

**Results of the 2002-2003  
Science Buddies Mentoring Program  
June 18, 2003**

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# **Executive Summary**

## ***Organization***

The Kenneth Lafferty Hess Family Charitable Foundation is a 501(c)(3) tax-exempt organization founded in 1995. In 2001, the Foundation began its sole operating program: Science Buddies. Science Buddies serves the Bay Area and maintains close ties to all the Bay Area regional science fair associations. Science Buddies is also a member of the Silicon Valley Mentoring Coalition.

## ***Purpose***

Science Buddies empowers students from all walks of life to help themselves and each other develop a love of science and an understanding of the scientific method. Our innovative mentoring program encourages, acknowledges, and rewards student research projects, and aims to increase science fair participation. With the help of our mentors and advisors, we help kids improve their science literacy, and we inspire them to consider additional study or careers in science and engineering.

## ***Program Description***

Science Buddies recruits professional scientists (like Stanford PhDs and NASA engineers) to become volunteer mentors to teams of students working on science research projects (typically science fair projects). Each team consists of a middle school student (called the “Investigator”), a high school student (called the “Mentor”), and a scientific or engineering professional from the community (called the “Advisor”). The goal of the team is to help the middle school student complete a science fair project. Mentors provide the first line of assistance to the younger student. Advisors provide deeper expertise, introduction to careers in science, and inspiration to both students. Participants interact over a 12- to 14-week period in the Science Buddies online mentoring environment, called the “Command Center”. The site is password protected and secure, ensuring that only participants, teachers, parents and program staff can access the students’ work and view their discussions. Program staff members supervise interaction between students and mentors. The Command Center is set up in the style of an online bulletin board system but enhanced specifically for mentoring and preparing a science fair project. It includes features such as a personalized and structured home page for each student team, team progress tracking, archives of completed assignments, and e-mail alerts to make it easy for team members to give timely responses.

Without burdening teachers, Science Buddies adds an element of challenge and excitement to their science curriculum. It offers the opportunity for our local students to personally interact with some of the brightest scientists and engineers in our region. Indeed, the program gives such professionals a convenient way to make a personal impact on improving science education for local students. With all the cutbacks in school budgets and programs, Science Buddies offers a way for a science teacher to get help directly from the community in a program that is centered around a proven technique for helping students learn science skills and learn to love science: hands-on experiments. Science Buddies offers local students a way to raise the level of their work to be on a par with students in the top schools in the state and the top entrants to state and national science competitions.

## ***Summary of the 2002-2003 Program Year***

The 2002-2003 Science Buddies program represented phase 2 of a two-year pilot study of the online science fair mentoring model conceived and developed by founder Ken Hess. After the success of the first pilot in 2001 with only 81 participants, the Science Buddies team was eager to test the program out on a much wider scale. We accomplished this goal by recruiting, training, and assigning 735 participants to teams (288 middle school Investigators, 221 high school Mentors, and 226 adult

Advisors)—a nine-fold increase over our first year. Science Buddies had many additional accomplishments during its second program year:

- 256 Investigators finished their projects, surpassing our objective and a fifteen-fold increase over the first year when 17 students completed their project.
- Seven participants competed at the California State Science Fair in Los Angeles, two Investigators and five Mentors.
- Three of our Mentors competed at the highest level of science fair competition, the Intel International Science & Engineering Fair held this year in Cleveland, Ohio. Only 30 projects from California qualified for this fair, so Science Buddies Mentors represented 10% of the entire California delegation.
- Surveys of our participants showed a high degree of satisfaction. 93% of our Investigators, 95% of our Mentors, and 94% of our Advisors expressed a willingness to participate again.
- In spite of the bleak economic climate, we enlisted 13 corporate sponsors.
- We designed, tested, and implemented our Command Center online mentoring environment, a state-of-the-art system that will serve us for years to come.
- We implemented the first phase of an assessment program to evaluate how much our participants learn from the experience of being a Science Buddies Investigator.
- Our lean organization operated at a much lower cost per student than other prominent mentoring organizations. Our costs were less than 20% of a well regarded, in-person mentoring organization and less than 70% of another online mentoring organization (neither operates in the area of science fairs).
- Ken Hess made presentations at the Intel International Science & Engineering Fair, the California State Science Fair, the American Association for the Advancement of Science—Pacific Division, and the California Science Teachers Association to solicit partners and increase knowledge of our program.
- We have evaluated the results of this program year and made plans for a number of improvements.

In the following pages, we report in greater detail the challenges, accomplishments, results, and feedback about the 2002-2003 program. Overall, the program was a great success. Though we made a few mistakes and experienced some problems, we were able to execute the program completely and meet our major goals. In the process, we learned a lot. We are excited to embark upon the 2003-2004 season and implement our many ideas for improvement.



**Mentor Darwin Damba at the Synopsys Silicon Valley Science and Technology Championship.**

# Overview of the Program Conducted

## Recruiting & Screening

For the 2002-2003 program year our recruiting goals for Investigators and Mentors were:

1. Obtain enough participants to insure that 250 to 300 teams would complete their project. This number would give a good test of the strengths and weaknesses of our new Command Center as well as our program management organization.
2. We wanted the Investigators to represent a true cross-section of the greater Bay Area community: geographically, ethnically, and socio-economically (including Investigators from underserved communities).
3. We wanted a good balance among the different grade levels for both our middle school and high school participants.

We screened the teachers of the Investigators for commitment, responsiveness, and the other criteria listed above.

If a prospective Mentor met our basic requirements for science education, we relied on our online training and qualifying test as a screen.

For our adult Advisors we required a science or technical undergraduate degree. In addition, every Advisor had to pass a background check performed by the firm VolunteerSelect, a division of ChoicePoint, and complete our online training.

