

Mathematical

Sciences

UNIVERSITY OF MONTANA FALL 2015



The Education System in Iran

As you probably know, our department tends to have graduate students from all over the world. Presently, we are happy to have three PhD students from Iran: **Ellie Bayat Mokhtari**, **Omid Khormali**, and **Esmail Parsa**. Since many of us are not familiar with Iran and its system of education we asked these three students to write a bit about it.

Education in Iran is divided into K-12 and higher education. Public education is free and is compulsory from grades 1 to 8 (ages 6-14). Farsi/Persian is the official language of instruction and English as a second language is taught in all public schools beginning in grade 8. The academic year runs for 10 months, starting in September.

Primary School (Dabestan). This level includes grades 1 to 5, for children ages 6 to 11. Upon completion of Dabestan, students take a nation-wide examination. A student who does not pass an exam in one of the subjects must retake it before being promoted to middle school.

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Lauren Fern wins Teaching Award

By Ke Wu

Lauren Fern is a lecturer in the Department of Mathematical Sciences. Last Spring, she won the College of Humanities and Sciences' *Excellence Award for Teaching at the Introductory Level*. This was the first-ever such award, and Lauren was one of two inaugural winners. Congratulations, Lauren!



Lauren Fern

This is Lauren's 13th year of teaching at the University of Montana. She has consistently taught large lectures along with smaller classes. Regardless of the class (and how large it is), her student evaluations have been outstanding across the board. Over the years, I have heard many positive comments from students about how

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Charles Bryan 1936 - 2015: In Memoriam



We are saddened by the loss of Professor Emeritus Charles Bryan, who passed away on August 29, 2015. Until his retirement in 1989, Charles had been a member of the department for 23 years, serving twice as its chair, and directing four Ph.D. students. Over the years, he was exception-

ally generous to the Department of Mathematical Sciences and its students. He and his brother John established, in memory of their parents, the George and Dorothy Bryan Endowment, which provides the principal support for many of our programs for students, from the Undergraduate Scholar

Program to the Graduate Student Summer Research Awards. You can read more about Charles in the article on page 5, an updated version of a faculty profile that Professor Emeritus Rudy Gideon originally wrote in 1997.

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Notes from the Chair

By Emily Stone

Greetings to all and sundry reading our newsletter! I am pleased that the department decided to elect me as chair for the next three years, it is a great honor that is not lightly bestowed. Many thanks to Leonid Kalachev, who served us so well for the past 6 years. I am excited to be entrusted with the task of making sure that all department programs run smoothly, and so far it has been a lot of fun. I have even enjoyed the job of juggling teaching assignments in the usual last minute rush at the start of the semester; new balls are always being added mid-air, but I like making sure that we cover all our classes while giving everyone the best assignment possible.

We have had lots of additions and subtractions to our faculty and staff over the past year. Last spring Michelle Johnsen handed over the reins of Head Administrator to Indy Singh, formerly of the Sponsored Research Office, to take a job as Director of Fiscal and Personnel for the College of Humanities and Sciences, working for our own Jenny McNulty (Associate Dean) and Dean Chris Comer. Indy dove in right away and has done a first rate job for us since he entered the building. We also have a new lead receptionist, Maria Yost. We are Maria's "day-job", she is a director/producer/writer and actor in local theater productions and is a bright spot in the main office. On the faculty side, as mentioned previously, Thomas Tonev passed away in January, and Jennifer Brooks is on leave for family reasons for at least this year, perhaps next. George McCrae and Jim Hirstein both retired last year, and while George can still be seen prowling the halls with his coffee cup, Jim only puts in an occasional appearance, having fully passed the baton to our new, energetic

faculty in Math Ed, the latest addition there being Fred Peck, who we lured away from Colorado-Boulder.

Following up on that, our faculty in general has been very industrious and productive over the past year. This is the time the Chair writes the final paragraph on all the faculty reviews going forward to the Dean. It was with great pleasure that I have read these files, everyone indeed is "above average". I felt tired just thinking about the amount of work and energy being expended on behalf of our department in all three areas teaching, research and service, by our faculty.

