

SEP Newsletter

February 1, 1997 No. 28

Students Helping Students thru MedTeach

This year, seven MedTeach teams are active in six different middle schools, working with 6th graders on the human body and health curriculum. Just what is a MedTeach team? An energetic and friendly group of 3-5 first year UCSF medical students who collaborate with 6th grade teachers to bring hands-on, active learning about the human body to 6th grade students. The medical students bring their own learning tools – a bone box with a real human skeleton, stethoscopes, models, and even real pathology specimens – to enhance the learning of the students, and are able to work with the 6th graders in small groups. Besides teaching the students about how their bodies work, the medical students, who are diverse in age, ethnicity, and background, also provide wonderful role models.

In addition to consultations and feedback from their teacher partner, MedTeach teams get support and resources from the SEP staff and Resource Center. Their lessons have included activities on how to trick the brain, how the heart works, and how human joints work. Medical student Geoff Criqui points out the importance of this program for both the medical students and the 6th graders: "I get excited to see the kids' eyes light up, to make learning fun for them. I wish there had been a program like this when I was in 6th grade, something that relates science to health and medicine." According to a student at Aptos Middle School, the MedTeach team helps students learn because "they made us think and explain more, and they brought samples [such as a cow brain] of what we were learning about. It was fun

MedTeach Volunteer Geoff Criqui helps students at Hoover Middle School learn about the nervous system through examining a human spine and cranium.

learning about the cerebrum, cerebellum, and medulla, and how they work."

A list of the MedTeach teams, their teacher partners, and schools follows: Brian Golden, Tin-Na Kan, Tamiko Katsumoto, Priti Bhansali, and Mintu Turakhia with Annette Anzalone at Hoover MS; Leslie Gillum, Saam Morshed, Kristen Hayward, and Mike Rothenberg with Mona Schraer at Luther Burbank MS; Nhat Pham, Eric Chow, Olga Hardy, Rowena Ramirez, and Sara Khademi with Rebecca Pollack at Aptos MS; Jenny Roost, Geoff Criqui, Eric Meyers, Greg Ku, and Efthimios Laios with Kathy Gilliland at Hoover MS; Michelle Pelot, Curtis Chan, Steve Bui, and Rameen Beroukhin

with Nathalie Hixson at A.P. Giannini MS; and Ivan Zeitz, Edward Conner, and Josh Mandelberg with Carrie Wong at Ben Franklin MS. Also,

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SEP

Executive Director

Liesl Chatman
476-0337 / liesl@itsa.ucsf.edu

SEP Core Programs

Helen Doyle, Ph.D., Coordinator
502-6324 / hdoyle@itsa.ucsf.edu
Tracy Stevens, Ph.D., Coordinator
502-5137 / tracys@itsa.ucsf.edu
Roberta Heidt, Admin. Ass't.
476-0300

City Science

Margaret Clark, Ph.D., Coordinator
476-0338 / mrcsep@itsa.ucsf.edu
Cynthia Gusman, Admin. Ass't.
476-6937 / citysci@itsa.ucsf.edu

Women's Triad Project

Katherine Nielsen, Coordinator
502-6690 / kmn@itsa.ucsf.edu

SEP Resource Center

Nick Alesandro, Librarian
502-6689

SEP Main Phone Number:
(415) 476-0300

SEP / City Science FAX: 476-9926

<http://itsa.ucsf.edu/~sfiles>

The Science & Health Education Partnership (SEP) is a collaboration between the University of California, San Francisco (UCSF) and the San Francisco Unified School District (SFUSD). Its mission is to support high quality science and health education. SEP is the organizational umbrella for the UCSF-end of the partnership and is made up of both core programs and specially funded projects. Core programs include equipment and supply donations to schools, partnerships between UCSF volunteers and SFUSD teachers, the operation of a resource center, and the SEP Student Lesson Plan Contest. Specially funded projects include *City Science*, *The Women's Triad Project in Science Education* and summer research internships for teachers and high school students. SEP also supports SFUSD projects including *SF Base* and the newly adopted K-8 science and health curricula. SEP is made possible through funds from NSF, NIH, Howard Hughes Medical Institute, Genentech, Herbert W. Boyer, the UC Office of the President, the UCSF Chancellor, Merck Pharmaceutical, PG&E, and private donations.

