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Office of the Vice Provost for Research and Economic Development

**Annual Report
Fiscal Year 2012**

**Submitted by
James M. Rankin**

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Executive Summary

Sponsored awards administered by Research and Sponsored Programs for FY2012 totaled \$47,523,240 representing a decrease of 9.6% compared to FY2011. Including the Division of Agriculture, University of Arkansas external support for sponsored activities received in FY2012 was \$68,736,194, an overall decrease of 7.2% from FY2011.

The Conflict of Interest and Commitment Review Committee along with additional representatives from UA faculty and staff began working on a new **Conflict of Interest and Commitment Policy** in response to significant changes in the Public Health Service regulations. The Policy is in its final stages and scheduled for implementation on or prior to the August 2012 deadline.

The **Technology Licensing Office** received 31 disclosures of inventions or copyrightable works (up 15% from FY2011), filed 19 new patent applications (doubled from FY2011), and had sixteen patents issue (also doubled).

Associate Vice Provost for Entrepreneurship, Dr. Carol Reeves, was recognized by *Fortune* magazine as one of the ten most powerful woman entrepreneurs in the United States.

All three UA student teams won a **Venture Labs Investment Competition (VLIC)** qualifying competition and competed at the season-ending VLIC competition. This has not been accomplished by a single university in the 25-year history of the competition.

Arkansas Space and Planetary Science Center faculty and students produced over 28 publications in refereed journals and gave at least 16 invited talks and 64 contributed presentations at major national and international conferences.

Space Center research faculty member, Dr. Vincent Chevrier, co-authored an article which was selected as an “Editors’ Choice” in the July 2012 issue of *Science*.

The **University of Arkansas Press** had three best-sellers with each having over 3000 copies in print.

The **Arkansas High Performance Computing Center** supported research grants totaling 12.89 million dollars. This research resulted in over 30 journal or conference publications and over 40 conference or workshop presentations.

Office of the Vice Provost for Research and Economic Development

The Office of the Vice Provost for Research and Economic Development initiated or continued several different programs in FY12 to enhance the research enterprise. The use of the UA aircraft to transport faculty to DC to meet with federal agency sponsors was continued. These trips have been very important in allowing faculty to present their research ideas to program directors and receive feedback on their viability and how to refine the proposal. There were two trips planned in FY12, although the fall 2011 trip was cancelled due to aircraft maintenance. Travelers scheduled for the trip were offered the option of traveling to DC via commercial air. Funding for the trips has been secured to allow three trips in FY13, one per semester including summer.

TreMonti Consulting of Fairfax, Virginia was hired to conduct an external review of the Technology Licensing Office. The review also included technology transfer experts from three land-grant institutions: Georgia Tech University, University of Nebraska – Lincoln, and Auburn University. These representatives interviewed faculty, administrators, and other university stakeholders. The review yielded recommendations and best practices that will inform the development of technology transfer services going forward.

The federal lobbying effort was continued in FY12. Since the House Republicans continued their “No Earmarks” policy in FY12, the lobbying effort was focused on 1) representing UA research to federal agencies and 2) working with the congressional delegation to support programs of interest to UA. The university lobbyist traveled to campus to meet with faculty in Nov 2011. Instead of a list of appropriation requests, each member of the Congressional delegation received a list of past federal agency grants and a list of interest areas.

Hanover Grants was contracted to provide comprehensive, discipline-based proposal writing, editing and review services for a limited number of grant proposals. The contract allows one proposal at any given time under review. In the last three months, Hanover has reviewed proposals intended for submission to the Department of Commerce, National Institutes of Health, and National Science Foundation. The cost of the contract is shared with Institutional Research who will also receive statistical services and reports on higher education from Hanover Research.

The Community of Science is under contract to provide a web-based platform for locating funding sources through a product called *Pivot*. This database also connects funding opportunities with potential collaborators at the University of Arkansas and nationally. Funding opportunities can be searched using a wide range of criteria, including discipline, funding source, and eligibility requirements.

Distribution lists corresponding to research initiatives were implemented to facilitate the exchange of information and broadcast funding opportunities. Investigators can subscribe or unsubscribe from distribution lists on the VPRED website. Lists are available for nanotechnology, energy and the environment, health, sustainability, cyberinfrastructure, and NASA.