As you may have already heard, the University as a whole is facing a significant challenge this year: how to continue to deliver quality programming while addressing a very large budget shortfall due to decreased enrollment over the past 3 years. Our funding is tied to enrollment numbers, both through tuition and state dollars, so the administration has put forward a plan for faculty and staff reductions to address this issue. While cuts to the base are always unpopular, it is clear that we need to do this, and do this in a considered manner that does the least damage possible. Being a chair might be hard, but being an upper level administrator must be much worse! We are somewhat sheltered here in Math, we have had a fairly constant number of majors over the past 6-7 years, we teach many general education courses, and we are the "M" in STEM! Our data analytics program is also buffering us, since the President mentioned data analytics as a target area for growth in the University.

While we do not know at this time the specifics of the cuts to be handed down to the College, we



can begin to address the overall problem by being the "Best Little Math Department in the West", a valuable component of the education and the research mission of the University. To that end, we are working on developing initiatives that give faculty more resources for scholarship (through a new in-house faculty enhancement program), and bolster our visitor and colloquium program. These are made possible through indirect costs from grants captured by the department, and unrestricted funds in the Foundation, a pool of money that alumni and friends continue to donate to – thanks very much for this; in times like these we rely on them more heavily than ever!

In the next newsletter I shall be able to give a more complete description of how the budget cuts have challenged our delivery of a quality education, and how we were able to rise to the challenge. With this group of talented and energetic folks, I trust we will be able to thrive, not just survive, this challenge. So Best Wishes for the Holiday Season and the New Year from all of us here at the Math Dept.!

Emily F. Stone

Montana Uncertainty Quantification

By John Bardsley

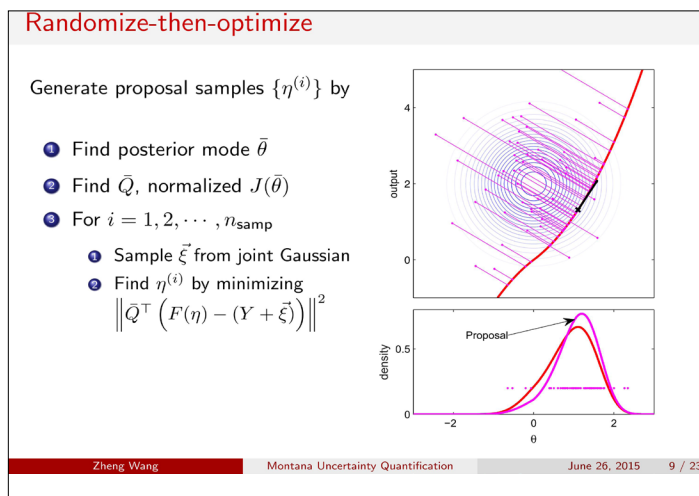
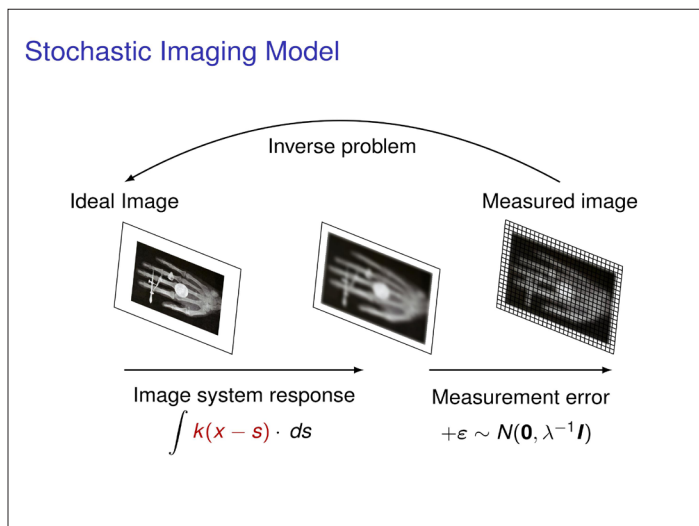
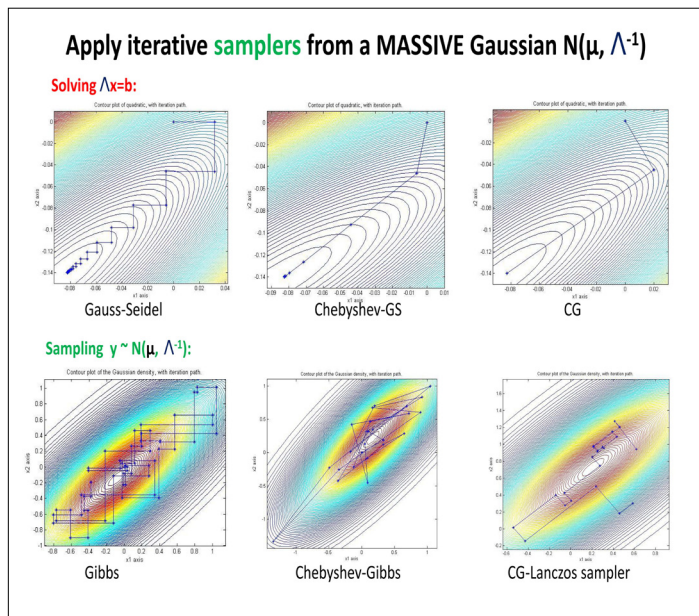
For a number of years, I have been toying with the idea of hosting a conference at UM on Uncertainty Quantification (UQ), which is a relatively recent research direction at the interface of computational mathematics, physics, and statistics. The goal of UQ is to extend the methods of statistics to the problem of fitting computationally challenging, physics-based models to data.