**Table 1. Summary of Recruiting & Screening (see Participating Schools & Employers for additional info)**

	Investigators		Mentors		Advisors	
	Count	% Apps	Count	% Apps	Count	% Apps
Applicants	416	1.00	262	1.00	241	1.00
Rejected	76	0.18	0	0.00	2	0.01
Failed "hurdle" step (topic selection, training)	52	0.13	41	0.16	13	0.05
Total assigned to a team	288	0.69	221	0.84	226	0.94
Removed from program	4	0.01	2	0.01	4	0.02
Voluntarily dropped out	8	0.02	5	0.02	12	0.05
Active status at end of program	276	0.66	214	0.82	210	0.87
		% of Active		% of Active		% of Active
Public school	138	0.50	183	0.86		
Private school	138	0.50	28	0.13		
Charter school	0	0.00	3	0.01		
Male	113	0.41	72	0.34	134	0.64
Female	162	0.59	142	0.66	76	0.36
6th Grade	89	0.32				
7th Grade	86	0.31				
8th Grade	100	0.36				
9th Grade			12	0.06		
10th Grade			51	0.24		
11th Grade			101	0.47		
12th Grade			50	0.23		
Previous Fair Experience	121	0.44	157	0.73		
Average GPA (math/sci only for Investigators)	3.49		3.80			

## ***Training***

We experimented with online training of Mentors and Advisors, and we found that it worked extremely well. Online training is more convenient for participants since they can do it at a time of their choosing, and less expensive for Science Buddies since once the training is in place there is very little staff time required. A staff member or the teacher performed Investigator training in person.

## ***System Development***

During the summer and fall of 2002 we developed a single, integrated system for the Science Buddies program. Based on the premise that all data should be stored in a single repository, a MySQL open source database running on a shared host is the heart of our new system. PHP and the Smarty templating system provide online access and interactivity. This system provides the following functions:

- Online applications for Investigators, Mentors, and Advisors
- Online training and qualification exams
- The Command Center mentoring environment which includes a bulletin board, project timeline, automated e-mail notification of team activity, assignment mailbox, and assignment evaluation
- Management reporting
- Post-program surveys and assessment

The system debuted in November 2002, met our expectations, and with a capacity of over 10,000 participants will serve as the Science Buddies foundation for several years to come.

## ***Monitoring & Reporting***

Since the MySQL database contains all communications among participants, as well as all Investigator assignments, the system generates management reports with ease. These reports enable staff to evaluate the responsiveness of all participants in real time.

## **Program Evaluation**

### ***Program Results & Statistics***

#### **Key Goals & Results**

We started the year with the objective of having 250 Investigators complete their science fair project, and we achieved this goal with 256 Investigators actually finishing their work. This compares with 17 students who finished their project in the first pilot year, a fifteen-fold increase.

Based on many changes we made, other measures improved substantially from the first pilot year. The rate of project completion went from 50% to 89%, and the number of students who did not engage dropped from 50% to 19%. However, the number of minimally or unengaged students is still far too high, and we have plans to improve it.

While Mentors did not do their own science fair project as part of the Science Buddies program, a number of them did so on their own with great success. In fact, 10% of our Mentors won an award at city/county science fairs, five of them reached the California State Science Fair in Los Angeles, and three participated in the Intel International Science & Engineering Fair (ISEF) held in Cleveland this year. Those three participants represent 10% of the entire California delegation to ISEF, a real testament to the quality of our Mentors. We were so impressed with the quality and dedication of our Mentors that we intend to develop programs that support these students with assistance for research projects, help

finding internships, and the like. This year we offered a practice judging session to help Mentors prepare for the California State Science Fair.

One disappointment was the small number of Investigators entering city/county-wide science fairs (as compared to school science fairs). The higher level fairs offer students a chance to meet others with the same interests, compare their work to others, win prizes, and progress to even more prestigious fairs. They also offer a hook to keep students involved in science through high school. Consequently, we will be making a major effort to increase the number of students that enter these fairs.

**Table 2. Science Fair Results**

Science Fair Results	Investigators		Mentors		Advisors	
	Count	% of Active	Count	% of Active	Count	% of Active
Completed project (Note 1)	256	0.89				
Entered city/county-wide science fair (Note 2)	20	0.07				
Won an award at city/county-wide fair	9	0.03	23	0.10		
Reached regional fair	1	0.00				
Competed at California State Science Fair	2	0.01	5	0.02		
Competed at Intel International Science & Engineering Fair			3	0.01		
Level of Engagement (Note 3)						
Never engaged (0 postings)	15	0.05	20	0.09	18	0.08
Minimally engaged (1-10 postings)	84	0.31	41	0.19	54	0.24
Highly engaged (>10 postings)	177	0.64	160	0.72	154	0.68
Average number of postings	21.0		13.8		12.9	

Note 1: An Investigator did not need to be an "actively engaged" participant in order to finish his or her project.

Note 2: The majority of participants entered school science fairs rather than city/county science fairs.

Note 3: Level of Engagement is an indicator of whether participants actively and productively communicated with teammates, measured by the count of messages and assignments posted. The large number of Investigators who minimally or never engaged can be traced to four specific schools where the teacher did not "push" to make sure students met their commitments. To be highly engaged, a participant had to initiate a minimum of 11 postings. Some participants exceeded 100 postings.



**Mentor Pamela Tien, Advisor Bob Hill, and Science Buddies Director of Development Courtney Corda compare notes at the Synopsys Silicon Valley Science and Technology Challenge.**

## Pre & Post Tests

We experimented with a science knowledge and appreciation assessment for the first time this year. This exam measured knowledge of the scientific method and experimental procedures, as well as interest in learning more about science and technology. Because the assessment was developed after the program had already started for many participants, we have pre- and post-assessment data for only 76 students.

The assessment showed that students improved their knowledge of the scientific method during the course of the program, with 72% of students scoring 75 or higher after the program, compared to only 45% at the start of the program. Girls made the greatest improvement with 72% scoring 75 or higher at the end of the program, up from only 33% before. The average score during the pre-assessment was 68% compared to 77% in the post assessment.



Investigator Melissa Poon at the Synopsys Silicon Valley Science and Technology Championship.

