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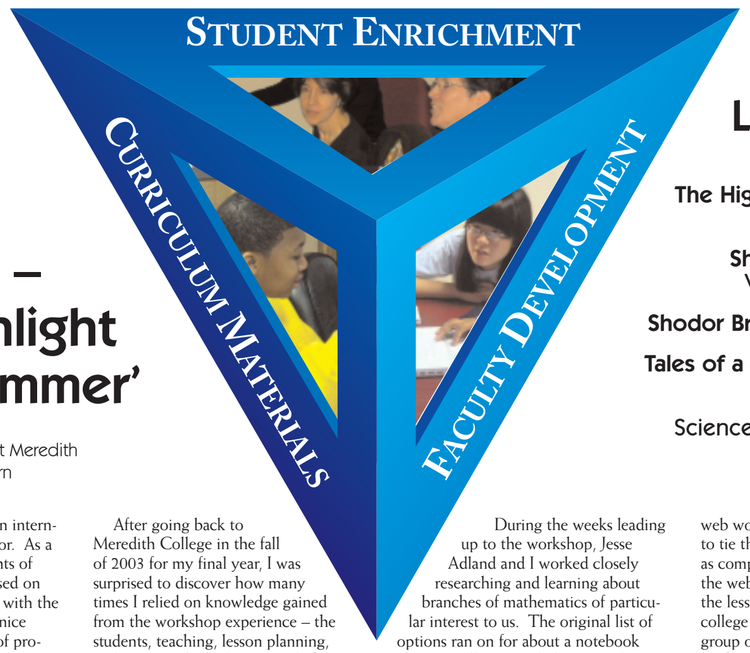
Issue 3 May 2004

# interactions

*The Newsletter of the*

## SHODOR EDUCATION FOUNDATION, INC.

*1994– Celebrating 10 years of Service in Education Reform–2004*




# Project SUCCEED – 'The Highlight of My Summer'

By Susan Edwards, Senior at Meredith College, Mentor Center Intern

In search of a way to fulfill an internship requirement, I found Shodor. As a computer science major, thoughts of programming were highly focused on and the addition of helping out with the workshops was thought of as a nice break from the everyday work of programming. Little did I know that this small component of my summer schedule would end up teaching me more than an entire semester of programming ever could, as well as become the highlight of my summer. The Math Connections workshop lasted only a week, but the experience has proven both fulfilling and helpful before, during, and after the week of the workshop.

After going back to Meredith College in the fall of 2003 for my final year, I was surprised to discover how many times I relied on knowledge gained from the workshop experience – the students, teaching, lesson planning, and creating the website. Aside from relating more with my teachers, I also was a step above everyone in my methods courses having already taught a few classes and began to develop my own teaching philosophy – which consists heavily of students interacting with the mathematics both physically and computationally.

During the weeks leading up to the workshop, Jesse Adland and I worked closely researching and learning about branches of mathematics of particular interest to us. The original list of options ran on for about a notebook page. Finally we settled on introducing the students to areas of statistics, probability, game theory, graph theory, fractals, and non-Euclidean geometry. Starting with a basic understanding of some of these topics, it was quickly discovered that time would have to be committed in order to ensure a beneficial workshop for everyone. This quickly led to the discovery that applets from around the web would have to be compiled in order to tie the concepts to a hands-on as well as computational activity. We scoured the web, researched topics, and drew up the lesson plans; in the end, these two college students were ready for their group of eager students.

On the first day, students met each other with a friendly game of tag. Soon the lesson was off and running with students analyzing the tag-game data and looking through newspapers and the World Wide Web in search of misleading statistics. By the end of the day, the students had gained enough statistical knowledge to be informed

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## Look Inside:





# Tales of a Mentor Center Intern

By Warren Myers, Junior at Elon University, Mentor Center Intern

As a relatively new intern at Shodor, I would like to describe my experience in becoming an intern and what we do here at the Foundation.

