

Advancing Science in America®

ARCS Foundation advances science and technology in the United States by providing financial awards to academically outstanding U.S. citizens studying to complete degrees in science, engineering and medical research. The Pittsburgh Chapter has the additional focus of increasing the number of doctoral scholars pursuing advanced scientific study and research in the Western Pennsylvania region.

The Pittsburgh Chapter

Chartered in 2003, the Pittsburgh Chapter is one of the newest of 17 nationwide ARCS chapters. In a short time, the Chapter has already pledged more than a million dollars to its three partner universities, Carnegie Mellon University, the University of Pittsburgh, and Penn State University.

An ARCS Perk: Learn About Natural Gas Drilling



ARCS Members tour Range Resources

This past fall, Lourdes Castellanos arranged for us to attend two informative events about Marcellus Shale drilling in Pennsylvania.

First, on a sparkling October day, 38 members boarded a courtesy Range Resources bus to tour two drilling sites not far from their regional headquarters in Canonsburg,

PA. Range Resources guide Mike Mackin explained how machines drill vertically up to a mile and a half, and then horizontally up to 3,000 feet, to extract natural gas.

Everyone inspected the telescope-like casings that gradually get smaller, like a telescope, as the well is dug. Over two million pounds of U.S. steel and cement go into each well.



Lourdes Castellanos, Peggy Mooney, Sarah Jones, Ann Fromm, Angie Maher, Carol Massaro, Karen Auclair (Photo by Maren Cooke)

Second, on Saturday November 23, Lourdes and other ARCS members



ARCS member Michalina Pendzich at the LWV conference

attended a daylong conference/health fair sponsored by the League of Women Voters at the Heinz History Center, featuring nationally known experts on shale gas extraction and public health. Called "The Straight Scoop," it featured interactive exhibits, and known experts presenting the latest information about fracking and gas drilling.

Members agreed that perks such as these add richness to what is already an inspiring ARCS experience.

ARCS Says Thank You to Donors



Steve Blake, Sue and Mark Breedlove

This past September, members and scholars mingled with beverages and hors d'oeuvres at the University Club, before Clyde Jones, Pitt's Vice Chancellor for Health Sciences Development, introduced Pitt

Chancellor Mark Nordenberg for a few remarks. Chapter President Missy Unkovic introduced two third-year scholars to say a few words about their work: Pitt's Adam Large, and CMU's Samantha Finkelstein.



Mary Lou Bennet, Mimi Coppersmith, Barbara Palmer, Joe Schneiderwind, Chris Thawley, Molly Hanlon.

All the first year scholars had their photos taken in advance of the festivities. Check out their photos in this newsletter.



Maureen Young and Lise Woodard

Thanks to Carol Stockman and Cristy Gookin for organizing such a lively and sociable event.

Letter from the President

Since becoming president, I have happily been exposed to so many reasons for belonging to ARCS. Probably most importantly, there is the knowledge that our donations are helping to advance science in America. But there are also the truly interesting educational programs during which we learn about the ways in which science is being advanced in Pittsburgh. There are the various lunches, teas, and cocktail receptions which provide a time to greet old friends and to meet new ones. There are the committee meetings and strategy sessions with members during which we look for ways to make our chapter even better than it already is. There are interesting meetings with university personnel. But for me, the most fun and exciting reason to belong to ARCS is the chance to interact with our students and to learn about their research.

This year we have 29 students. The second and third year students are all embarked on research projects in areas ranging from bioengineering to biomechanics to computer science to ecology to neuroscience. Their projects will someday help patients with liver disease or patients that have suffered mobility issues due to strokes or patients with prosthetic devices. They will help to treat drinking water in better ways. They will study how various species can adapt to the presence of changes in their environment. They will investigate language and machine learning. They will encourage stem cell-based approaches to wound healing. They will excite high school students about computer science and computer security. They will help younger students to learn more easily. In so many different ways their research projects will bring positive changes to our world.

Of the 29 students, ten are new to ARCS this year. Several already know the specific research they will work on; others are still deciding. We have enjoyed meeting and getting to know them all. We particularly loved seeing how quickly they got to know and enjoy each other. They are an incredible group of young men and women who will certainly make new discoveries and generate new and exciting ideas and will help to translate these discoveries and ideas into the tools and services that will make the world a better place.

My hope is that all of you will find your memberships in ARCS to be as rewarding as I have found mine to be. Whether you have the time to attend educational programs or lunches and teas and receptions, whether you serve on our board or one of our committees, or whether you prefer just to provide financial support to our students, we appreciate you all very much. And we hope that you understand how important and valuable your support of ARCS is.



Missy Unkovic
President
ARCS Foundation Pittsburgh Chapter

Do You Recognize Our First Year Scholars?