## Summary of Participant Surveys

### Investigators

Sixty-five percent of all Investigators completed a survey at the conclusion of the 2002-2003 program year. The survey measured overall satisfaction as well as desired areas of improvement. The table below summarizes some key responses:

**Table 3. Selected Investigator Survey Responses**

Question	Response
My Mentor & Advisor helped me the most on my project? [Compared to teachers, parents, other.]	42% Yes overall 31% among 6th graders 58% among 8th graders
What part of your project was the most fun?	53% "Performing my experiment"
What part of your project was the hardest?	27% "Deciding on my question" 26% "Writing a review of literature"
What part of your project was the most educational (you learned the most)?	37% "Writing a review of literature"
What was the best thing about the Science Buddies program?	"The help I received"
What was the worst thing about the Science Buddies program?	"The schedule, the workload"
Would you participate in Science Buddies again?	93% Yes or Maybe
Would you recommend Science Buddies to a friend?	94% Yes or Maybe

### Mentors & Advisors

Thirty-nine percent of all Mentors and Advisors completed an online survey at the conclusion of the 2002-2003 program year. The survey measured overall satisfaction as well as desired areas of improvement. There was very little difference between the responses of Mentors (high school students) and Advisors (adult science & technology professionals). The table below summarizes some key responses:

**Table 4. Selected Mentor Survey Responses**

Question	Mentors 2001 – 2002	Advisors 2001- 2002	Mentors 2002 - 2003	Advisors 2002- 2003
Why did you sign up for Science Buddies?				
Enjoy science	75%	--	70%	78%
"Give back" to the community	50%	--	74%	82%
Fun	100%	--	81%	78%
Enjoy young people	--	--	83%	80%
Help on college apps	58%	--	70%	--
Would participate again	92%	100%	95%	94%
Would recommend Science Buddies to a friend	92%	100%	92%	89%
How much time did you spend on average?	80 min/wk	107 min/wk (Note 1)	78 min/wk	55 min/wk
Skill level of Investigator greater than expected	--	--	13%	11%

<b>Question</b>	<b>Mentors 2001 – 2002</b>	<b>Advisors 2001- 2002</b>	<b>Mentors 2002 - 2003</b>	<b>Advisors 2002- 2003</b>
Skill level of Investigator less than expected	--	--	35%	41%
Science Buddies training was adequate	--	--	81%	87%
Investigator's project was better than it would have been w/o your help?	58% yes	67% yes	87% yes or maybe	85% yes or maybe
Overall experience	--	--	3.7 on 5.0 scale	3.5 on 5.0 scale

Note 1: All Advisors had more than one team during the 2001-2002 program.

## ***Other Feedback***

"Thanks for all your motivation and ideas that you gave me to succeed in this science project. At first, I thought that science projects were boring and I saw it as another dull assignment that I have to do for class. But you guys made it fun and I actually wanted to work on my science fair project each day after I got [home] from school. I couldn't have done it without all your help. Thank you." — An award-winning Investigator's message to his teammates.

"I want to thank you for the Mentor Scholarship and the opportunity to work with my middle school student. It was a satisfying and great experience for me (and I'm sure for my investigator too). Keep up the program and rewarding the students! It's so exciting to have your work recognized. Motivation to excel is priceless." — Thank you note from a Mentor.

"Without the program, it would have been impossible for [my son] to do a science fair project. The structure and guidance provided by the program were invaluable. [My son] has had a difficult school year, battling major depression and other challenges. He is interested in almost nothing and comfortable in almost no situation. His teammates were enthusiastic in their efforts to engage him in the project and expand his horizons... I know he felt a tremendous sense of accomplishment. I particularly appreciated the deadlines, the online explanations and samples and the responsiveness of the [Mentor and Advisor]." — Parent of an award-winning Investigator.

"Thank you very much for this scholarship award. It was entirely unexpected and very much appreciated. Since yours was the first scholarship I received, it is very special to me. I entered into Science Buddies with the intent to share my experience in doing science fair projects (my elementary school required that we do them, so I have done a total of 9 science fair projects throughout elementary, middle, and high school). I feel very honored to receive the Outstanding Mentor Award and scholarship. Once again, thank you very much and please share my thanks with the members of the Kenneth L. Hess Family Foundation." — Thank you note from a Mentor.

# Student Awards & Recognition

## Science Buddies Awards to Investigators

Grand Prize winners received \$50 from our three largest sponsors: Synopsys, Applied Biosystems, and Fresh Express. Each Outstanding Investigator received a \$25 gift certificate from Old Navy, sponsored by Gap, Inc., and a certificate from Science Buddies. Each Honorable Mention Award winner received a certificate from Science Buddies. All other participants who completed their projects received Science Buddies Certificates of Appreciation in recognition of the time and effort they put into their projects.

<b>A. P. Giannini Middle</b>	Zachary Goodman (Team Joliot-Curie)	Grand Prize Winner
<b>Bohannon Middle</b>	Amy Zhang (Team Leeuwenhoek)	Outstanding Investigator Award
<b>Lawton Elementary</b>	Ben Lewin (Team Fahrenheit)	Outstanding Investigator Award
<b>Mendenhall (William) Middle</b>	Rebecca Fortelka (Team Ray)	Outstanding Investigator Award
<b>Pacific Collegiate Charter School</b>	Diana Tordoff (Team Archimedes)	Honorable Mention Award
<b>Piedmont Middle</b>	Alexander Glanville (Team Mandelbrot)	Honorable Mention Award
<b>Russell (Thomas) Middle</b>	Kathryn Daniels (Team Barrow)	Honorable Mention Award
<b>St Mary School</b>	Charlotte Moose (Team Hess)	Outstanding Investigator Award
<b>St. Victor Elementary School</b>	Adrian Tan (Team Mottelson)	Honorable Mention Award
	Alexandra Tee (Team Salam)	Honorable Mention Award
	Alexis Bustos (Team Newton)	Honorable Mention Award
	Andrew Strawbridge (Team Penrose)	Honorable Mention Award
	Andy Pham (Team Pascal)	Outstanding Investigator Award
	Angelica Mata (Team Rainwater)	Outstanding Investigator Award
	Carlea Luna (Team Riemann)	Outstanding Investigator Award
	Carolyn Ho (Team Snow)	Outstanding Investigator Award
	Chris Milan (Team Stark)	Grand Prize Winner
	Corinne Wolf (Team Rohrer)	Honorable Mention Award
	Derrick Emperador (Team Millikan)	Honorable Mention Award
	Jency Butler (Team Siegbahn)	Outstanding Investigator Award
	Jeremy Jimenez (Team Nicholas)	Honorable Mention Award
	Jeri Canlas (Team Maxwell)	Grand Prize Winner
	Jessica Cizdziel (Team Mayer)	Honorable Mention Award
	Joseph Lee (Team Oppenheimer)	Outstanding Investigator Award
	Nicholas Bui (Team Perrin)	Outstanding Investigator Award
	Nicole Ramirez (Team Paul)	Outstanding Investigator Award
	Riwana Totah (Team Schawlow)	Outstanding Investigator Award
	Stephanie Rodriguez (Team Rohrer)	Honorable Mention Award
	Sylvie Dao (Team Szilard)	Outstanding Investigator Award
	Tammey Nguyen (Team Rainwater)	Outstanding Investigator Award
	Tiffany Lorica (Team Riemann)	Outstanding Investigator Award
<b>Vallejo Middle</b>	Meghan Gibson (Team Steinberger)	Honorable Mention Award
<b>Valley Christian Jr. High School</b>	Amanda Baker (Team Giaever)	Outstanding Investigator Award
	Bernard Chiu (Team Gibbs)	Outstanding Investigator Award
	Boris Taratutin (Team Lobachevsky)	Outstanding Investigator Award
	Larry Lin (Team Hopper)	Honorable Mention Award
	Lauren Venosta (Team Hittorf)	Honorable Mention Award
	Melissa Alvey (Team Gesner)	Outstanding Investigator Award
	Michael Sherwood (Team Lubbock)	Outstanding Investigator Award
	Robert Norman (Team Chadwick)	Honorable Mention Award