Over my first ten years at UM, I spent a year at both the University of Helsinki in Finland and at the University of Otago in New Zealand. The contacts that I made during those years all now do research in UQ, and over time we've grown into a group of 30 or so people (including students and postdocs) meeting at conferences, collaborating, and generally enjoying each other's company. Given the maturity of our group, and that it was an in-between year for the biennial SIAM Conference on Uncertainty Quantification, it seemed like the right year to have a UQ conference at UM.

The conference was June 24-26, which were hot (90+ degrees) days, but the attendees didn't mind the high temps. After coffee and pastries, we would all attend talks from 9 am to 2:30 pm. The talks were uniformly good and can be seen by the interested reader, along with a list of attendees and the conference program, at the conference web page: <http://www.math.umt.edu/bardsley/MUQ/MUQ.html>. Once the talks were over, on the first two afternoons, I organized hikes, after which we met at a local brew pub for beer and then went somewhere interesting for dinner, like the Dinosaur Café in Charlie B's Bar. On the last evening, we had a barbeque at my place, and then finally, on the day after the conference, I took a few attendees tubing on the Clark Fork, and they loved it! Although it was a lot of work, I really enjoyed doing it, and I hope to do it again at some point.

I'd like to take this opportunity to first thank the conference co-organizer Aaron Luttmann, who helped me get an NSF grant for supporting the travel of several students and post-docs, as well as the Dean's Office (Jenny McNulty in particular) and the Math Department for their financial support in the way of lunches, and to the Goldes family for their donations to the Applied Math group, which were used for morning coffee and pastries, and supplies for the barbeque.

Some slides from the conference:



Education in Iran, continued from page 1.

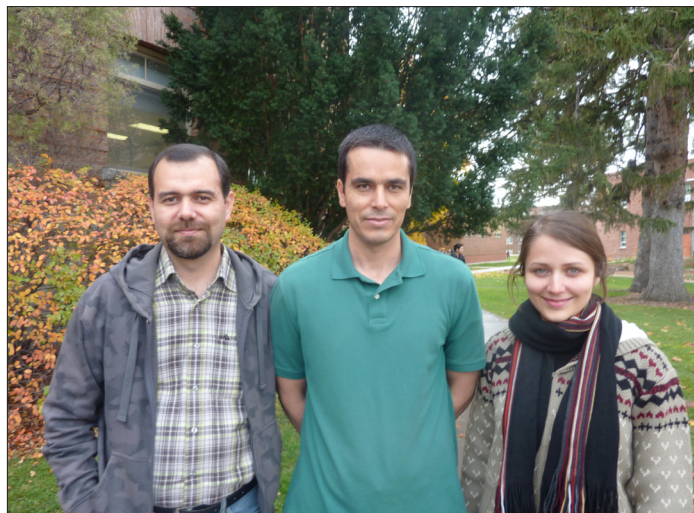
Middle School (Raahnamaai). Also known as Lower Secondary School (Guidance), this level would be equivalent to middle school in the United States, including grades 6 to 8. Study of English as a foreign language begins in grade 8. Upon completion of this level, students take a region-wide exam, which they must pass to move on to the next level.

