AIMS TIMES

Murray State University

Volume 12. Issue 4

April 2014

DIRECTOR'S CHAIR

April showers bring May flowers!!!!

Greetings AIMS FAMILY!

Hard to believe but the summer component will start next month! We are busy putting the finishing touches on what is shaping up to be one "Groovy" Summer!!! Can you dig it?

We are doing a 70's theme this summer... So get ready to boogie!!! Remember our motto work hard and play even harder!!!

I look forward to seeing you at Orientation in a couple of weeks!!

Until then peace, love and soul!!!

Dr. Doris Clark-Sarr

Special points of interest:

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- *College Information pg. 7*

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ADMINISTRATIVE GREETINGS

Hello Everyone!

Spring Flowers are here! I hope everyone is having a good Spring Semester. Just the other day I was thinking the AIMS Summer Program will be here and gone before we know it.

Please make sure you have mailed all paperwork you have received from the AIMS Department.

I look forward to seeing you at Orientation.

Gail Woolridge

COORDINATOR'S CORNER—AIMS I

Outta sight AIMS!

This summer is going to be "off the hook"! I'm so excited about our 70's theme and all the "rad" activities we have in store for you! I hope you are ready for a very fun and exciting summer.

Saturday, April 19, 2014 is Orientation for new and returning students. It is very important for you or a parent to attend so you can receive your Pre-Assignments and have everything ready for the summer!

Bridge Students, I will have some information for you to complete as well!

As Always, if you have any questions please do not hesitate to contact us. Continue to work hard throughout the rest of the semester and keep those grades up!

Can't wait to see you all in a few weeks! This summer is going to be "slammin"!

Stephen D. Keene

COORDINATOR'S CORNER—AIMS II

Hello AIMS Family!

2014 is already about one-third over with—CRAZY! Time flies when you're having fun though! We have been busy here on the Murray State campus getting ready for the Summer 2014 program. We've conducted interviews, hired the staff, and now it is time to take care of all of those little details to bring it all together. Will be a great summer!!

Good luck to those taking the ACT this month! Email or Facebook me if you have any questions and/or want a copy of our super helpful ACT power point presentation. I look forward to seeing you all at orientation on April 19th! While you're there, don't just hang out with the people you already know! Be sure to greet new students and make them feel welcome—it will go a long way. See you soon!!

Evan O'Neal

CAREER PROFILE: Scarcity Breeds Opportunity By Trisha Gura

hen pediatrician and biochemist Heng Wang answered the advertisement to work in Ohio farm country, he knew he was charting an unusual career path. Five families had decided to start a clinic there to treat their children with undiagnosed conditions; they were Amish, members of a religious group that drives horses and buggies and mostly eschews modern conveniences. The Amish passed around a hat, collected $50, and in 2001 launched the DDC Clinic-Center for Special Needs Children.

With an annual operating budget of just $100,000, Wang and Baozhong Xin—a postdoc who was hired in 2006—publish three or four articles each year in top journals, including *Science, Nature Genetics*, and *Proceedings of the National Academy of Sciences*. They have discovered two new genes implicated in two medical conditions and conducted one of the cheapest clinical trials in history, formulating a nutritional formula from pig brains that supplements a protein missing in a rare developmental disorder.

Conducting successful science on a shoestring budgetmakes for a good story—but it is, more importantly, a vital skill set in times of declining research funding. With the National Institutes of Health's (NIH's) budget languishing, investigators must find ways to stay afloat. In this respect, the DDC clinic could serve as a paradigm. What advice do Wang and other spartan scientists have to offer? Be resourceful, creative, and daring, they suggest—and protective of your scientific passion. "When you do more meaningful work, it is quite an adventure," Wang says. "But the money does come."

Use what you have

When the DDC clinic began, Wang could not afford an office where he could meet patients. So he made house calls. A year later, he converted a small home into a clinic and recruited an Amish carpenter to build a "lab:" a bench in a 9-square-foot space that supports a centrifuge for DNA purification.

The Hunt for Money in Biomedicine

Two years later, the clinic's conference room became the new lab, and Wang hired Xin—then a cancer-genetics postdoc at Case Western Medical School—to run clinical diagnostics and basic research. Lacking money to outfit the new lab, Wang and Xin bought used equipment: a single channel DNA sequencer (bought and barely touched by a Harvard Medical School researcher); second-hand centrifuges and pipettes; a reconditioned CytoScan HD system that detects variations in the number of copies of a gene.

Going beyond bargain hunting, Wang drew on his most important asset: a heartfelt mission to help minority children who don't have health insurance. Pleading that case, he convinced Affymetrix, CytoScan's manufacturer, to extend the instrument's warranty by 2 years. A local philanthropist underwrote purchase of a new Illumina MiSeq device that facilitates targeted gene sequencing. And the clinic stays afloat. More than that: It's doing good science.

For young researchers, frugal environments can offer broad, resourceful training. "Having the experience of working on projects cheaply, in a very small lab, I get the opportunity to do a little bit of everything," says genetics researcher Adam Heaps, at the Clinic for Special Children in Strasburg, Pennsylvania, which pioneered the model for Wang's Ohio clinic.