An Arts and Humanities Seed Funding program was initiated in the VPRED office this year. Faculty from all UA colleges were invited to submit a brief proposal on an arts and humanities related project. The project was limited to tenured and tenure-track faculty and the criteria were to improve the national reputation of the faculty member and the University. Each budget was capped at \$5,000.

Research and Sponsored Programs

Proposals and Awards

Award Administration

The Office of Research Support and Sponsored Programs (RSSP) accepted a total of 453 awards from various sponsors during FY2012. Total sponsor awards administered by RSSP for FY2012 was \$47,523,240 representing a decrease of 9.6% compared to FY2011. The Division of Agriculture administered research support in the amount of \$21,212,954 representing a decrease of 1.5%. As shown in Table 1, University of Arkansas external support for sponsored activities received in FY2012 was \$68,736,194, an overall decrease of 7.2% from the previous year.

| Table 1: Summary of Awards FY04-12 (including the Division of Agriculture) | | | | | | | | | |
|--|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|---------------|
| Unit | FY2004 | FY2005 | FY2006 | FY2007 | FY2008 | FY2009 | FY2010 | FY2011 | FY2012 |
| ADMIN | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 957,967 | \$ - | | \$ 4,228,831 |
| AFLS | \$ 15,193,476 | \$ 17,335,331 | \$ 14,931,201 | \$ 13,696,441 | \$ 14,811,857 | \$ 19,989,692 | \$ 21,290,763 | \$ 25,061,033 | \$ 25,618,983 |
| ARCH | \$ 527,989 | \$ 1,433,944 | \$ 1,778,349 | \$ 1,043,038 | \$ 586,961 | \$ 855,246 | \$ 468,085 | \$ 191,493 | \$ 95,720 |
| ARSC | \$ 27,408,401 | \$ 20,634,520 | \$ 19,886,493 | \$ 17,220,638 | \$ 19,891,658 | \$ 21,308,726 | \$ 21,858,369 | \$ 18,666,359 | \$ 14,662,942 |
| EDUC | \$ 6,494,183 | \$ 5,348,988 | \$ 7,676,504 | \$ 6,368,064 | \$ 7,272,031 | \$ 7,176,954 | \$ 8,698,295 | \$ 8,226,951 | \$ 11,338,163 |
| ENGR | \$ 7,466,224 | \$ 10,399,587 | \$ 20,994,561 | \$ 10,992,697 | \$ 17,935,215 | \$ 8,755,641 | \$ 19,326,484 | \$ 15,474,529 | \$ 10,528,923 |
| GRAD | \$ 176,346 | \$ 197,136 | \$ 615,541 | \$ 1,527,150 | \$ 436,831 | \$ 649,833 | \$ 3,477,614 | \$ 490,240 | \$ 348,475 |
| LAW | \$ 222,180 | \$ 39,744 | \$ 46,510 | \$ 117,853 | \$ 89,529 | \$ 11,000 | \$ 39,744 | \$ 39,412 | \$ 39,744 |
| LIBR | \$ - | \$ 30,000 | \$ - | \$ - | \$ - | \$ - | \$ - | \$ - | \$ 5,590 |
| VCAA | \$ - | \$ 355,000 | \$ 1,028,362 | \$ 43,418 | \$ 70,000 | \$ 700 | \$ 51,516 | \$ 140,000 | \$ - |
| VCFA | \$ 823,730 | \$ 1,010,333 | \$ 1,736,322 | \$ 3,114,851 | \$ 1,578,067 | \$ 1,386,081 | \$ 3,569,906 | \$ 1,914,342 | \$ - |
| VCSA | \$ 2,822,405 | \$ 1,682,489 | \$ 2,876,985 | \$ 1,959,914 | \$ 2,482,727 | \$ 1,803,320 | \$ 2,900,192 | \$ 2,097,931 | \$ - |
| WCOB | \$ 1,549,525 | \$ 1,135,109 | \$ 775,381 | \$ 1,501,740 | \$ 918,644 | \$ 1,197,457 | \$ 618,478 | \$ 640,988 | \$ 1,868,823 |
| Other | | | | | | | | \$ 1,145,084 | \$ - |
| Total | \$ 62,684,459 | \$ 59,602,181 | \$ 72,346,209 | \$ 57,585,804 | \$ 66,073,520 | \$ 64,092,617 | \$ 82,299,446 | \$ 74,088,362 | \$ 68,736,194 |

The composition of total FY2012 awards is \$34,763,291 (50.6%) from federal sources, \$17,252,039 (25.1%) from state sources, and \$16,720,864 (24.3%) from other sources such as industry and private foundations. These amounts are summarized by unit in Table 1.