TERC and RISE Conferences: Exploring Successful Models for Partnership

How can partnerships between scientists, teachers, and students be of benefit to both science and education? How can scientists become meaningfully involved in K-12 science education? What are successful models? This past fall, two small but mighty working conferences were held, one on each side of the coast, to respond to these questions. The first was conducted in October by the Concord Consortium/TERC and held in Washington, DC; the second was conducted in November by Project RISE (Resources for Involving Scientists in Education) in Irvine, CA. Both invited key individuals from leading science education partnerships around the country. Independent of one another, the two conferences each took a different approach to exploring partnership models.

The TERC conference took a focused approach, examining an innovation known as Scientist-Student Partnerships (SSP's). SSP's engage students in original science activities based on research questions formulated by scientists who are recognized experts in the research area with activities utilizing the most up-to-date research technologies. With the Internet, SSP's can involve schools and citizens from all over the country in the research process, not only gathering data but analyzing it as well. Cornell University ornithologist André Dhondt emphasized that new electronic communication technologies are enabling scientists "to ask questions that cannot be answered any other way, and to have 50,000 people participating to address absolutely fundamental problems." Dhondt is the scientific director for Cornell's *Project FeederWatch*, an SSP which involves amateur birders observing bird feeders and providing data for population and migration studies. For more information on SSP's, check out <http://www.terc.edu/projects/ssp.html> or call (617) 349-3535.

The RISE meeting was broader in

scope, bringing participants together to identify an array of roles and levels of involvement for scientists and engineers in support of standards-based K-12 science education, and to examine cross-cutting issues about partnerships. Issues considered included integrating scientists with school programs, training for scientists, and bridging the gap between the cultures of science and education. Participants stressed that partnerships can and should be mutually beneficial, and that it's important for scientists and teachers to spend time in each other's professional culture. Trust was also identified as essential to deep collaboration, with the added caveat that trust takes time and good communication to develop. Many roles and levels were identified and are scheduled to be incorporated into a RISE Website in the near future.

The RISE conference was sponsored by the National Research Council and coordinated by Jan Tuomi, Ted Schultz, and Kit Johnston; the TERC conference was sponsored by the National Science Foundation and coordinated by Sue Doubler, Bob Tinker, and Dan Barstow. Liesl Chatman had the honor of representing SEP at both conferences.

In the spirit of FeederWatch, the next time you visit the SFUSD CIPD Center (formerly Parkside), watch for the American Kestrel, shown here, who perches frequently on the power lines along 25th Ave.

The Magic of Mission Science Workshop

This article on the Mission Science Workshop is the first in a series of profiles of science opportunities in the San Francisco Bay Area. SEP has been working with the Mission Science Workshop on an informal basis for the past few years and provides assistance for its Triad-inspired girls' science club.

One's first impression of the Mission Science Workshop is likely to be that it is cluttered, noisy, and chaotic. But, spend a little time there, and one is likely to come to think of it as focused, beautiful, and stimulating.

The Mission Science Workshop, located in the heart of the Mission, encourages people to discover the

Visitors of all ages, but mostly eight to fifteen-year-olds, tinker here, using an example as a guide or coming up with their own project.

natural world through science and experimentation. Behind huge, black curtains, one can explore exhibits about light and color. Dissecting scopes are available to study bugs, rocks, leaves, and pond water. Students can watch, touch, and hold a legless lizard or a corn snake. Several Exploratorium-like exhibits are set-up where one can play, experiment, and learn about such things as static electricity and sound waves. There is a kiln and a darkroom.

But the area where visitors probably spend the most time is the work area. It has a number of large tables, hand tools, wood, drawers full of screws, nails, and magnets, a drill press, and a bench jigsaw. There are numerous examples of things one can make; everything from paper cup motors to robots and from music boxes to speakers. Visitors of all ages, but mostly eight to fifteen-year-olds, tinker here, using an example as a guide or coming up with their own project.

Almost magically, the Mission Science Workshop has just enough adult supervision and guidance. Adults ensure that tools, especially power tools, are safely used. They also give tips, explain the science behind the projects, and suggest next steps. The staff successfully walks the fine line of providing support but not taking over the experimenting or building.