## Science Buddies Awards to Mentors

Outstanding Mentor Award Winners each received a \$300 scholarship sponsored by Dr. Lewis T. Williams and the Hess Family Foundation. Each Honorable Mention Award winner received a certificate from Science Buddies. All other Mentors received a Certificate of Appreciation to thank them for volunteering with Science Buddies.

<b>Organization</b>	<b>Student Name</b>	<b>Award</b>
<b>American High</b>	Tsun Au Yeung	Honorable Mention Award
<b>Bellarmino College Prep</b>	Matthew Durstenfeld	Outstanding Mentor Award
<b>Burlingame High</b>	Yukiko Isoya	Honorable Mention Award
	Olga Mukha	Honorable Mention Award
<b>California High</b>	Deborah Banner	Outstanding Mentor Award
	Leslie Tonjes	Outstanding Mentor Award
<b>College Preparatory School</b>	Eric Baxter	Outstanding Mentor Award
	Daniel Cohen	Outstanding Mentor Award
	Katherine Romer	Outstanding Mentor Award
<b>De La Salle High</b>	Sean McCreery	Outstanding Mentor Award
<b>El Cerrito Senior High</b>	Amy Gonsalves	Outstanding Mentor Award
	Jennifer Hirsh	Honorable Mention Award
	Ian Umemoto	Honorable Mention Award
<b>Georgiana Bruce Kirby Preparatory High</b>	Cassidy Clawson	Honorable Mention Award
<b>Hillsdale High</b>	Kanako Nakashima	Honorable Mention Award
<b>Redwood High</b>	Cassandra Heron	Honorable Mention Award
	Alicia Mastromonaco	Honorable Mention Award
<b>Saratoga High</b>	Grace Hsu	Outstanding Mentor Award
<b>Silver Creek High</b>	Alex Cheng	Honorable Mention Award
<b>Stevenson School</b>	Amber Hess	Outstanding Mentor Award
	Deanna Chan	Honorable Mention Award
<b>Tamiscal High</b>	Sara Westin	Honorable Mention Award
<b>Tennyson High</b>	Thanh Le	Honorable Mention Award
<b>Valley Christian Schools</b>	Daphne Ngo	Outstanding Mentor Award
<b>Woodside Priory School</b>	Jesse Lampert	Honorable Mention Award

## City and County Science Competition Winners

Sophia Chan, Investigator from Team Bardeen (Mentor-Tiffany Chiu, Advisor-Shannon Sullivan)  
"Who does better on tests, visual or auditory learners?"  
San Francisco / Randall Museum Science Fair  
- Honorable Mention, Behavioral Science

Kathryn Daniels, Investigator from Team Barrows (Mentor- Janet Shih, Advisor-Genetha Gray)  
"Soft vs. Hard: Which Type of Wood Holds the Most Weight?"  
Synopsis Silicon Valley Science and Technology Championship  
- First Place in Category - Intel Microscope  
- 1st Place Award - \$75 Cash, American Society of Civil Engineers  
- 2nd Place Award - \$75 Cash, SAMPE - Society for the Advancement of Material and Process Engineering  
- Certificate of Achievement and VIP Tour of NASA, NASA Ames Research Center

Rebecca Fortelka, Investigator from Team Ray (Mentor-Jodie Cheng, Advisors-Elizabeth Jeffords, Henry Guo)  
"What types of wood would make the strongest tray for handicapped people?"  
Livermore Science Odyssey  
- 3rd Place

Rebecca Hidalgo, Investigator from Team Agassiz (Mentor-April Sun, Advisor-Jacqueline Brooks)  
"Does guided imagery have a biological effect on a person's heart rate?"  
San Francisco / Randall Museum Science Fair  
- 4th Place, Life Sciences

Stephen Hom, Investigator from Team Aston (Mentor-Hanley Chan, Advisor-Rod Bell)  
"Which laundry detergent removes stains the best?"  
San Francisco / Randall Museum Science Fair  
- Honorable Mention, Behavioral Science

Ben Lewin, Investigator from Team Fahrenheit (Mentor-Dan Baum, Advisor-Josef Frisch)  
"What is/are the stored energy/calories of various foods?"  
San Francisco / Randall Museum Science Fair  
- 3rd Place Physical Science  
San Francisco Bay Area Science Fair  
- 3rd Place Physical Science

Elise Siegel, Investigator from Team Bloch (Mentor-Stephanie Dewald, Advisor-Ellen Ackerman)  
Monterey County Science & Engineering Fair  
"Getting the Dirt on Hydroponics: Which Method of Growth is More Effective?"  
- 3rd Place Plant Biology

Cristen Andrews, Mentor  
"The Crusade Against Propioni Bacterium"  
Tri-Valley Science & Engineering Fair  
- 2nd Place Team Projects

Monica Aranda, Mentor  
"Cancer Cells vs. Normal Cells"  
Tri-Valley Science & Engineering Fair  
- Honorable Mention Team Projects

Sylvia Aranda, Mentor  
"Using 16S DNA Sequencing to Determine the Phylogeny of Three Selected Species of Nudibranchs"  
Tri-Valley Science & Engineering Fair  
- 1st Place Team Projects

Ashley Bleile, Mentor  
"Bioterrorism and Our Water Supplies"  
Tri-Valley Science & Engineering Fair  
- 2nd Place Team Projects  
- Special Award

Jamie Bufkin, Mentor  
"The Crusade Against Propioni Bacterium"  
Tri-Valley Science & Engineering Fair  
- 2nd Place Team Projects