American Recovery and Reinvestment Act of 2009 (ARRA)

The University received an insignificant amount (\$2,666) in ARRA (stimulus) funding in FY2012. This compares to \$4,002,710 in FY2011 and \$20,426,270 in FY2010.

| Table 2: Summary of Awards by Funding Source | | | | |
|---|----------------------|----------------------|----------------------|----------------------|
| Unit | Federal | State | Other | |
| ADMIN | \$ 3,497,757 | \$ 729,704 | \$ 1,370 | \$ 4,228,831 |
| AFLS | \$ 11,632,419 | \$ 1,147,873 | \$ 12,838,691 | \$ 25,618,983 |
| ARCH | \$ 89,500 | \$ 6,220 | | \$ 95,720 |
| ARSC | \$ 9,205,927 | \$ 4,536,316 | \$ 920,699 | \$ 14,662,942 |
| EDUC | \$ 2,221,858 | \$ 8,449,453 | \$ 666,852 | \$ 11,338,163 |
| ENGR | \$ 6,940,981 | \$ 2,131,404 | \$ 1,456,538 | \$ 10,528,923 |
| GRAD | \$ 348,475 | \$ - | \$ - | \$ 348,475 |
| LAW | | \$ 39,744 | \$ - | \$ 39,744 |
| LIBR | | \$ - | \$ 5,590 | \$ 5,590 |
| VCAA | \$ - | \$ - | \$ - | \$ - |
| VCFA | \$ - | \$ - | \$ - | \$ - |
| VCSA | \$ - | \$ - | \$ - | \$ - |
| WCOB | \$ 826,374 | \$ 211,325 | \$ 831,124 | \$ 1,868,823 |
| Other | \$ - | \$ - | \$ - | \$ - |
| | \$ 34,763,291 | \$ 17,252,039 | \$ 16,720,864 | \$ 68,736,194 |