CARNEGIE MELLON UNIVERSITY



DANIEL GINGERICH
The Pittsburgh Chapter Award
B.S.: Mississippi State University
Civil Engineering
M.S.: Auburn University
Civil Engineering
Research Interest: Innovation and implementation of new treatment technology in drinking water



DEVIN GRIFFITH
The Pittsburgh Chapter Award
B.S.: University of Oklahoma
Chemical Engineering
Research Interest: Synthetics, optimization and control of large-scale chemical processes



CLAY LONG
The Pittsburgh Chapter Award
B.S.: Penn State
Electrical and Computer Engineering
Research Interest: Applied physics and nanofabrication, not yet decided on a specific project



MOMIN MALIK
The Susan and Roy Dorrance Award
B.S.: Harvard University (History and Science)
MSc: University of Oxford, Oxford Internet Institute, Social Science of the Internet
Research Interest: Computational analysis of social systems, integrating social science and computer science, especially around the study of networks



JOSEPH TASSAROTTI
The Gookin-Stockman Award
B.S.: Harvard University
Computer Science
Research Interest: Programming languages and formal certification of software in security and safety critical settings

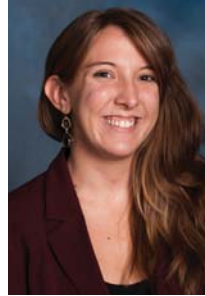
UNIVERSITY OF PITTSBURGH



JENNIFER BOATZ
The Pittsburgh Chapter-Fromm Award
B.S.: Indiana University at Bloomington
Biology
Research Interest: Studying the structure of protein aggregates that form in the brain of individuals with neuro-degenerative disorders



MICHAEL CALDERON
The Pittsburgh Chapter Award
B.S.: Southern Illinois University at Carbondale
Biological Sciences
Research Interest: Cell biology, wound healing



VICTORIA CORBIT
The Beukema-Wainwright-Wood Award
B.S.: Lafayette College, Neuroscience
Research Interest: Systems Neuroscience focused on cortical/sub-cortical networks involved in motor control, with hopes of implementing computational modeling in the future



MICHELLE GUARAGNO
The Pittsburgh Chapter Award
B.S.: Point Park University, Biology
M.S.: Duquesne University, Biotechnology
MBA: Point Park University
Research Interest: Biomimetic research focused on developing single-walled carbon nanotube as a membrane transport delivery (i.e., membrane channels)

PENN STATE UNIVERSITY



JOSEPH SCHNEIDERWIND
The Bennett-Coppersmith-Palmer Award
B.S.: Colorado School of Mines, Engineering Physics
M.S.: Colorado School of Mines, Math and Computer Science
Research Interest: Acoustics

Twin Passions Govern Scholar's Life

Originally from a small town in northeastern PA, third-year ARCS scholar Amy Dale came to CMU after an undergraduate degree at Pitt, partly because she was getting married. Her then-fiancé, Alex, was a graduate student at Pitt and she wanted to stay nearby.

Now married and renting a turn-of-the-century brick house between Squirrel Hill and Greenfield, they love living in Pittsburgh, and Amy could “stay here forever” pursuing her twin passions: computational analysis in support of public policy making, and doing watercolor illustrations for books and songs.

Amy illustrates book series, myths and legends or songs she likes, especially a complicated mythical or fantastical story. She has even sold her work; see it on the web site alsdale.deviantart.com.

Academically, Amy is a mathematician. She appreciates the applicability aspect of her CMU work now, since earlier she had focused more on basic science than applied.

Specifically, Amy studies water quality and environmental health, suggesting risk-based regulatory policy for politicians. Even more specifically, she studies nanomaterials such as nanosilver. The Giant Eagle Market District, for example, uses the very tiny particles in grocery cart handles for anti-bacterial purposes, as do soap and cosmetic manufacturers, and Amazon.com sells socks embedded with nanosilver. Heavy metals such as silver, copper and mercury are naturally anti-bacterial. Because they're good at killing things, Amy explains, they're good at killing bacteria.

How much nanosilver can safely get into our environment, particularly our water?

“We want to do a mathematical risk assessment,” says Amy. “We don't want people running for the hills. Yet overuse of nanosilver can lead to antibacterial

resistance and be toxic, especially if it builds up in aquatic environments.

“Right now,” Amy continues, “there isn't much cause for alarm. But there are situations, such as high oxygen environments, where nanosilver is more

toxic. So we don't want manufacturers to use it too much.”

At one time, regular silver was used intensively in photo processing. The silver going into the environment then had a measurable impact, especially in coastal systems like the San Francisco Bay. If nanosilver concentration gets higher, there's a potential that it

could also cause negative outcomes. In aquatic environments, silver is the second most toxic metal after mercury.