Around the beginning of October 2003, Bob Panoff, the founder and head of Shodor, gave a presentation on Computational Science at Elon University, where I am a junior majoring in Computer Science and Computer Information Systems. His presentation proposed and answered the questions, "What is Shodor?", "What does Shodor aim to do?", and "What is Computational Science?" Computational Science, he explained, is the art and act of using computers to simulate events, reactions, or situations, that may be too long, too short, or too dangerous for people to perform and study in a lab. The example he gave us was the perceived spin of galaxies in space. Using software developed at Shodor, Dr. Panoff showed what is likely happening in some of the extreme reaches of space between various stellar bodies. The program, GalaxSee, allows you to create your own 'galaxy', and then run it for thousands of "virtual" years all in just a few minutes on your computer.

Actually logging the twistings, turnings, and gyrations of stars and planets in the depths of space since time began is hardly a feasible undertaking. However, understanding the basics of inter- and intra-object interactions due to gravity and other forces, a computer program can be set up to show what has been happening since the universe started.

On the other extreme of the spectrum, computer models are used by places such as Los Alamos National Laboratory to simulate what happens in a nuclear detonation, an event that lasts mere microseconds.

Other applications for computer simulation, on large and small scales alike, are seen daily by anyone reading or watching the news, with their computer projections of weather patterns, election results, poll results, effects of an experimental drug, and so on.

Dr. Panoff's presentation, and the further ideas it sparked, was an eye-opener for me. I had never really thought of using my skills as a programmer and analyst for much more than systems administration and software design. The hour he spent explaining his vision for spreading (shodering: the art of hammering – gold leaf or foil) the knowledge and technology gained and developed by research and education done here at Shodor led me to apply to work as an intern a couple days later.

After an on-site interview with each of the current staff members, I was accepted in late October 2003, and I began my work here part time. So far, I have been mostly engaged in developing curriculum materials for one of the workshops we offer during the summer through our SUCCEED (Stimulating Understanding of Computational Science through Collaboration, Exploration, Experiment, and Discovery) program. SUCCEED is aimed at rising 6th through 9th graders, and has many branches of science education. We have run Forensics, Engineering, Physics, Biomedical, and other science classes over the past several summers. I look forward to being able to help teach one or more of these workshops this upcoming summer.

One of the primary goals of the SUCCEED program, and of Shodor in general, is to encourage young people to pursue careers in math and science. Ours is a technology-driven economy, and engendering interest in these areas at a young age will help propel the next generation of technologists into the world. Perhaps one of the young kids who have gone through a workshop in Biomedical Science might be the person who comes up with a cure for cancer, or a student going through one of the Engineering classes might help design the replacement to the shuttle for NASA.

I'm excited about the prospects of helping to guide some of these upcoming scientists into their future careers. I look forward to seeing some of you, or your children here at Shodor this summer.

Leigh and Warren testing materials for Engineers in Training

If you are interested in being an intern at Shodor, then contact Mentor Center Director Matt Lathrop by phone at (919) 286-1911 or by email at moreinfo@shodor.org, or apply online at http://www.shodor.org/mentorcenter/

# Shodor Broadens Impact

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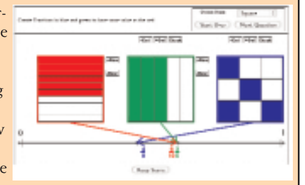
Shodor was also an integral partner in the North Carolina Central University / Durham Public Schools pre-college kickoff workshops in October. Shodor scientists Kent Robertson, Bethany Hudnutt, and Matt Lathrop presented potential future students of the planned college-credit secondary education program with a sample of the type of quality educational offering that the new school intends to implement.

Ten students from the Emily Krzyewski Family Life Center have been provided with full scholarships to Shodor's fall and spring SUCCEED workshops. Teachers from the Emily K have also assisted with SUCCEED workshops in the hopes that they can successfully establish a similar program at the Center. Project SUCCEED Director Matt Lathrop will continue to work with the Emily K Center to identify possibilities for future collaboration.

Shodor is also participating in an extensive collaboration with another local science education non-profit. Shodor scientist Garrett Love has been contracted as a curriculum developer and instructor with the Contemporary Science Center (www.contemporarysciencecenter.org). He will participate in the Center's 'Entrepreneurs in Science' summer camps, contributing a computational science element from Shodor to the entrepreneurial focus of the CSC, all in the context of authentic research experiences developed by the CSC with companies in the Research Triangle Park. The collaboration has already led to the creation of some very exciting example lessons and data concerning the secretion of mucus from human lung cells.