Darwin Damba, Mentor  
"Experimental Analysis of the Photoelectric Effect"  
Synopsis Silicon Valley Science and Technology Championship  
- Second Place in Category  
- Certificate of Merit, International Society for Optical Engineering  
- Honorable Mention for Technical Paper

Matthew Durstenfeld, Mentor  
"The Effect of Increased Voltage and Current on the Speed and Torque of an Electric Motor"  
Synopsis Silicon Valley Science and Technology Championship  
- Second Place in Category

Athena Fong, Mentor  
"The Effect of Tannic Acid on Bones"  
Synopsis Silicon Valley Science and Technology Championship  
- First Place in Team Category - \$25 Cash

Ankita Iyer, Mentor  
"Alcohol Induced Cell Suicide"  
Tri-Valley Science & Engineering Fair  
- 2nd Place Biochemistry  
- Special Award

Joan Khuu, Mentor  
"Fatty Fries"  
Synopsis Silicon Valley Science and Technology Championship  
- Certificate of Achievement, U.S. Department of Health and Human Services

Michael Nguyen, Mentor  
"Biomimicking Fish: A Quieter Submarine Using A Memory Alloy"  
Synopsis Silicon Valley Science and Technology Championship  
- One Year Subscription to Scientific American, Scientific American

Bayan Parsa, Mentor  
"The Effect of Lipopolysaccharide on Human Glial Cells"  
Tri-Valley Science & Engineering Fair  
- 1st Place Team Projects

Fiona Scott, Mentor  
Marin County Science Fair  
- 3rd Place Grade 11, Environmental Science

Christine Sutu, Mentor  
"The Effects of Medicine on Eczema"  
Tri-Valley Science & Engineering Fair  
- Honorable Mention Team Projects

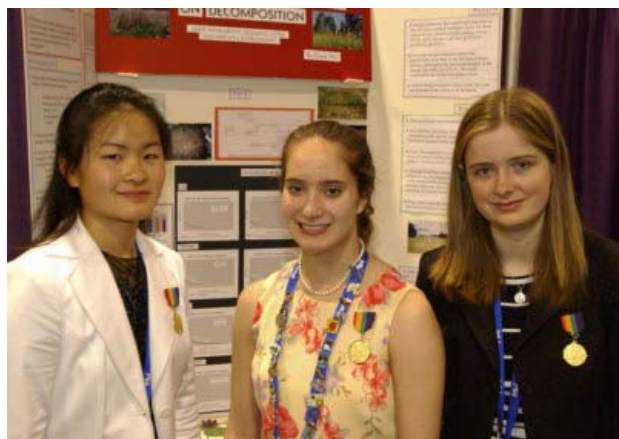
Pamela Tien, Mentor  
"Observation of Ion Diffusion Within Saline Solutions and Columns"  
Synopsis Silicon Valley Science and Technology Championship  
- First Place in Category - \$50 Cash  
- \$100 Cash award, San Jose State University Student Affiliates of the American Chemical Society  
- Book and Certificate, Promethium Chapter of Iota Sigma Pi

Matthew Tolentin, Mentor  
"A Memory Altered"  
Tri-Valley Science & Engineering Fair  
- 3rd Place Team Projects

Tawan Udtamadilok, Mentor  
"Patterned Co-expression of Gene Neighbors in Multiple Organisms"  
Tri-Valley Science & Engineering Fair  
- Special Award

## State and National Science Competition Participants & Winners

Seven Science Buddies participated at the highly competitive California State Science Fair in Los Angeles, where less than 15% of participants win awards.



Standing left to right, Grace Hsu, Amber Hess, and Genevieve Mount competed in Cleveland, Ohio, at the Intel International Science and Engineering Fair (ISEF), often known as the Olympics of science fairs. These Science Buddies Mentors qualified for the fair by winning the grand prize at the Santa Clara County, Monterey County, and Santa Cruz County Science fairs, respectively. The gold medal on their left lapel signifies that they are one of the 1300 ISEF participants from around the world, competing for approximately \$3 million in cash prizes and scholarships. These Science Buddies Mentors represented 10% of the California delegation of 30 projects at the fair. Interestingly, Grace and Amber also won Science Buddies' own Outstanding Mentor Award for their work helping their middle school Investigator.

Amy Kroll, Investigator from Team Marconi (Mentor-Deanna Chan, Advisor-Laura Kovalek)

"How Effective is Lettuce as a Bioassay Medium for Determining the Toxicity of Water Contaminants?"

Monterey County Science & Engineering Fair

- Pacific Grove Museum of Natural History Award

- 1st Place Plant Biology

- Junior Division Grand Prize

California State Science Fair in Los Angeles

- Participant

Melissa Poon, Investigator from Team Hyatt (Mentor- Krystina Baldwin, Advisor-Jaime Handelsman)

"Solar Energy: The DC of Panels at Different Angles"

Synopsys Silicon Valley Science and Technology Championship

- 1st Place in Category - Intel Microscope

California State Science Fair in Los Angeles

- Participant

Amanda Berry, Mentor for Team Mulliken

"Optimal Alkalinization to Potentiate the Duration of Bupivacaine Spinals"

Monterey County Science & Engineering Fair

- 1st Place Biochemistry/Microbiology

California State Science Fair in Los Angeles

- Participant

American Association for the Advancement of Science-84th Annual Meeting of the Pacific Division

- Invited poster presentation

Amber Hess, Mentor for Team Maxwell (with advice on her own project from Team De Gennes Advisor Geoff Dreyer)

"Organic Chemistry without Solvents"

Monterey County Science & Engineering Fair

- Certificate of Achievement, United States Army

- Fleet Numerical Oceanography Center Award

- 1st Place Chemistry

- Senior Division Grand Prize

California State Science Fair in Los Angeles

- Honorable Mention in Senior Division Chemistry

Intel International Science & Engineering Fair in Cleveland, Ohio

- Eastman Kodak Company, 2nd Place award of \$500 for the best use of photography to gather data, solve a problem, or to clearly explain the essence of a science project.