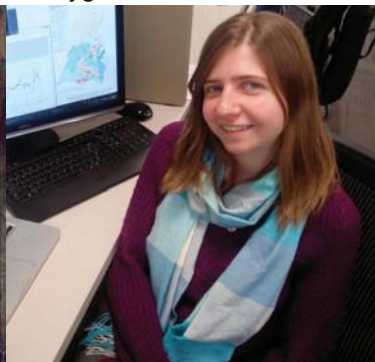
So is nanosilver safe or not?

“I'd love to give you a clear answer,” says Amy. “We want to figure out scenarios and assess risk. My goal is to be able to say factually that nanosilver as it is currently used is not dangerous to the environment.”

Amy also currently takes a CMU class that looks at environmental regulations of the Marcellus Shale. “Although I can't speak with great expertise,” Amy says, “I think PA's response to the regulatory side of drilling has been quite good. We Pennsylvanians are wary in general, because of our history, from Titusville on, with oil and coal.”

She does worry about radioactivity from some of the drilling. During drilling, particles get dislodged from the soil and turn up in wastewater. The particles accumulate in sediment and solid wastes, as with nanosilver. Radioactivity is not a huge public or occupational health concern right now. But is there a potential for concern?

Someday, scientists like Amy will build a mathematical model of what happens to these particles and let us know.



Amy Dale and her illustration of The Little Mermaid by Hans Christian Andersen

ARCS Scholar Inches Closer to Building Human Liver

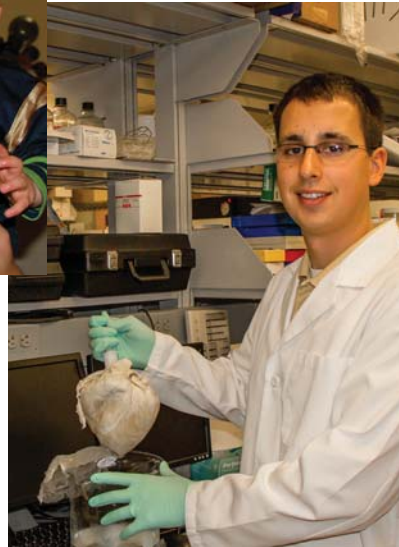
Across the country, thousands of patients die waiting for a liver transplant. The lucky few who get a liver will probably take immunosuppressant drugs the rest of their lives. But what if you could harvest a patient's own liver cells, add growth factors and scaffolding, put them together in a bio-reactor to grow, and then implant the new liver into the same patient?

The patient would never need a transplant. They'd never need an immunosuppressant drug.

"That's our goal," said Denver Faulk, third-year ARCS scholar in bioengineering at Pitt's Swanson School of Engineering. "So far, we've moved from doing this in small animals, such as mice and rats, to the large animal models using pigs and dogs. We haven't been able to show this yet in a large animal model."



Denver Faulk with his son Michael and in his lab attempting to build a liver out of his patient's own cells.



Across the globe, teams like theirs are racing to be first. In the U.S., groups at Harvard at Wake Forest are trying to grow a liver they can successfully implant into a pig or dog. "In the next two to five years," Denver predicts, "someone will accomplish this. This will be my doctoral thesis."

Denver has a dual undergraduate major from CMU in chemical and biomedical engineering, and he applied to graduate school at Pitt to further these interests. In 2010, he married, and bought a house with his wife, Bridget, in North Versailles, midway between Pitt and her job teaching music at Norwin High School. He hopes to stay in academia, perhaps working his way someday to a professorship of his own in the Pittsburgh area.

Right now, Denver also works two to three times a week as a clinical engineer with the UPMC artificial heart transplant team.

"I like working at the hospital," says Denver; "I've done it for a year and a half. It opened my eyes to the clinical part of transplantation. It's a great opportunity to help patients, especially children to see them get transplants and recover."

For the transplant team, Denver checks devices that keep patients from having a heart attack. "We make sure the device settings are appropriate, and we monitor them."

How does he have time for anything else? The answer: he hardly does. "Whenever I have time," he says, "it's family time." Born and raised in Ligonier, PA, he is close to his parents, who help care for their year-old son, Michael, as does Bridget's family and various babysitters. An excellent golfer, and former golf team member at CMU, Denver has temporarily shelved his clubs.

Instead, usually in the modern Tissue Engineering Building on the Monongahela River, Denver works to build a liver. Near him, former ARCS alum Megan Jamiolkowski works on heart tissue. To attempt a large animal liver transplant, Denver has already received the necessary approvals from his professors, as well as from the university and the committee that oversees animal work. He will culture the animal's cells in an incubator, build the liver, and implant it parallel to the animal's native liver. Theoretically, the engineered liver will start growing in the patient's body. After it's grown enough, they'll take out the native liver -- and the patient thrives.

After such a feat has been accomplished, human clinical trials will begin.

"But," says Denver, "that's beyond my focus now."