It's a formula that works. Spend a

ers.

The Mission Science Workshop was founded by Dan Sudran in 1991. Dan saw a need for such a place when he found that as he worked in his garage with the door open, he had frequent visits from the neighborhood children. They asked what all the things were, what he was doing, and more. Dan came to realize that many children had little to do after-school

Kids getting down to the nitty-gritty of dry ice at the Mission Science Workshop.

couple of hours there and you'll see youth of all ages and backgrounds absorbed in their projects, seemingly oblivious to the noise and activity around them. Listen to their conversations and you'll hear both English and Spanish: many staff persons and visitors are bilingual. Most of the visitors are from the surrounding neighborhood, dropping in after attending such schools as Horace Mann and Everett Middle Schools. Up to 75% of them are repeat visitors. Every Wednesday evening, parents and children learn side-by-side in the comfortable, non-competitive atmosphere. The Workshop also welcomes school and youth group field trips, working with teachers to plan a focused visit, and offers workshops for teach-

and that very few of them had a workshop or garage where they could build and explore.

The Mission Science Workshop currently collaborates with SFUSD, City College of San Francisco, San Francisco State University, and the Exploratorium. The National Science Foundation recently awarded the Workshop a grant to initiate new similar centers in Hunters Point, San Bruno, Oakland, Fresno, Los Angeles, San Jose, and Stockton.

Visit the Mission Science Workshop at the Mission Campus of City College, 106 Bartlett Street at 22nd Street, Room 209. They are open Monday through Thursday afternoons and host family nights every Wednesday from 5 to 8 pm. Admission is free! FFI, call (415) 550-4419.

Paul Herzmark: SEP Ace Volunteer

If you have spent much time around SEP, you already know Paul Herzmark. If you don't, keep your eyes open for a lively man with curly reddish hair and an infectious smile, who works in Henry Bourne's lab (when he's not at Jefferson Elementary School). The list of Paul's activities is practically a catalogue of SEP programs — a high school partnership, SF Base classroom volunteer, past supervisor for the SEP Interns, for a City Science Kit Club facilitator, Lesson Plan Contest judge, donations of microscopes, computers and other goodies, and now a partnership with teachers at Jefferson. Paul even set up SEP's World Wide Web page.

Recently, Margaret Clark spoke with Paul about what brought him to UCSF and SEP. Paul joined the Peace Corps right after college, spending two years in Paraguay working with an agricultural research station. Periodically, he would take a boat loaded with fruit-bearing plants up river to three vocational agricultural high schools. There he helped the students with the planting and taught them about grafting and how to care for the plants. "So I'd get on this cool boat with my grapes and pineapples and different citrus plants, go up river — it sounds way more exotic than it really was."

After the Peace Corps, Paul earned a master's degree in genetics at UC Davis, and then enrolled in a Ph.D. program in plant biology at Washington University in St. Louis, but after a year he decided to go into teaching as a career. He obtained his teaching credentials and a Master's Degree in Education and spent a year teaching at a private high school. He recalls that year as a stressful one.

After moving back to the Bay Area in 1986, Paul worked for five years at a plant biotech company, then took up his current position as a Senior Research Associate in the Bourne lab. At UCSF he searched for volunteer opportunities that would address his interest in teaching. "I was talking to

Paul watches thoughtfully as Jefferson Elementary students explore plants.

Chris Field [stalwart SEP advocate and volunteer] at Asilomar, and she said she'd set me up. [She told] me when the Kick-Off was, so I came to the Kick-Off and you got my name. The rest is history."

"When I come back to the lab, I'm always completely jazzed up about what I've done."

At first, Paul was more interested in working with high school students than with the lower grades, but now has chosen to spend a second year at Jefferson Elementary School. He explained, "These elementary students are way more receptive to what I would like them to do than any of the high school students I worked with. They'll more or less listen to me when I want to talk; they'll do pretty much what I ask them to; and I don't seem to have very much trouble keeping them on task. It's a complete miracle to me. They're enthusiastic about it, and they seem to have fun while they're doing it, which is extraordinarily satisfying." He further said, "When I come back to the lab, I'm always completely jazzed up about what I've done."