Secondary School (Dabirestan). Equivalent to U.S. high school grades 9 to 11 is Dabirestan, which is followed by an optional, post-diploma 4th year (Pish-daneshgahi) that is focused on preparation for university admissions. Students choose one of two tracks: an academic track including subjects in fields such as physics-mathematics, socio-economics, literature and culture, or experimental sciences; or a technical/vocational track including areas such as business and agriculture. The curriculum varies depending on the track chosen. English language courses, however, are mandatory for everyone at this level. Students are required to complete the three years and obtain their diplomas before becoming eligible to participate in the fourth year studies (Pish-daneshgahi) required to apply for higher education.

The first year of the academic track consists of general studies, which include many different classes such as Persian, English, French, Islamic ethics, mathematics, economics, social/experimental sciences, etc. Students proceed to the second year upon passing national exams. In the second year, students are placed in a subject area of focus based on their grades and exam results; they will continue to focus on this area through the third year of study. Students must pass national examinations in all subjects that they are taking each year prior to moving to the next academic level. Upon completing three years of Dabirestan and passing the third-year exam a certificate/diploma is awarded; however, students cannot proceed to university study until they have completed the Pish-daneshgahi and have taken the relevant exam.

Students in the vocational/technical track of Dabirestan pursue specific skill-sets (Kaar-daanesh), and after successful completion of the first year, based on aptitude, interest, and grades, select a specialization. Following their third year of study and successful final examinations, students receive a vocational diploma/degree qualifying them to work in their area of specialization. They can also, if they choose, take the entrance examination for the Pish-daneshgahi pre-university year in order to continue on to higher education.

Pre-University (Pish-daneshgahi). This is the fourth-year extension of high school during which students prepare for the national university entrance examination, known as the Concours. Pish-daneshgahi



Omid, Esmail, and Ellie

Ellie Bayat Mokhtari is from Mashhad, a city of over 3 million in northeastern Iran that used to be a major oasis along the ancient Silk Road. Ellie earned both a B.S. and M.S in Statistics at Ferdowsi University of Mashhad. This university, which is named after a great epic poet and historian of Iranian national history, was established in 1949. It is the third oldest major university in Iran, and one of the top universities in the country.

Prior to coming to UM, **Omid Khormali** worked at Tarbiat Modares University in Tehran, an institution with only graduate programs. There, Omid also earned his master's degree in pure mathematics; he received his undergraduate degree in pure mathematics from the University of Tabriz in northwestern Iran.

Esmail Parsa is originally from Nishapur, a city in northeastern Iran, the land of Omar Khayyam, Persian mathematician, astronomer, philosopher, and poet, who is widely considered to be one of the most influential scientists of all time. He grew up in Shahriar, which is about 30 km from Tehran, and received his master's degree in mathematics from the University of Tehran.

consists of intensive studies in a range of areas such as math, sciences, Islamic studies, and foreign languages. The Concours determines students' chances to enter the public and some private universities in the country. It is an extremely difficult examination and every year only a small minority of the students who take it pass.

Higher Education. The higher education system in Iran is composed of private, public, and state-affiliated universities. All state-run universities are under the direct supervision of the appropriate ministry, usually the Iranian Ministry of Science, Research and Technology. There are currently over 50 public universities in Iran in addition to the over 40 public institutions specializing in medical study and 290 sizeable private postsecondary institutions.

Continued on page 7.

Profile of a Montana Mathematician - Charles Bryan

By Rudy Gideon

Charles Allen Bryan was born in 1936 in Livingston, Montana where he spent his entire childhood through high school. He became interested in science under the mentoring of his physics-chemistry teacher Don Holmquist, who was able to inspire all of his students.

When Charles graduated from high school in 1954, he attended Montana State College-Bozeman and majored in Engineering Physics. He graduated in 1958 and somewhere along the way developed an interest in mathematics. His interest in mathematics led him to accept a graduate fellowship (NDEA) offer at the University of Arizona in Tucson.

In the summer of 1956, Charles married Cynthia Rapp, his high school sweetheart and classmate in Livingston. Cynthia also attended Montana State College and after a year, became a secretary for the Northern Pacific Railroad. Two of their children, Mike and Gary, were born in Montana. Their third child, Julie, was born in Arizona. They also had an adopted son, Talbert.