Create a concept ... and sell it

Seconding the idea of using scarcity to breed opportunity, Jason Osborne, a laboratory instrument designer, and Aaron Alford, a psychiatric epidemiologist, came up with an outrageous concept: Get the education system to pay for field work in paleontology. With nothing but some scuba equipment and an intrepid spirit, the two cofounded Paleo Quest and SharkFinder, which enlist students to hunt for fossils of ancient sharks, rays, and invertebrates.

Based near Washington—Alford at Battelle in Arlington, Virginia, and Osborne at the Howard Hughes Medical Institute's (HHMI's) Janelia Farm research campus in Ashburn, Virginia—the investigators first sought to prove their concept. They targeted areas known to be rich in fossils from information-poor periods of prehistory. They dove to

CAREER PROFILE: Scarcity Breeds Opportunity By Trisha Gura (continued)

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Next came the sales pitch. Alford and Osborne contacted the heads of elementary and middle school science departments. Given a green light, they sent teachers unsorted swamp material and armed students with instructions for identifying fossils. The kids did the sifting and discovered fossils that appear to be "first occurrence" species in the region where they were found.

Give away data

But of course, before they could publish, they needed to be confident of their conclusions. So Osborne and Alford trotted over to Bretton Kent, director of undergraduate studies at the University of Maryland (UMD), College Park. Kent is passionate about ancient sharks and rays, but he could not do that work because UMD's Department of Entomology, where he had his post, did not have a position for cartilaginous fish paleontology. Sold on the SharkFinder idea, Kent trained undergraduates to assist in processing and studying the samples. The result: A gold mine of discoveries. The project is now staffed with 10 undergraduates, a lab head supervisor, and, of course, Kent. His team has prepared 13 manuscripts based on discoveries made largely by students, some as young as 8 years old.

The key to this economical approach to paleontology is that Osborne and Alford were happy to "give data away," Osborne says. While it may look like an act of altruism, in this case data sharing seeded the novel funding model. The schools now buy the kits, and UMD researchers write grants that pay for fieldwork. Osborne and Alford do what they love most, diving and publishing on novel methods of science education, including citizen science, where regular people gather data to support peer-reviewed science. Osborne's inclusiveness led to an invitation to the White House as a "champion for change" in science education. He accepted the award on behalf of SharkFinder.

His advice: "Proof of concept first … network like hell … give data away. Then, funding falls into your hands."

Be über-creative

Money can also be teased from the commercial sector. Looking for a way to promote science education for all, Osborne came up with another wild idea: Why not sell beer to pay for lab equipment for underprivileged schools? The idea is not as crazy—or controversial—as it seems. At HHMI, Osborne had worked with molecular biologist Jasper Akerboom, who later left to follow a dream: He became a brewmaster and yeast specialist.

On a whim, Osborne and Akerboom swabbed the bones from a prehistoric whale found by Alford. Akerboom cultured from it a wild strain of yeast and brewed a hip, new beer. Meanwhile, Osborne championed labeling the beer with whale skull bones, and an Internet link to learn more. The project spans public outreach, education, and real research. It is a way to teach the public about yeast, molecular biology, and paleontology. Part of the proceeds goes to the SharkFinder project, eventually supporting science departments at underprivileged schools.

Repurpose technology

Computer research scientist Victor Pankratius of the Massachusetts Institute of Technology (MIT) in Cambridge, Massachusetts, is part of an interdisciplinary team at MIT's Haystack Observatory. The team's goal is to map the electron content in the atmosphere with high resolution. Such maps can help monitor natural disasters such as tsunamis

CAREER PROFILE: Scarcity Breeds Opportunity By Trisha Gura (continued)

and earthquakes.

If they had chosen the traditional, expensive approach, the team would have spent large sums setting up a satellite network and positioning earth-based receivers to collect the data for calculating electron content in the ionosphere. But Pankratius and his team leveraged an economical alternative: Harness the GPS network that people use to find directions to, say, a restaurant. Scientists could intercept two different frequency signals relayed by the same satellite. The delay between them would be proportional to the total electron content in the ionosphere.

Pankratius had to get around one problem: Typical mobile phones—while inexpensive, ubiquitous, and capable of acting as sensors—have cheap GPS receivers that are not capable of measuring the two frequencies. So his team constructed external dual-frequency receivers and positioned them at strategic access points. When a smartphone user walks near one of those access points, the receivers recognize their mobile devices and relay a signal to the phones, which in turn transmit the data via cellular networks or Wi-Fi to the place where they are analyzed.

It's affordable because the networks they're using already exist. "We are not building a new satellite infrastructure," Pankratius says. "We are reusing the existing GPS infrastructure, but for science instead of positioning."

The MIT team is in the pilot phase of the program, called "The Mahali Space Weather Monitoring Project," so team members are using their own phones. But they hope that eventually citizen scientists will download the app and donate some of their monthly data-usage to the cause. The clincher will be when cell phone manufacturers start making phones with embedded dual receivers; then there will be no need to build receivers. The more people who use their phones to transmit positioning data, the greater the resolution and the better the electron map.