Shodor continues to look for collaborative possibilities on both a local and national level, and encourage potential partners to contact us at moreinfo@shodor.org

# Activities for Kids – Science & Math Explorations for Students



Ever had difficulty understanding fractions? With one of Interactivate's newest activities, Equivalent Fractions Pointer, understanding equivalent fractions has never been easier! This new activity helps you visualize what equivalent fractions are and the values they represent. By slicing up a circle or square and coloring in pieces to represent an equivalent fraction from a given fraction, you find and see how fractions with different representations, such as three fifths actually is the same value as nine fifteenths which is the same as six tenths. You may want to read through the 'How?' page linked on the Equivalent Fractions Pointer page for directions on how to use the activity.

Develop you understanding of equivalent fractions online at: http://www.shodor.org/interactivate/activities/fracfinder5

## Great Developments

The National Science Foundation has officially renewed the National Computational Science Institute for a third year at $931,228. The award, with this amendment, now totals $2,757,944 and will support the project through the end of 2005.

Shodor and Meredith College signed a formal Memorandum of Understanding on March 23 to form a partnership between the two institutions. The partnership facilitates professors and Shodor staff working together to tailor, integrate, and evaluate the use of computational science tools for undergraduate instruction in the mathematical sciences.

A recent partnership between The North Carolina School of Science and Math and Shodor will result in Shodor's Interactivate activities being featured in the school's Advanced Functions and Modeling course. Shodor will also work with NCSSM to develop new applets for the class.

Bell Street Middle School recently received a grant for professional development for their math teachers. Shodor will provide teacher workshops for these teachers to help them become "highly qualified" teachers, as outlined by the No Child Left Behind Act.

## Shodor Staff



Interactions is a regular publication of the Shodor Education Foundation, Inc. To be added (or removed) from our mailing list call (919) 286-1911 or email moreinfo@shodor.org

# Shodor Interns Emeriti:
## Where are they now?

By Cornelia Seiffert, MA
Bioscience Educator

Over the years we have had the pleasure of providing mentorship experiences for hundreds of students from central North Carolina. Many of these students return as Shodor interns throughout middle school, high school and college. We have watched some of them grow from freckle-faced youths into exemplary young adults. A few have even returned as staff members!

Over the last few months, we have been contacting past Shodor interns to see what they are up to these days. There are many to track down, but we are happy to tell you about some of the ones we've found. We like to think that we've encouraged and enabled our interns to pursue careers in science, math, and technology. From what we've found so far, that seems to be the case! Here are two of their stories:

> The people of Shodor have shown me that continuing education is the most important thing one can do and they have been the motivating force behind me wanting to continue to graduate school.
>
> – Monte Evans, Junior at UNC-Chapel Hill

Robbye Fielden was an intern at Shodor from 1999 to 2000; she was an indispensable asset to the foundation while she was here, assisting with the online documentation of our Project SUCCEED workshops and even redesigning the SUCCEED website. Robbye also served as an instructor for our math-themed workshops.

Robbye Fielden teaching a Math Explorations workshop during Summer 2002.

After leaving Shodor, Robbye went on to teach math and science for three years and then, just a few weeks ago, she moved on to work as an actuarial technician for an insurance company. Since, like me, you may not know what an actuarial technician is, Robbye explains that, "It's someone who builds and runs computer models to determine the cost of providing insurance to a customer." This is a wonderful example of a "real world" application for computer modeling. We try to give our interns at Shodor tools that will help them when they go on to school or to enter the workforce.

Robbye is a great example of the "Shodering" process of spreading gold leaf that we use as an analogy for what we do at Shodor. We try to spread the knowledge and resources available to our staff as far as possible by training both students and teachers in the authentic and appropriate uses of technology in the classroom. Due to her experience at Shodor, Robbye was able to serve as the go to person for HTML and web design expertise while she was an in-service teacher in Charlotte. She was able to spread the knowledge that she gained at Shodor far beyond our doors and into the school system – where we ultimately want it to be!