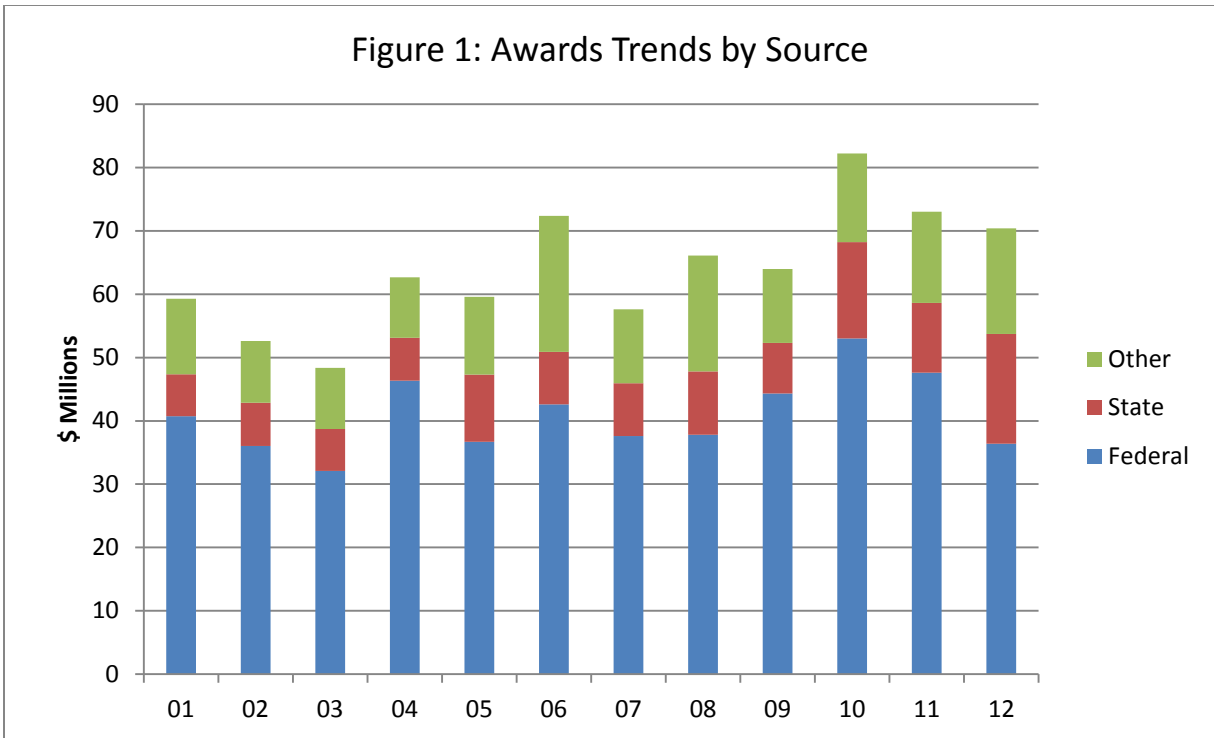


Figure 1. Awards Trends by Source

Proposal Development and Submission

RSSP assisted with the development and submission of 683 proposals and requests for continuation, exclusive of requests for no-cost extensions, in FY2012. The number of proposal submissions to all sources decreased by 11.9% over the previous fiscal year. Total funds requested were \$158,313,473. This includes requests of \$122,367,235 (77%) for federal funding, \$23,606,501 (15%) for state funding and \$12,339,737 (8%) for other types of funding. Figure 2 illustrates the history of submissions from FY2001 through the current fiscal period.

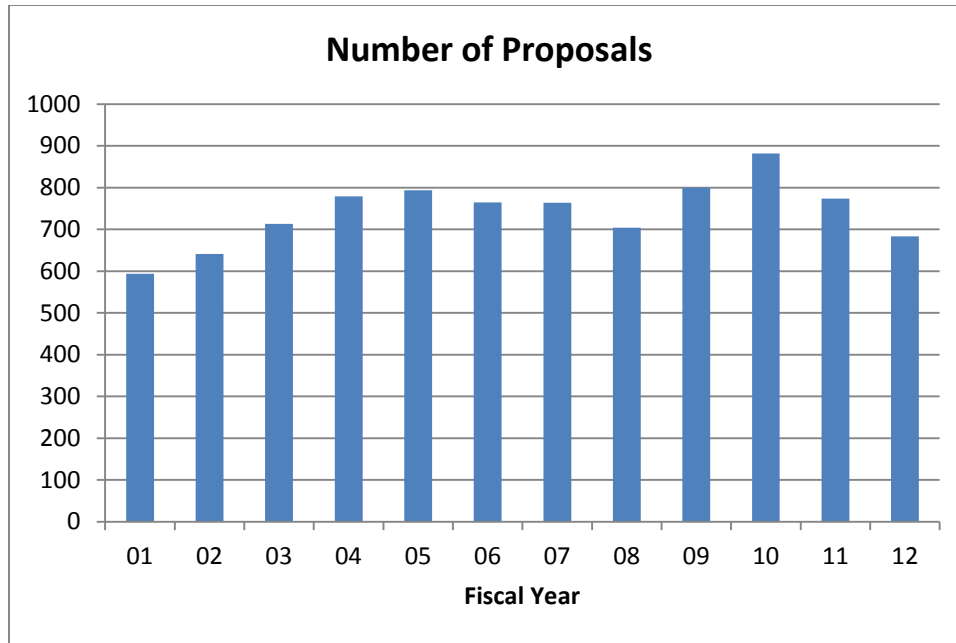


Figure 2. Number of Proposals Submitted

RSSP Highlights for FY2012

Personnel

Peggy Anderson resigned as grants specialist on March 30, 2012 to accept a position in the Department of Chemical Engineering. Following a national search process, Renee Vendetti has hired to fill this position on April 9, 2012. Renee brings valuable experience as a grants manager for the United States Agency on International Development (USAID). Noel Sharif was appointed a grants specialist by internal promotion effective July 1, 2012. Noel has previously worked in the Survey Research Center has been an important part of the implementation of electronic research administration within RSSP. Sandra McKinley, grants specialist, was recognized with an award as Employee of the Quarter.