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2013-2014**

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ARCS Foundation greatly appreciates the generosity of
these donors toward our scholars.

What is Hacking?

Second-year ARCS scholar Peter Chapman answered that question in a compelling talk on CMU's campus last November.



*Top: Peter Chapman,
Right: Annie Rivers, Janet Wood,
Charlotte Beukema, Kathy Dee,
Debbie Scully, Angie Maher, and
Dottie Nielsen, Below: Linda Ban
and Debbie Scully*

When they work on computer security, Peter's team always wonders: "What threats are we defending against? Who is our potential hacker?"



With this ATTACK - DEFEND model in mind, Peter and his team in CMU's Software Engineering Institute sponsored a contest across the United States inviting high school

seniors to try to hack a given computer program. It was the largest computer security competition ever held. Thousands of students from 955 high schools participated, exciting the students and potentially introducing them to future study in computer security. We need such



security to defend not only our online bank accounts and passwords, but also the computers that run everything from cars to underground sewers and the electric grid.

Peter cordially answered questions for ARCS members and guests after his talk.

Al Fresco Luncheons

Stay tuned for word of this summer's Al Fresco lunches, to which members bring their own lunches and hostesses provide cool drinks and tasty snacks and desserts.

Last summer on July 11, Peggy Mooney hosted an Al Fresco lunch in her lovely Fox Chapel home, which twelve ARCS members attended. Similarly, seventeen people attended Natalie Hoffman's lively

August 7 luncheon on S. Linden Avenue in Point Breeze, including current ARCS scholar Samantha Finkelstein.

These are always occasions for learning about ARCS in a relaxed and cordial way.

National ARCS Foundation Meets

Five ARCS Pittsburgh members, who also serve as members of the national ARCS board, traveled to the fall national board meeting in Portland, Oregon: Jeanne Berdik, who continues on the national board although she has completed her term as ARCS Foundation president; Missy Unkovic, current Pittsburgh chapter president; and past chapter presidents Sue Harter, Carol Stockman and Beth Wainwright.

In a message following the meeting, then ARCS Foundation president, Jeanne Berdik noted that the national foundation can boast that:

- Support for our STEM scholars this past year totaled \$4.39 M, an increase of \$221,000 over 2012.
- Ninety-four % of 2013's award money, \$4.09 M, supports graduate scholars, and 6 %, or \$247,000 supports undergraduates.
- The national cumulative total since our founding in 1958 is \$87 M in support of over 8,500 scholars at 54 of America's top science universities (587 ARCS Foundation-approved departments or programs).
- An ARCS Foundation survey found that 89 % of all ARCS Scholars believe the ARCS Award to be of significant or extremely significant importance to them.
- In the same survey, 48 % credited their ARCS Award as being significant or extremely significant in the completion of their degrees.

From these results, an even greater impact can be extrapolated in terms of the financial and moral support ARCS scholars continue to receive, both from our members and from future achievements such as patents, grant funding, scientific articles, etc. resulting in part from our early encouragement.

That continues to be our goal.

Welcome New Members!

Please extend a warm welcome to the new ARCS Pittsburgh members who support STEM scholars with us. Zip codes are included beside the new member's name. If someone lives in your neighborhood, please welcome her and perhaps offer to car pool for the next ARCS event.

NAME	ZIP CODE
Barbara Ackerman	15232
Deb Acklin	15217
Debra Alward	15215
Barbara DeWitt	15208
Sandra Lafe	15206
Barbara Laswell	15238
Maria Liang Ludmer	33408
Dotty Nielsen	15215
Shauna Spencer	15221

Many thanks to Karen Slevin and Natalie Hoffman, who chair and co-chair the New Members Committee.

Pittsburgh Chapter Board of Directors 2013-2014

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Special thanks to Kellie Anderson, Lori Spisak and the University of Pittsburgh for the printing and mailing of this newsletter.

Save the Dates!

February 20	Planning Event. All members are invited, from 4:45 to 7:00 PM at the Pittsburgh Parks Conservancy's Schenley Park Café and Visitor Center. Beverages (including wine) and hors d'oeuvres will be served.
February 12	Interactive lecture at Pitt on the Impact of Media on Human Behavior by Dr. Brian Primack at the University Club, Ballroom A from 5:30 to 7:30 PM.
March 26	Scholar Showcase at the Twentieth Century Club.
April (TBD)	Tour of the Nine Mile Run Watershed.
Summer (TBD)	Al Fresco lunches

Donate Tickets to our Scholars

If you can't use your tickets to any sports or cultural event, please email Kathy Dee at KathyDee28@aol.com, or telephone her at 412-243-5333. Include your telephone number and the event name and date.

Kathy will send an e-blast to the scholars. If a scholar can use your tickets, he or she will contact you about them directly.

Thank you!!!