American Association for the Advancement of Science-84th Annual Meeting of the Pacific Division

- Best Poster Award

- 3rd Place Presentation, Non-biological Sciences

Grace Hsu, Mentor for Team Ramsey

"The Effect of Global Change on Decomposition: Light Availability, Standing Litter, and Growth Environment"

Synopsys Silicon Valley Science and Technology Championship

- Intel Excellence in Environmental Health and Safety Award, \$200

Cash Award plus a Certificate and a Memento

- Certificate of Achievement and VIP Tour of NASA, NASA Ames Research Center

- Certificate of Achievement, United States Army

- California Association of Professional Scientists, Plaque and a \$100 Savings Bond

- First Place in Category - \$50 Cash

- Grand Prize - Best of Championship - Biological Sciences

Intel International Science & Engineering Fair in Cleveland, Ohio

- Fourth Award in Environmental Sciences - \$500

- Agilent Technologies, paid summer internship

- American Society for Horticultural Science, First Award of \$1,000 in Environment

Megan Li, Mentor for Team Ray

"Screening for Regulatory Elements of Rapamycin-induced Mep2 Gene Transcription"

Synopsys Silicon Valley Science and Technology Championship

- First Place in Team Category - \$25 Cash

- First Place Award - \$100 cash, American Society of Pharmacognosy, Northern CA Section

- Grade 11 or 12 team - \$250 cash, Genencor Biotechnology Award

- Grand Prize Alternate - Biological Sciences

California State Science Fair in Los Angeles

- Participant

Genevieve Mount, Mentor for Team Reaumur

"Aphid Populations and How they Relate to Plant Height, Parasites and Predators"

Santa Cruz County Science Fair

- 1st Place Senior Division Zoology

- Senior Division Grand Prize

California State Science Fair in Los Angeles

- Participant

Intel International Science & Engineering Fair in Cleveland, Ohio

- Participant

Steven Young, Mentor for Team Gay-Lussac

"How Does the Distance Between Two Super Magnets in a Magnetohydrodynamic System Affect the Overall Thrust?"

Synopsys Silicon Valley Science and Technology Championship

- First Place in Category - \$50 Cash

- 1st Place Award - \$35 Cash, United States Metric Association

- Second Place Technical Paper

California State Science Fair in Los Angeles

- Participant

## Fundraising Summary

Science Buddies is the sole program of the Kenneth Lafferty Hess Family Charitable Foundation which has itself provided major start-up funding for the program. In addition to funding from the Hess Family Foundation and from a few private individuals, Science Buddies has received many grants from local companies.

Science Buddies first began its development program in May of 2002. The fundraising strategy for the 2002-2003 program was to prioritize seeking support from local companies over other possible sources of funding. One reason this approach made sense was that we were already building relationships with local companies because they are a primary source of adult volunteers for the program. Another reason we put more emphasis on corporate giving was that the time and effort required to research and write grant proposals for governmental sources of funding was too great for our limited development staff (one part-time person) to accomplish this year, especially considering how few applicants are actually awarded such grants.

This strategy of focusing on corporate giving was successful in spite of the dismal economy. Most companies we approached were very enthusiastic about the Science Buddies mentoring model and were helpful in publicizing our volunteer opportunity among their employees. The following 13 companies also sponsored the program with grants:

- Actuate
- Affymetrix
- AMD
- Applied Biosystems
- Beckman Coulter
- Bio-Rad
- Fresh Express
- Gap Foundation
- Oracle
- Intel
- Seagate
- Sybase
- Synopsys

For 2003-2004, Science Buddies will still actively seek funding from local companies and private foundations interested in science education. Yet in 2003-2004, the fundraising strategy will also include the development of a base of individual donors (through both a traditional annual campaign and a major gift campaign) and an increase in the effort devoted to researching governmental partnerships and grants. Now that the development program has been underway for a year and now that we have established corporate partners, there will be more time and resources available for pursuing other potential funding sources.

The Hess Family Foundation has pledged to support the balance of the program's operating costs that are not met by grants from corporate and private donors in the 2003-2004 academic year. In this sense, we have a stable financial safety net that ensures we can successfully execute our program. But it is important that in 2003-2004 we raise the level of support coming from outside the Foundation in order to ensure the future of Science Buddies.

The Hess Family Foundation is a private foundation with 501(c)3 status. In 2003, the Hess Family Foundation plans to transition Science Buddies to public benefit corporation status (a category of charity under the IRS tax code that differs slightly from private foundation). This status change will open up new funding opportunities since many private and governmental grantmakers exclude private foundations from grant eligibility.

## Calendar Year 2002 Financial Summary

Science Buddies is a very lean organization. The president, Ken Hess, takes no salary, and all other employees operated from home offices during calendar year 2002, keeping overhead expenses at an absolute minimum. Our efficiencies allowed us to operate at an expense level (after deducting nonrecurring startup expenses) of just \$455 per student assigned to a team. As a point of comparison, the per student cost of an in-person mentoring program such as Big Brothers Big Sisters is in the range of \$2,500. MentorNet, an online mentoring organization for females pursuing technical careers operated at an average cost of \$639 per student, even though it is now in its sixth year of operation.

By capitalizing on economies of scale and continuing to make improvements in operating procedures, we expect to be able to make significant reductions in the per student cost over the next several years. We also anticipate that positive word-of-mouth will reduce our recruiting expenses as we move forward.

**Table 5. Calendar Year 2002 Expenses**

<b>Category</b>	<b>Expense</b>	<b>Comments</b>
<b><i>Operating expenses</i></b>		
Employee wages, taxes, & benefits	\$228,028	
Software development expenses	\$ 53,030	
Other professional fees	\$ 13,470	Legal, accounting, graphic design, administrative
Printing & mailing	\$ 7,367	
Telephone, photocopying, & office supplies	\$ 3,940	
Internet expenses	\$ 1,817	
Miscellaneous	\$ 9,254	
Total	\$316,906	
<b><i>Less</i></b>		
Nonrecurring startup expenses	(\$ 85,070)	Software development, 1/3 of fundraising expenses, logo development
<b><i>Total ongoing operating expenses</i></b>	<b>\$231,836</b>	
per Student applicant	\$342	678 students applied to be Investigators & Mentors
per Student assigned to a team	\$455	509 students were assigned to a team
per Student completing program	\$473	490 students completed the program

Note: Data for Big Brothers Big Sisters of San Francisco and the Peninsula at [http://www.sf-bbbs.org/6\\_result.htm](http://www.sf-bbbs.org/6_result.htm) and data for MentorNet is at <http://www.mentornet.net/Documents/About/Organization/growth.html> (\$1,800,000 operating budget divided by 2,816 students = \$639 per student).

