
(name) _____
(address) _____
(city, state, ZIP) _____
(telephone) (____) _____

Home:
(address) _____
(city, state, ZIP) _____
(telephone) (____) _____

Title of Contribution:_____

I would like may article to appear in:

___ARTICLES
___IN FOCUS
___SPECIAL INTERESTS
___MINI IDEAS
___REVIEWS
___POTPOURRI
___OPPORTUNITIES
___MEETINGS
___AWARDS/RECOGNITION
___FIELDTRIPS/WORKSHOPS
___EDUCATIONAL MATERIALS

Please print my contribution in the following issue(s):

___**Fall** (due June 1)
___**Winter** (due September 1)
___**Spring** (due December 1)
___**Summer** (due March 1)

SPECTRUM welcomes black and white glossy photographs. We can sometimes use color pictures but they must be sharp with high contrast. Please enclose a stamped self-addressed envelope if you want your photos returned.

ISTA REGIONAL DIRECTORS

REGION II
Karen Meyer
Ridgewood School
9607 West 14th Street
Rock Island, IL 61201
(309)793-5980

Linda Duncan
Pecatonica Comm. Unit School
District #321
1200 Main Street, Box 419
Pecatonica, IL 61063-0419
(815)239-2550

REGION III
Linda Lucas
Grundy Elem. School
1100 S. Fourth St.
Morton, IL 61550
(309)263-1421

Karen Zuckerman
Hollis Consolidated Grade
School
5613 W. Tuscarora Rd.
Peoria, IL 61607
(309)697-1334

REGION V
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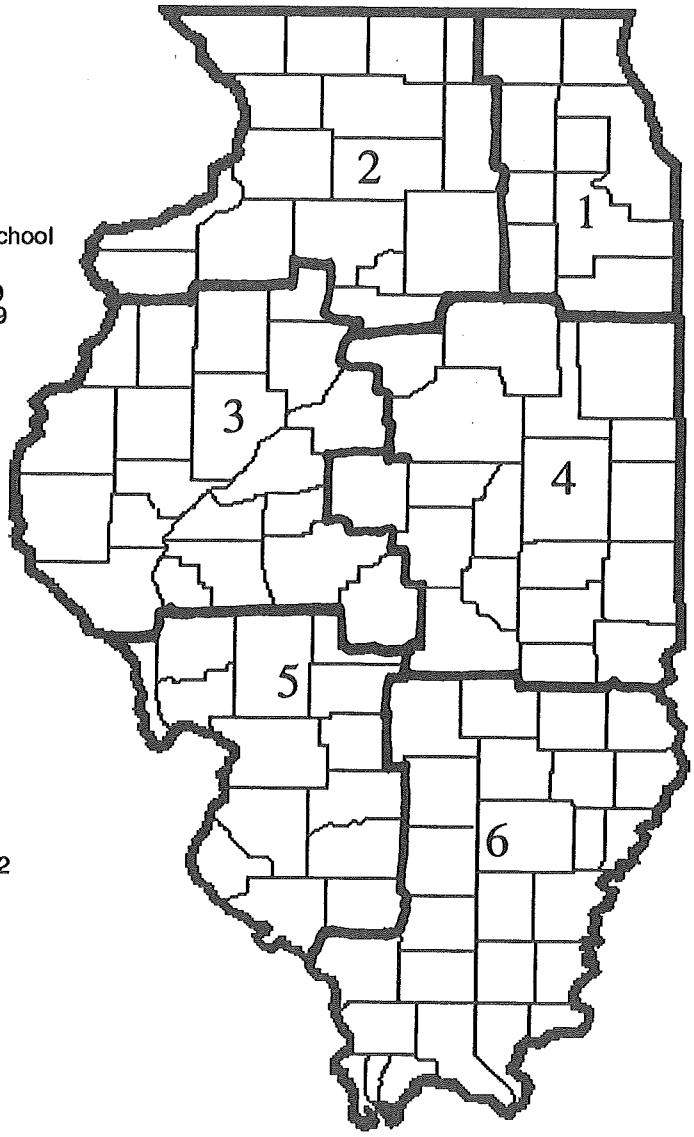
Red Bud Comm. Dist. #132
200 Field Dr.
Red Bud, IL 62278
(618)282-3858

Ann Scates
Dept. of C&I
SIU-Edwardsville
Edwardsville, IL 62026
(618)692-3065



REGION I
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Riverside, IL 60546
(708)447-6070

Barbara R. Sandall
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Oak Brook, IL 60521
(708)571-4700

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Bob Fisher
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(309)438-8768

REGION VI
Wes Heyduck
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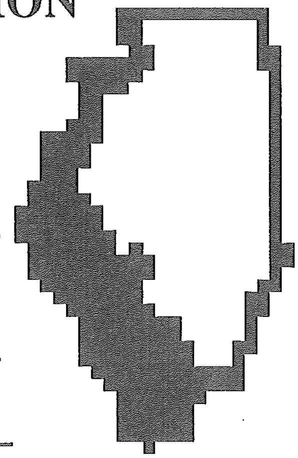
300 W. King
Fairfield, IL 62837
(618) 842-2649

Max A. Reed
Hutsonville H.S.
West Clover St.
Hutsonville, IL 62433
(618) 563-4913

Listing of Counties Comprising Each ISTA Region

Region I	McHenry, Lake, Kane, Cook, DuPage, Kendall, Will, Grundy, Kankakee
Region II	Jo Daviess, Stephenson, Winnebago, Boone, Carroll, Ogle, DeKalb, Whiteside, Lee, Rock Island, Henry, Bureau, LaSalle, Putnam, Marshall
Region III	Henderson, Warren, Knox, Stark, Peoria, Hancock, McDonough, Fulton, Tazewell, Schuyler, Mason, Adams, Brown, Cass, Menard, Pike, Scott, Morgan, Sangamon
Region IV	Woodford, Livingston, Ford, Iroquois, McLean, Logan, DeWitt, Piatt, Champaign, Vermillion, Macon, Shelby, Moultrie, Douglas, Edgar, Coles, Cumberland, Clark
Region V	Calhoun, Greene, Macoupin, Montgomery, Madison, Bond, St. Clair, Clinton, Monroe, Washington, Randolph, Perry
Region VI	Fayette, Effingham, Jasper, Crawford, Marion, Clay, Richland, Lawrence, Wayne, Edwards, Wabash, Jefferson, Franklin, Hamilton, White, Jackson, Williamson, Saline, Gallatin, Union, Johnston, Pope, Madison, Alexander, Pulaski, Massac

ILLINOIS SCIENCE TEACHERS ASSOCIATION
MEMBERSHIP APPLICATION



NAME ______________________________
LAST FIRST

DATE ____________________ REGION (SEE MAP) ________

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CITY STATE ZIPCODE

EMPLOYER ADDRESS ______________________________
STREET

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CITY STATE ZIPCODE

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P.O. BOX 2800
GLEN ELLYN, IL 60138

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WINTER 1994