Noting that he is still interested in teaching at a higher level, Paul pointed out that one way to teach more complex science to students who are interested and enthusiastic is to work with the teachers, as he did in the City Science Kit Club program last spring. To continue this work, he has persuaded his Jefferson Elementary School teacher partners, Kathy Loughlin, Carolyn Weiss and Jean MacCormack, to co-present with him a workshop series this spring as part of the City Science professional development program.

Paul reflected about some of the challenges of teaching science, recalling a moment of insight about the goals of science teaching that he had as a student teacher. In telling his science methods instructor about his experiences at an ecology camp, he enthusiastically described how the students had gone out and collected specimens and made measurements in the stream and the forest at the camp. His instructor asked him what they did with their observations and measurements, and a light went on in Paul's head: "Oh yeah! What did you DO with that information! No, [science is] not really just doing all those things; it's PROCESSING the information when you're done with them."

Get Involved in the Partnership!

WHOA! Exciting Opportunities for SFUSD Teachers & Students!!

Want to learn more science activities for your classroom? Help your students improve their teaching skills? Be a scientist in a UCSF lab for the summer? Then read about these upcoming events:

BrainLink Workshops: Once again, Helen Doyle and neuroscience graduate students Kimberly Tanner and Erin Peckol will offer BrainLink workshops—exciting, hands-on, classroom-ready activities on the brain and nervous system for elementary and middle school teachers and students. Workshops and materials are FREE to participants! Where and when? On two Saturdays, March 8 and 22, from 9-2 at UCSF (room TBA). Space is limited, so call Helen at 502-6324 to sign up now!

Lesson Plan Contest: The 10th Annual Lesson Plan Contest deadline is rapidly approaching—written lesson proposals are due on Friday, February 21. MS and HS teachers can sponsor up to three teams of students to prepare and teach a science and health lesson in a real classroom. It's a great learning experience for students, teachers, and UCSF judges, with an added bonus of \$5000 in cash prizes for the top 16 teams! Call Tracy at 502-5137 for application forms and more information.

Summer Internships for Teachers: SEP has two full-time positions for SFUSD teachers to work on research projects at UCSF during the summer. Past interns have investigated human parasites, sperm production in mice, and childhood nutrition among other topics. Internships offer a stipend of \$5000 in addition to a great learning experience in the world of science! To apply, simply send your resume, a cover letter stating why you are interested in an internship, and a letter of recommendation from a professional colleague to Tracy at SEP. Or call Tracy at 502-5137 for more information. Applications are due on Friday, February 28.

SF Base Workshops: High school teachers interested in learning up-to-date activities for their classroom are invited to attend an all-day workshop on PCR (polymerase chain reaction) technology, at the Exploratorium, on February 19. Look for a flier in school mail, or contact Len Poli at 759-2767 for more information.

WHOA! Exciting Opportunities for UCSF Volunteers!!

Looking for a way to get involved in SEP? To serve your community? To work with young people? Just to get out of the lab or library and have fun? Then check these programs:

Internship Program: Need help with your research project? Want a new face in the lab? Want to share your love of science? Then mentor an SFUSD teacher or high school student intern this summer; interns work 20-40 hours per week for 8-10 weeks, and are paid through SEP. Interns are great fun and often very productive in the lab! Contact Tracy at 502-5137 or Helen at 502-6324.

Lesson Plan Contest: visit three SFUSD schools to watch and judge middle and high school students teaching a science or health lesson; requires three school visits over three weeks (<2 hours per visit) and a 1-2 hour judges meeting. Lots of fun and a great learning experience! To judge high school students, contact Tracy at 502-5137; for middle school, contact Helen at 502-6324.

Speakers and Partners: visit an SFUSD classroom once or several times to speak on a variety of health and science topics, including careers in the health professions; requires as much time and effort as you can give. Volunteers needed at all grade levels! Call Tracy at 502-5137 or Helen at 502-6324.

City Science: work with elementary teachers learning exciting, hands-on science activities for elementary school classrooms; for one to two weeks in the summer. Learn about Environments, Landforms, Balls and Ramps, and Seeds and Weeds! Call Margaret at 476-0338.

Equipment and Supplies: donate unused equipment and supplies to San Francisco's schools. Get rid of computers, microscopes, models, petri dishes, etc. Call Roberta at 476-0300 to schedule a pick-up.