## **Conclusions & Implications for Next Year**

### ***The Teacher's Role***

If we have learned anything in our first two years, it is that an adult must hold an Investigator's feet to the fire. Any worthwhile science project takes enough effort over a long enough period of time that virtually every participating middle school student needs a "push" at some time during the process. That push can come from a parent, but more often than not it comes from a teacher. Within that context, the strength of the Science Buddies mentoring program is its ability to make a good teacher better. We can enable an individual with good teaching skills, but a weak science background, to provide a world class science fair experience for his or her students. We can enable a teacher with strong science skills to support a larger number of students than otherwise possible. And, in an environment where increasing demands on teachers' time are causing many good teachers to drop science fairs, we can offer productivity improvements that allow science fairs to remain part of the curriculum. In any of these cases, the Investigator gets a much richer experience than would otherwise be possible.

Recognizing the importance of the teacher's role, we have already implemented in our recruiting for next year a "teacher contract" that outlines the responsibilities of both Science Buddies and the participating teacher. This simple two-page agreement will insure that everyone is on the same page with regard to a variety of issues that arose during the past year, especially those involving Investigators that never engage. It also commits the teacher to encourage student participation in city and county science fairs, an area where we are looking for substantial increases over last year. We involved our existing teachers in the preparation of the agreement, and so far, it has met with universal acceptance.

### ***Student Ethics & Responsibilities—An Investigator's Code***

At one school where students were adept computer users, we encountered significant plagiarism in about 5% of the student projects. We turned these cases over to the teacher. For the coming year we have developed an Investigator's Code which addresses plagiarism, falsification of results, and general expectations about appropriate, respectful, and responsive behavior in the Command Center. All participating teachers agree to help us teach and uphold these ideals, and Investigators who do not honor the code will be dismissed from the program.

### ***Delivering the Program in Schools in Underserved Areas***

One goal of Science Buddies is to help children from all walks of life. During the 2002-2003 program we learned that many factors influence how well students at a given school performed in the program. We found that students in underserved schools faced several unique obstacles to successful participation such as extremely poor computer skills in spite of more than adequate computer access.

Some of these obstacles are things that Science Buddies is already prepared to address and help students overcome. Others are not. Therefore, for the 2003-2004 program, we will select participants from underserved areas with careful attention to these factors. In 2002-2003, we worked toward a specific goal of having 30% of Investigators be from underserved areas. In 2003-2004 our goal will not be expressed in terms of a fixed number or specific percentage of students, but rather as a commitment to learning how best to serve students in underserved areas.

Over time, as we improve the program in school environments where we know it works, we will constantly experiment to extend mentoring and perhaps new Science Buddies programs into underserved communities. This will be an ongoing, iterative process of, "get it right, then extend and expand."

## Other Improvements

We anticipate improvements in a number of additional areas as summarized in the table below.

**Table 6. Other Program Improvements**

Issue or Area	Improvement
Investigator age	We found a clear correlation between age and success as a Science Buddies Investigator. Consequently, we will no longer accept 6th graders, but will add 9th and 10th grade Investigators.
Investigator engagement, online team building	The mentor is only a role model or a good influence if there is a bond, a relationship. This may seem obvious for a character mentoring type program, but it is not so obvious for an academic program. Yet it does apply. We have seen issues with our kids engaging. We have seen some kids ignore advice from our mentors and advisors and not accord them respect. Why? One reason must be that we haven't helped them foster a real relationship before they started work on the project. If they had more of a real relationship, a friendship, then all team members will have more of a commitment to be involved. We plan to develop some exercises to help participants develop a bond, then try them this fall.
Matching of Mentor & Advisor with the Investigator	One way to develop stronger bonds among teammates is to make sure that we match participants with like objectives. (Currently we match primarily on scientific interests.) Our first attempt at this will be to ask Mentors and Advisors about their preference for mentoring someone in need of remedial help as compared to someone who is an overachiever, then match him or her accordingly.
Participation at city / county science fairs	As mentioned above, we are enlisting teacher commitments to encourage student participation in city / county science fairs. We also intend to provide guidelines and help with the paperwork, which is extensive at some fairs.
Geographical expansion	Given the success of our online training, which reduces the need for our staff to visit participating schools, we plan to cautiously extend the program to several locations in Southern California and on the East Coast. The objectives of this expansion are to increase our knowledge of science fair "best practices" and to expand our potential donor base.
Tools for teachers	We intend to develop some tools for increasing the productivity of teachers managing a large number of science fair projects.
Level or amount of science content in Investigator's project	As we reviewed all of this year's 200+ projects, we concluded that the vast majority of them should have contained "more science." In every case this would mean more scientific depth in the review of literature, and in many cases it would lead to a modified experimental procedure. Our approach will be to enhance our training for all participants (Investigators, Mentors, and Advisors) to address this point by providing specific examples of the appropriate level of science by grade level.
The Command Center mentoring environment	During its first year, the new Command Center performed admirably. We anticipate only modest incremental improvements during the coming year. Many of these improvement ideas came from participants themselves.
Administrative procedures	We have identified a number of administrative improvements to streamline our operations during the coming year.
New programs	While our resources are limited, we plan to begin an educational program directed at the general public to explain how science fairs work and their value. We also plan to assist Mentors who are doing their own science fair projects.
Overall program size	While we plan moderate growth in the number of participants during the coming year, our emphasis will be on improvements to the quality of the experience.