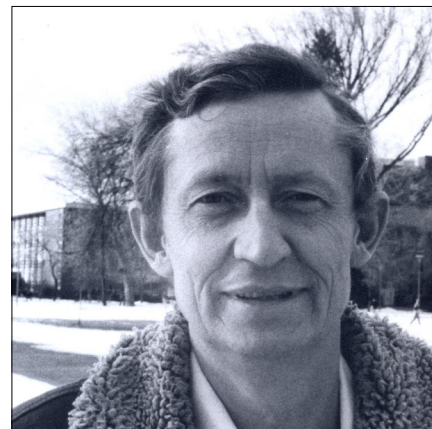
While in Arizona, Charles became interested in applied mathematics. Mel Lieberstein, a mathematics professor, told Charles he wasn't smart enough to get through graduate school. In response, Charles translated an abstract Italian partial differential equation paper for Prof. Lieberstein. Prof. Lieberstein was impressed, took Charles under his wing and Charles went on to earn a Master's Degree and Ph.D. in mathematics with a dissertation in numerical analysis. Charles was the second Ph.D. student in mathematics at Arizona.

His varied degrees gave Charles the opportunity to work at Cape Canaveral in the budding aeronautical industry as the head numerical analyst. However, he preferred Arizona State University at Tempe where he was able to teach calculus as a tenure track faculty member. He started teaching for a salary of \$8,000 when he could have earned \$20,000 in industry. His choice proved to be the correct one as he continued to be happy with his teaching career.

After 3½ years at Tempe, Charles and his wife came to Montana in the fall of 1966 to be closer to family. The University of Montana had just started a Ph.D. program and Charles wanted to be a part of it. Charles produced the second Ph.D. student in math at UM while Professor Bill Myers was chair of the Mathematics Department. This student, Charles Schelin, was the first of his four Ph.D. students, the others being Daniel Hansen, Dick Wood, and Hashim Saber. They all went on to teach at colleges throughout the United States.

In 1973, Charles became chair of the department and

remained so until 1975. He served a second term as chair from 1981-1984. Charles became interested in the activities of the University Teacher's Union and became a member of the bargaining team. He was chief bargainer during 1979-1980



and became president of the union the next year. This was one of the few times that faculty received adequate raises.

Charles liked to point out that in 1906, the University of Montana president complained about low faculty salaries and that nothing much has changed since then. As a native Montanan, Charles felt University funding is too low and that faculty and students do not get the respect they deserve from the state legislature and Board of Regents.

Charles helped the mathematics department grow from 12 faculty and a handful of graduate teaching assistants in 1966 to more than 16 faculty members and 16 teaching assistants by 1975. Charles suffered from multiple sclerosis since 1959 and because of increasing complications decided to retire from the University of Montana in the spring of 1989 with 23 years of service in the Department.

After retirement, Charles and his ever-devoted wife were co-owners and operators of Gillespie Realty (currently Berkshire Hathaway) in Missoula and were annual "Pacesetters" of the UM Foundation. They have always designated their contribution for academic departments including the Department of Mathematical Sciences. Charles and his brother John created a considerable endowment for the Department of Mathematical Sciences under their parents' names, George and Dorothy Bryan.

Charles was a Boston Red Sox fan ever since the Ted Williams days and later added the Denver Broncos and the Chicago Bulls to his interests. He enjoyed and supported Grizzly athletics as an active Grizzly Athletics Association (GAA) and Quarterback Club member.

This article appeared originally in the Fall 1997 Newsletter; Rudy Gideon updated it for the current edition.

(MT)² - MonTana supports Mathematicians of Tomorrow: 2015 Summer Sampler Program

By Ke Wu



The Department of Mathematical Sciences has recently received funding from the National Science Foundation (NSF) to support students with diverse backgrounds pursuing undergraduate and/or graduate degrees in the mathematical sciences. Part of the program provides a summer math sampler experience, which allows students to explore a variety of areas within mathematics and of applications of mathematics to other fields. In the summer of 2015, (MT)² partnered with the BRIDGE program at UM to provide a 3-week long, one-hour per day math sampler experience for 15 Native American undergraduate students. Six full time tenured or tenure-track faculty members designed and facilitated hands-on, problem-solving based activities with assistance from one graduate mentor and three undergraduate peer leaders.