High School Mentors at Marshall & Lincoln

Two diverse groups of physicians and basic researchers have volunteered to take time from their busy schedules to mentor students from local high schools.

Chemists & Lincoln HS

Approximately one hundred students from Mr. Jonathan Frank's chemistry classes at Lincoln High School will be able to spend time touring research labs and talking to scientists who use chemistry in their research. These students, in groups of three or four, are visiting UCSF laboratories to interview scientists and discover real-world applications for the knowledge they are pursuing in Mr. Frank's classes. They will then prepare posters to present to the rest of the class so everyone can get an idea of the breadth of health science questions that can be approached with the tools of chemistry.

Many thanks to the following scientists who have agreed to be mentors for these students. Department of Biochemistry and Biophysics: Peter Hwang, Jon Kull, Shane Atwell, Shirleko Dai, Reuben Peters; Depart-

ment of Pharmaceutical Chemistry: Carlos Simmerling, Kathlynn Brown, Toshi Takeuchi, Shauna Farr-Jones, Mary Espanol, Bob Stephenson, and Justin Torpey; Department of Molecular & Cellular Pharmacology: Brinda Govindan, Dara Friedman, Bernice Li, Taroh Iiri, Pablo Garcia and Janine Morales; Department of Stomatology: Paula Ostrovsky; and from Clinical Labs: Jeff Wall.

Clinicians & Thurgood Marshall HS

Another mentoring project has teams of students from Thurgood Marshall High School spending time with UCSF physicians from a variety of fields. Teachers Nicole Nunes and Laurel Reitman have put together a short course entitled "So You Want to be a Doctor?" to provide more information and maybe a reality check for students who are thinking about careers in medicine. The class will learn about diagnosis and disease, what it takes to become a physician, and what kinds of things real doctors do. As part of the course, groups of three or four students will spend a few hours with doctors to

get a feel for what physicians really do. In addition, some of the docs have volunteered to go to the class and take part in a panel discussion on becoming and being a doctor.

Many thanks to the following volunteers who have generously offered to give their time to this project: Dr. Carol Miller and Dr. Jennifer Skillman from Pediatrics; Dr. Eliseo Perez-Stable and Dr. Scott Friedman from Medicine; Dr. Henry Sanchez from Pathology; Dr. Clifford Leoung from Infectious Disease; Dr. Herminia Palacio from the AIDS Clinic; Dr. Enid Neptune from Pulmonology; Dr. Michael Drake from Ophthalmology; and Dean Haile Debas from the Department of Surgery.

Mentoring opportunities such as these are available from time to time at the request of SFUSD teachers. If you are interested in spending a few hours of your time with local high school students, contact Tracy at 502-5137.

MedTeach from p. 1

Andrea Willey is getting a team together to work with Jerry Manker at Visitation Valley MS. Thanks to all the people involved in MedTeach, including Marlon Ramilo, the 2nd year medical student MedTeach Coordinator, and Terri Baldochi in the Medical Student Affairs Office.

Due to the overwhelming demand for MedTeach this year, SEP has tried to accommodate other 6th grade teachers by pairing them with scientists/student partners. A very active partnership has developed between UCSF Staff Research Associate John Flanagan and Roosevelt MS teacher Roona Voorsanger. John visits Roona's class every Thursday, bringing materials from his research lab to share with the students – one day, that included a dead rat to dissect. A partnership between Pharmacy student Dung Nguyen and Presidio MS teacher Lynn Lewis is also beginning. Teachers and UCSF people interested in forming a similar partnership should call Helen at 502-6324.

Genetic Onioneering

This is the first in a series of hands-on science activities you can enjoy with your family, friends, colleagues, and students. In the procedure described below, we're going to extract DNA from living cells and separate it from the other components of the cell using (mostly) common household equipment and materials. If you use the quantities in this protocol, you should be able to make DNA about 20 times (or have 20 students do it at once). Or you can use more of the onion extract and purify fewer but more impressive globs of DNA.