# Participating Schools & Employers

## *Middle Schools*

<b>Participating Middle Schools</b>	<b>County</b>	<b>Participants</b>
A. P. Giannini Middle	San Francisco	7
Bohannon Middle	Alameda	4
Chaboya Middle	Santa Clara	7
Everett Middle	San Francisco	1
Harden Middle School	Monterey	1
Hoover Middle School	Santa Clara	46
Lakeview Middle	Santa Cruz	5
Lawton Elementary	San Francisco	9
Los Arboles Junior High	Monterey	5
Mendenhall (William) Middle	Alameda	1
Pacific Collegiate Charter School	Santa Cruz	2
Piedmont Middle	Santa Clara	1
Robertson (Garnet J.) Intermediate	San Mateo	2
San Benancio Middle	Monterey	17
St Mary School	Santa Clara	35
St. Victor Elementary School	Santa Clara	81
Stanford (Jane Lathrop) Middle	Santa Clara	4
Vallejo Middle	Solano	21
Valley Christian Schools	Santa Clara	22
Greene Scholars Program	Santa Clara	3
Individuals (not organized through a teacher)	Santa Clara	2
<b>Totals by County</b>		
	Alameda	5
	Contra Costa	0
	Marin	0
	Monterey	23
	San Francisco	17
	San Joaquin	0
	San Mateo	2
	Santa Clara	201
	Santa Cruz	7
	Solano	21
<b>Total from Underserved Communities</b>		
Students from schools with greater than or equal to 25% of students qualifying for free lunch program (we collect no such information from individual students)		100
Total Investigators		276

## High Schools

High School	County	Participants
Acalanes High	Contra Costa	1
Amador Valley High	Alameda	7
American High	Alameda	1
Balboa High	San Francisco	1
Bellarmino College Prep	Santa Clara	1
Benicia High	Solano	1
Burlingame High	San Mateo	16
California High	Contra Costa	12
Campolindo High	Contra Costa	5
Carondelet High	Contra Costa	2
Castro Valley High	Alameda	5
College Preparatory School	Alameda	3
Cypress Grove Charter HS	Monterey	3
De La Salle High	Contra Costa	4
El Cerrito Senior High	Alameda	9
Foothill High	Alameda	6
Georgiana Bruce Kirby Preparatory High	Santa Cruz	1
Gilroy High	Santa Clara	1
Gunn (Henry M.) High	Santa Clara	3
Hillsdale High	San Mateo	6
Independence High	Santa Clara	1
Irvington High	Alameda	2
Leigh High	Santa Clara	5
Los Altos High	Santa Clara	3
Los Gatos High	Santa Clara	2
Mills High	San Mateo	10
Mission San Jose High (Fremont)	Alameda	15
Monta Vista High (Cupertino)	Santa Clara	1
Monte Vista High (Danville)	Contra Costa	6
Mountain View Academy	Santa Clara	1
Mountain View High	Santa Clara	1
North Salinas High	Monterey	1
Notre Dame High	Santa Clara	2
Oak Grove High	Santa Clara	4
Pacific Collegiate Charter School	Santa Cruz	1
Piedmont High	Alameda	7
Presentation High	Santa Clara	2
Redwood High	Marin	25
San Lorenzo Valley High	Santa Cruz	3
San Ramon Valley High	Contra Costa	1
Santa Cruz High	Santa Cruz	1
Santa Teresa High	Santa Clara	4
Saratoga High	Santa Clara	2
Silver Creek High	Santa Clara	8
Stevenson School	Monterey	7
Tamiscal High	Marin	1
Tennyson High	Alameda	1
Terra Linda High	Marin	1
Valley Christian Schools	Santa Clara	2
West (Merril F.) High	San Joaquin	1
Woodside High	Santa Clara	2
Woodside Priory School	Santa Clara	2
York School	Monterey	1
<b>Totals by County</b>		
	Alameda	56
	Contra Costa	31
	Marin	27
	Monterey	12
	San Francisco	1
	San Joaquin	1
	San Mateo	32
	Santa Clara	47
	Santa Cruz	6
	Solano	1
Total Mentors		214

## Advisor Employers

Advisor Organization	Participants
Accenture	1
Actuate Corporation	8
Affymetrix	7
Agilent Technologies	1
Alexa Internet	1
Align Technology	1
ALZA Corporation	4
AMD	6
Aperto Networks	1
Apple Computer, Inc.	2
Applera Corporation	1
Applied Biosystems	12
Atmel Corp.	1
Beatnik	1
Beckman Institute - UIUC	1
Berkeley Process Control	2
Boeing, Lockheed Martin, GE	1
Brown and Caldwell	1
Caterpillar Inc.	1
Cisco Systems Inc	1
ClairVoyante Labs	2
Composite Software	1
CPI	1
CSU Monterey Bay	1
CVRWQCB - State of California	1
Delphi Safety Systems	1
Earthlink, Inc.	1
Eike Consulting	2
ELORET Corp./NASA Ames	1
EPFL Physics Dept.	1
Epicentric Inc	1
Forensic Science Consulting	1
Fresh Express	4
GE Financial Long Term Care Division	1
GE Medical Systems	1
Genentech	7
GNF	1
Green Environment, Inc.	1
HAER	1
Hewlett-Packard Company	2
Hill Research Associates, Inc.	1
Hines	1
Hitachi Data Systems	1
Imperial College, University of London, UK	1
Indigo Partners	1
Inphi Corporation	1
Intel Corp.	1
Intuit, Inc	1
Ispiri	1
Kaiser Permanente	1
Kondra Systems, Inc	1
Lawrence Livermore National Laboratory	3
LCAB	1
LCB Associates	1
Liberate Technologies	1

Advisor Organization	Participants
Lockheed Martin	1
Mare Is. Historic Park Fdn.	1
Mary Kay Inc.	1
MBARI	1
McKinsey and Company	1
Microsoft	1
MIRA	1
Monterey Bay Aquarium	2
Motorola	1
NASA-Ames Research Center	2
Naval Postgraduate School	1
NDC/ Johnson & Johnson	1
Net.com	1
Network Appliance, Inc.	2
New York State Museum	1
NexRay Medical, Inc.	1
Nuance Communications	1
ON24	1
Oracle	1
Princeton University	1
Radia Communications	1
Renovis, Inc.	1
Ricoh Innovations, Inc.	1
Roches	1
Sandia National Labs	1
Santa Clara Basin Watershed Management Initiative	1
Santa Clara County Public Health	1
SBC Long Distance	1
Seagate Technology	2
Self-employed	22
Sensant Corp.	1
Silicon Image	1
SJSU	1
Space Systems/Loral	1
SRI International	1
Stanford Aerospace Robotics Lab	1
Stanford Linear Accelerator Center (SLAC)	3
Stanford University	8
Sun Microsystems, Inc.	1
SupportSoft, Inc.	1
Synaptics	7
Synopsis	5
Texas Cooperative Extension (TAMU)	1
The Source Group, Inc	1
U.S. Navy	2
UC Berkeley	5
UCSF	2
UCSF School of Dentistry	1
UCSF/UC Berkeley	1
United States Marine Corps	1
University of Illinois	1
Ventura County Sheriff's Department	3
Versaggi Biocommunications	1
Wells Fargo	1
Wind River Systems	1
Total Advisors	210