From 1998 to 2001 we were lucky enough to have Jonathan Stuart-Moore as an intern at Shodor. Jonathan helped us with a number of things from enhancing our science content to computer programming and graphic design. Jon, as he goes by, is now a music/computer science double major at Middlebury College in Vermont. When asked to reflect upon his experience at Shodor, Jon said:

"I originally came to Shodor because I was interested in computer programming, and had experimented a great deal on my own, but lacked any kind of guidance or experienced mentor. Shodor was a wonderful guide for me in the field of computer programming – it showed me many new possibilities and new applications (science), as well as teaching me new platforms (UNIX) and languages. Shodor both fueled my interest to continue in computer science as a college major, and gave me a solid basis in how to think about computers, which has proved invaluable. Again and again, I will be taught some new idea or technique, and I'll think, 'Wow – that's what Bob was talking about back at Shodor!' Shodor also was a great place for me to develop my skills in web and graphic design for the Foundation's many web-based projects."

Are you a former Shodor intern? Please get in touch with us at moreinfo@shodor.org, and let us know what you're doing now.

> Through my experiences at Shodor, I improved my ability to communicate and collaborate with my peers; I also developed an analytical approach to problem solving that has aided me tremendously throughout the past year.
>
> – Elizabeth Gass, Junior at NCSSM

# Project SUCCEED

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consumers. The next day was spent looking at fractals and Zeno's paradoxes. After a full class of discovering and playing with fractals using the Shodor applets, the students (and teachers) created a huge fractal from little paper squares.

The rest of the week flew by, jumping from graph theory concepts and their connections to maps, transit schedules, and the World Wide Web to conditional probabilities to geometries of all types. Students actually discovered the Hand-Shaking Lemma by acting out the scenario. On Thursday, candy made the day more enjoyable as students learned about basic conditional probability and game theory strategies that may result in the highest pay off. Concluding with a look at geometry on different planes, students discussed why Euclidean geometry is used when we live on a sphere and discovered the meaning of straight on a sphere.

After this whirlwind of a week, all that was left for the interns was to compile everything into a useful web page for teachers all over to access and use. This was yet another opportunity for learning and discovery considering that my knowledge of HTML was non-existent. Luckily other interns came to the rescue guiding this intern through the syntax of HTML; one Miss Elizabeth Gass was particularly helpful in both teaching and creating the pages. By the end of the experience, each of the interns walked away with strong friendships and plenty of knowledge about teaching, mathematics, and HTML.

**If you are interested in being an intern at Shodor or attending a SUCCEED workshop, then contact Matt Lathrop by phone at (919) 286-1911 or by email at moreinfo@shodor.org**

# Shodor Broadens Local Impact

By Garrett Love, Ph.D.
Engineering Educator

Since Shodor started in 1994, we have tried to balance our "local impact" with the "national stage" for our activities. Shodor staff are involved in several collaborations with local schools and organizations in Durham, Chapel Hill and the greater Research Triangle area, promoting and demonstrating the use of computational science tools in a variety of educational settings. Here are a few examples.

Shodor scientists recently represented career options in the sciences for middle school students as part of the city-wide career fair hosted by the Durham Public Education Network, and also spoke with elementary students at the Eastway Elementary Career Fair. A variety of staff have spoken as guest scientists for the Chapel Hill High School Science Club, and Shodor has also become a regular participant in Club Boulevard Elementary's annual 'Science Day' event. Look for Shodor scientists participating in the fun of science fair judging at the upcoming N.C. Academy of Science Competition and local middle school competitions. Shodor's 'mobile classroom', consisting of Apple iBook laptops, an Airport base station and a portable projector has greatly facilitated local outreach, allowing students to experience modeling and simulation technologies firsthand, even in the short time periods typical of a career fair or science day.

> Today we did things with prime numbers and codes. We went on a website and did a decode game where we had to decode the code with knowledge. Then we split up into teams and made up our own code for the alphabet and made a phrase with the code. Then we passed them around and tried to decode them. It was a lot of fun.
>
> — Carol, 7th Grader at Immaculata Catholic School

For four weeks in the month of March, students in the 10th grade at the Emerson Waldorf School in Chapel Hill also made use of Shodor's mobile computational classroom as part of a learning segment titled 'Computer and Internet Explorations'. Shodor scientist Garrett Love taught the class in a series of lessons loosely structured according to the Project SUCCEED 'Internet Science Explorations' curriculum, including lessons on binary logic, command line interfaces, HTML programming, and internet search engines. Shodor's collaboration with Emerson Waldorf will continue, as discussions for future class offerings in computational technology have already begun.