Procedure

1. Dice 1 medium yellow onion into bite-sized pieces.

2. Mix together:

- 85 ml (1/3 cup) water
- 10 ml (2 tsp.) liquid dish detergent
- 5 ml EDTA (0.5 M)
- 1.5 g (1/4 tsp.) table salt-non-iodized is best

3. In a large beaker or jar, cover the diced onions with the solution. Stir. What does this solution do?

a) Recall that both the cell and the nucleus are bounded by membranes made of lipids (fats/oils). The detergent breaks the membranes apart by making the lipids soluble in water, just as detergent breaks down grease on dishes.

b) Cells contain enzymes. Some of these enzymes break down proteins; others break down DNA if it is not protected by the cell's nucleus. Having broken down the nuclear membranes, we've exposed DNA to these enzymes. EDTA is a binding agent that prevents these enzymes from working.

c) The phosphate backbone of DNA molecule has negative charges in solution. These charges repel each other and prevent the molecules from clumping together for extraction. However, when salt dissolves in water, it forms positively charged ions that attach to the charged phosphates of DNA, so that the molecules will clump together.

4. Heat the mixture in a 60° C water bath (hot enough to just barely be able to keep your hand in it, we use a coffee maker to heat water in rooms without sinks or water baths) for 10 minutes, stirring frequently. This step will soften the cell walls and membranes, and further denature (deactivate) DNA-degrading enzymes.

5. Mix the following solution, and set it aside:

- 50 ml (3 Tbs) water
- 3 g (1/4 tsp) meat tenderizer with papain (like *Adolph's*)

6. Cool the onion mixture in an ice water bath for five minutes, stirring frequently. This step will help prevent the DNA from being digested by any remaining enzymes.

7. Pour mixture into a blender. Blend for 1 minute on low speed, then for 30 seconds on high speed. This mechanical action breaks down the weakened cell wall and membranes, releasing the DNA (as well as releasing other parts of the cell, such as proteins.

8. Filter the mixture through a coffee filter in a large funnel, placed over a beaker or jar. This step gets rid of big pieces of cell wall and other insoluble junk.

9. Obtain the following materials:

- 3.5 ml (1/2 tsp.) of meat tenderizer solution
- 15-20 ml (1-1.5 Tbs) of ice-cold ethanol
- 6 ml (just over one tsp) onion filtrate from step 8 in a test tube or small jar

10. Add the meat tenderizer to the onion filtrate, and swirl to mix. This step helps to make our final product pure. Both DNA and many proteins are long, stringy molecules. However, you want to extract only the DNA. Meat tenderizer contains an enzyme called papain (comes from papayas!), which breaks proteins down into short pieces. (How would this tenderize meat?) As luck would have it, papain works in the presence of EDTA, so it will degrade protein molecules in the onion filtrate, leaving the DNA intact.

11. Add ice cold ethanol to the filtrate, and let sit undisturbed for 2 to 3 minutes. Bubbles may form as the other cell components dissolve into the ethanol, and you should see DNA precipitate out as a whitish mass. DNA will NOT dissolve in ethanol, but everything else in the onion filtrate will (lipids, chewed up proteins, etc.).

12. Cap the tube tightly and rock it gently back and forth or swirl the liquids together in the jar. If all goes well, you should see a stringy mass forming in test tube! It will look something like the icky portion of egg white. This is the onion DNA!

What other kinds of DNA could you extract using this procedure?

This protocol was developed by Melinda Mueller and 11th Grade class, Seattle Academy, revised by Nancy Hutchison Science Education Partnership, Fred Hutchinson Research Institute, Seattle Washington, and further revised for this newsletter. If you have ideas for activities to publish in the SEP Newsletter, call Tracy at 502-5137.

Events Calendar

UCSF/SFUSD Holiday, SEP Closed	February 17
Lesson Plan Contest Entry Deadline	February 21
Lesson Plan Contest Presentations	April 7-25
Teacher Summer Internship Applications Deadline	February 28
BrainLink Workshops, Units 1 and 2	March 8, 9 am-2 pm
UCSF Holiday, SEP Closed	March 23
BrainLink Workshops, Units 3 and 4	March 22, 9 am-2 pm
SFUSD Spring Break	March 31-April 4
Triad Project Year-end Event	May 17
UCSF Holiday, SEP Closed	May 26
Last Day of SFUSD Instruction	June 6