Post program survey results showed that 80% of stu-

dents strongly agreed and 20% of students moderately agreed that the program provided interesting experiences of various mathematical topics. When students were asked to describe one new mathematical thing that they learned, their answers included: topology, cryptography, binary numbers, Fibonacci numbers, modular arithmetic, affine geometry, graphing sets, and "how tic-tac-toe is mathematical". Wouldn't you have liked to attend a program like that?



Lauren Fern Award, continued from page 1.

much they love Lauren's class and how much she cares about students, not only how they do in her class, but also about them as human beings.

In addition to her dedication in the classroom, Lauren has engaged in numerous other activities. To name just a few: She regularly mentors students; she is UM's coordinator for EdReady, an online tutoring program that helps students master the mathematical skills they need to succeed in the classes they are taking; and she authored instructor and student solution manuals for two different textbooks.

The Department of Mathematical Sciences is proud to

have Lauren on our faculty. We appreciate her dedication to teaching and all her contributions!

"I feel my unique contribution is that I truly enjoy teaching large lectures, and make the material and the class as personal and accessible as possible, despite the size. I am fully dedicated and committed to my students and always strive to positively impact them mathematically, academically, and personally. I truly seek to make a difference in their lives. This manifests itself both in and out of the classroom." – Lauren Fern.

Undergraduate Research, continued from page 8.

institutions visit during the summer. I went to as many seminars as I could and talked to lots of people about their research. Everyone at the institute has lunch and tea together every day, so there were many opportunities to ask questions and have interesting conversations.

This experience inspired me to pursue math. I switched from a math minor to a math major and I hope to go to graduate school in a program that applies math to biology.

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Endowed Scholarship Funds: *The Adams Scholarships, Anderson Mathematics Scholarship, Joseph Hashisaki Memorial Scholarship, Mac Johnson Family Scholarships, Merle Manis Award, William Myers Mathematics Scholarship*

George and Dorothy Bryan Endowment: an endowment in support of undergraduate and graduate students

Lenes Fund: an endowment to provide funds for the Lenes Exam Competition

Colloquium Fund: an endowment to provide funds to bring in visiting speakers

To donate online, please visit <http://hs.umt.edu/math>. For information on other ways to give, please contact Marci Bozeman: marci.bozeman@mso.umt.edu or by phone at 406-243-2646 (or call toll free 1-800-443-2593).

Education in Iran, continued from page 4.

Counting branch campuses, technical institutes, and religious colleges, the government oversees over 1,500 postsecondary campuses.

Tuition at public universities is free, while private institutions typically charge fees. The largest private institution in Iran is the Islamic Azad University, which enrolls more students at over 360 campuses in Iran and overseas than all the public universities combined.

The most common degrees offered by the universities in Iran are, like in the United States, associate, bachelor, master's and doctoral degrees, and the basic requirements (like number of credits) are quite similar. Unlike in the US, however, a master's degree is a prerequisite for admission

to a doctoral degree program.

As we have seen, there are many similarities between the educational systems in Iran and the United States, but there are also many differences. The most fundamental ones seem to be the two tracks at the high school level (Dabirestan), and the prevalence of national exams which govern promotion to the next grade and admittance to the universities.

References: 1. Wikipedia: https://en.wikipedia.org/wiki/Education_in_Iran

2. Institute of International Education Website: <http://www.iie.org/>

Undergraduate Research in Santa Fe

By Gilia Patterson

Last summer I participated in an NSF Research Experience for Undergraduates at the Santa Fe Institute in Santa Fe, New Mexico. I was part of a group of 15 students from all over the country who spent 10 weeks working on research projects, listening to talks, attending classes, playing foosball, and exploring Santa Fe.

The Santa Fe Institute is an interdisciplinary research group that studies complex systems through modeling and computation. Researchers from many different fields – biology, math, computer science, economics, physics, and anthropology – collaborate to answer interesting questions. I was excited to work on a project that combined math and biology. I worked with my mentor, Sam Scarpino, on developing ways to estimate the number of people infected in an outbreak of disease from the pattern of transmission and genetic data. I modeled disease spread on a network of people. I then used features of the pattern of transmission – who infected who and when – to estimate the number of infected individuals.

The Santa Fe Institute was an exciting place to be



Gilia Patterson (front left) and other REU students with Murray Gell-Mann, Nobel laureate and co-founder of the Santa Fe Institute

in the summer. There are only about 30 researchers at the Institute year round, but many faculty from other

Continued on page 6.