Ten students from the Emily K Foundation were granted full scholarships to attend fall and spring SUCCEED workshops.

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## SUCCEED Summer 2004 Calendar

| Event | Dates | Times | Grade Levels | Workshop Fee* |
|---|---|---|---|---|
| Modeling Your World, Session A | June 7-11 | 9am-Noon | Rising 6-8 | $175 |
| Engineers in Training | June 7-11 | 1pm-4pm | Rising 6-8 | $175 |
| Internet Science Explorations | June 14-18 | 9am-Noon | Rising 6-8 | $175 |
| Modeling Your World, Session B | June 14-18 | 1pm-4pm | Rising 6-8 | $175 |
| Math Explorations | June 21-25 | 9am-Noon | Rising 6-8 | $175 |
| Medicine and the Biomedical Sciences | June 21-25 | 1pm-4pm | Rising 8-9 | $175 |
| Environmental Science | June 28-7/2 | 9am-Noon | Rising 8-9 | $175 |
| Forensic Science | June 28-7/2 | 1pm-4pm | Rising 8-9 | $175 |
| Shodor Scholars program | July 19-8/6 | 9am-4pm | Rising 10-11 | $150 |

* Full and partial financial assitance is available: no qualified student will be turned away for financial reasons

**Contact us: (919) 286-1911 • moreinfo@shodor.org**

# Thinking with Numbers

By Robert M. Panoff, Ph.D.
President and Executive Director

Shodor's work in education focuses on providing curriculum materials, internships and classes for students, and workshops for teachers to help all of us think more clearly about and to make reasonable decisions with numbers. A famous computer scientist, R. Hamming, was quoted as saying, "The purpose of computing is insight, not number." Yours truly has been quoted as adding, "But if you can't trust the numbers, you aren't going to get very much insight!"

You don't have to be around the office or our workshops very long before you'll hear one of us chanting our battle cry: "Fractions, decimals, percents, and ratios! Reading and interpreting graphs!" Even though we value the use of high-powered computational tools in math and science, at the very core, we need to keep focusing on the basics, and our approach allows us to look at the world around us and measure it, model it, describe it, and understand it in all of its quantitative glory.

It's not a "drill and kill" approach. We use our simulations, applications, activities, and tools to help students see patterns and describe them using the language of mathematics. Come to our workshops and you will hear our instructors provoking and probing a learner's observations: What fraction of the forest just burned? How would you represent that as a decimal? What percent of the rabbits are surviving? What is the ratio of the side of the fractal now to what we had before? Where is the graph increasing? What does it mean if a graph is flat?

More than anything, you will hear us ask: How do you know if it is right? If we are going to base more and more of our life's decisions on the results of a computer model (does this chemical cause cancer, will the beach erode, is this plane safe to fly, what will interest rates due to the economy), shouldn't we make the effort to ensure that the model is correct? Shouldn't we care that the input to the model is valid? That the output of the model can be verified?

These are the core questions we ask, and try to answer, in all we do. We are pushing the limits of information technology, but we cannot avoid the personal responsibility of checking the answers. The sorry state of the Web today is that most of the quantitative "facts" that you might retrieve are indefensible, that is, there is no reason to believe them. Don't believe me? Try this: Search on the Internet using your favorite search engine and try to use the results of that search to answer to a reasonable degree of scientific certainty the answer to some simple questions: What is the boiling point of radium? How many species of lemurs are there? What is the mass of the Earth? You'll be surprised at the wide variety of "answers" that come back!!

At Shodor, we are working to filter the good, from the bad, from the ugly. Our Computational Science Education Reference Desk project is identifying the best resources that have evidence of effectiveness in all areas of scientific inquiry. Many of our materials have already been selected for inclusion in the National Science Digital Library. We could use more help in identifying the "good stuff". Know of a site you would like to recommend? Go to http://www.shodor.org/refdesk and submit the link for review. All of us can work to make the Web a safe and appropriate place for scientific inquiry.