Take a risk

Commercial technology also aided atmospheric scientist Berk Knighton, a faculty member in chemistry and biochemistry at Montana State University (MSU), Bozeman. Trained to do chemistry and atmospheric sciences research, Knighton weathered the 1999 recession by branching out from his lab to work part-time on a MSU program called "BOREALIS," funded by NASA to promote science education.

Typically, researchers would have to line up to pay for a spot on a NASA satellite or a large-scale balloon. The wait would be up to 7 years, and it would be necessary to "add two zeros to the cost of whatever we do," Knighton says.

Knighton's predecessors at MSU came up with a cheaper alternative: weather balloons, $250-600 apiece, that can float to altitudes of 100,000 feet. Because the balloons are less than 12 pounds, they save money and hassle by sidestepping a requirement for licensing by the Federal Aviation Administration, which waives the rule for small balloons that gather weather data. Students do space science cheaply, photographing events like solar eclipses or attempting to collect cosmic dust. (The students did capture particles in space, but they turned out to be aluminum oxide spheres, produced by rocket exhaust.) Knighton's team also harnesses the latest commercial advances, such as miniature video cameras, meant for the sporting market but capable of weathering the extremes of temperature in near space.

Doing low-budget science means taking risks, but that is part of its value. "I have had to be very creative and redefine what I do a couple of times through my career," Knighton says. "Boredom is not something I suffer." That attitude drives true invention, he notes.

MIT's Pankratius agrees. "Don't go for something that is robust but does not yield too many new insights," he says. "Look for the interesting projects with potentially a breakthrough character ... and take the risk."

April 3, 2014

APRIL BIRTHDAYS

Shuntara Beard

Tamera Lott

Lucas Reed

Megan Warren

Austin Wisniewski

PARENTS' CORNER: College Information

The following information will help you guide and advise your college bound student.

To ensure that your child will be prepared for college, make sure that he/she takes the recommended courses, signs up for the right tests, and completes the necessary forms. Most importantly, encourage your child to do as well as possible in high school.

College recommended courses

Four-year colleges generally recommend that students take these college preparatory courses in high school.

- 4 years of English
- 3 years of Math (Algebra I, Geometry, and Algebra II)
- 3 years of science (with laboratory experience)
- 2-3 years of the same foreign language
- 3 years of social studies
- 1 year of fine or performing arts

College bound students should complete all the above recommended courses, if possible. Students who haven't taken all of these courses may be required to take remedial and/or additional courses once they are in college. Students who haven't taken several of the above courses may want to consider starting at a community college or at a college's branch campus. These students can then transfer to a four-year college (or to the main campus) after a year or two.

Competitive schools and programs consider the above to be the minimum requirements. They recommend that students challenge themselves by taking advanced, honors, AP (Advanced Placement, and IB (International Baccalaureate) courses wherever possible. As a general rule, students should take as many college prep English, science, math, social studies, and foreign language courses as they can handle.

Admissions Criteria

Colleges use some, if not all, of the information listed below when determining whether or not to accept an applicant. Individual colleges, however, differ in how they evaluate this information. For example, one college may place a great deal of importance on test scores. Another college may focus more on other factors.

- Grade point average (GPA)
- Strength of subjects
- ACT/SAT scores
- Class Rank
- Recommendations
- Special talents/awards
- Personal qualities
- Activities
- Essays
- Interviews

Paying for College

For the 2012-2013 school year, most college costs fell within the ranges listed below. These figures include tuition, fees, room and board, and books for one year.

Public Four-Year College (in-state) - $21,500—$23,500

Private Four-Year College— $41,000—$46,000

Community College— $14.000—$16,800

Parents who are saving money for their child's college education may want to consider investing in a 529 plan. While these plans vary from state to state, all provide tax benefits. For information, go to www.savingforcollege.com.

Although college can be expensive, many students qualify for financial aid (grants, scholarships, work-study, loans). There are also a number of ways that students can make college more affordable. Students can go to a public college in their home state, live at home and commute, start at a community college, or take advantage of military educational programs.

For information on how to pay for college, talk to your child's counselor or go to one of the following websites.

www.studentaid.ed.gov

www.finaid.org

www.collegeboard.org

Education is an investment in the future!

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AIMS Program

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Schedule At-A-Glance

April
9th Honor Roll Cultural Outing
12th ACT Test Date
19th AIMS Orientation
251 Blackburn Science Bldg

May
26th—29th AIMS Staff Retreat Eminence, MO
26th Bridge Move In Day
2:00pm
27th Bridge Classes Begin

June
2nd AIMS Pre-Assignments Due Date
3rd—5th Bridge Surprise Trip
6th—8th Bridge Weekend
8th Undergraduate Move-In Day & Cook-Out
2:00pm
9th Undergraduate Classes Begin
11th AIMS Testing & Carnival
14th ACT Test Date
18th Venture River Day & Bridge Graduation
20th—22nd Bridge St. Louis Trip
25th Discovery Park of America & Cultural Outing (TBA)
27th Closing Symposium & Move-Out Day
28th—July 2nd
End Of Year Trip (TBA)