Research Administrators Post (RAP)

In April of 2009, RSSP organized a University-wide group of administrators who wish to improve their understanding and assist investigators/ program managers to comply with of the rules, regulations, policies and procedures which govern the administration of sponsored activities. The purpose of the group is to standardize practices and procedures and improve services to investigators/programs directors. Attendance varies but ranges from 40 to 60 attendees per meeting.

Using the materials prepared for the monthly RAP presentations/training, the group has begun to draft a “Research Administrator’s Handbook” which is a primary goal of the group. Also to be created are “Preaward (Proposal) Management” and “Award Negotiation and Acceptance.” From the Administrator’s Handbook the group hopes further to create a handbook for

investigators/program managers to assist them with proposal creation and submission, post award management, and project closeout.

Research Administrators Post (RAP) Presentations FY2012

Non-Residential Immigration/Employment Processes – Aug 2011
Equipment Purchases – Sep 2011
Research Communications – Oct 2011
Panel of Experts Discussing Employment Practices at the UofA – Nov 2011
SURF's Up (Handling SURF student research awards) – Dec 2011
RazorGrant is Coming – Feb 2012
Export Controls – A Shared Responsibility, A Shared Liability – Mar 2012
Panel of Departmental Research Administrators – Apr 2012
Enhancements to webBASIS Reporting Tools – May 2012
Equipment Policy Revision – June 2012

Electronic Research Administration

In 2011, the Office of Research and Sponsored Programs conducted a Proof-of-Concept (POC) for the Quali-Coeus (KC) electronic research office management system. The goal of the POC was to assess the feasibility of implementing KC. In 2012, the system, renamed *RazorGrant*, has been implemented within RSSP for electronic proposal storage and internal review. Grants specialists are no longer using paper files for most proposals.

The next phase of *RazorGrant* implementation will replace the routing and disclosure forms currently in use. The department and college approval hierarchy has been implemented within the web interface so that proposals are automatically routed to the appropriate administrative office depending on the investigators involved. RSSP has written an extensive collection of training materials to help with the roll-out to other units. The Department of Chemical Engineering, and later the College of Engineering, will serve as the initial adopters of routing and approval workflow process.

Glass Blowing and Machine Shops

John Pace serves as Master Scientific Research Technician in the Glassblowing Shop. Dennis Rogers serves as Master Scientific Research Technician in the Machine Shop. Half of Dennis Rogers' salary was paid by the College of Engineering in FY12.

The Glass Shop saw a decrease in revenues of 29% and the Machine Shop showed an increase in revenues of 156%. The Machine Shop marked increase was partially due to a reduction of 3 months of service in FY2011 in order to prepare for a move to the Engineering Research Center (ENRC). Effective, July 1, 2011, the RSSP and College of Engineering machine shops were co-located at ENRC.

| Shop | Jobs | Shipping and Materials | Labor | Total Income | Change from FY10 |
|--------------|------|------------------------|----------|--------------|------------------|
| Glass Shop | 59 | \$3,987 | \$6,008 | \$9,995 | -29% |
| Machine Shop | 39 | \$1,841 | \$10,627 | \$12,468 | +156% |

Research Compliance

The Research Compliance office was established on January 1, 2011. This report represents the activities and accomplishments of the office for FY12, the first, full fiscal year since its inception.

The office has four full-time employees and one part-time employee.

Among the significant accomplishments of the office this Fiscal Year were:

- In collaboration with Property Accounting and the BASIS Team, modified the AIMS database to store the Export Control Classification Number or Category in the records of all permanent equipment items. This will facilitate compliance within the facilities and when the equipment is sent to surplus for disposal.
- Completed export classification assessments for three research facilities and five laboratories.
- Submitted UA Registration as a defense contractor to the Department of Defense Trade Controls.
- Completed UA Registration with the Department of Commerce to allow electronic submission of license requests, advisory opinions, etc.
- Collaborated with International Students and Scholars to implement an I-129 Certification process for export control compliance in accordance with new federal regulations regarding application for H1-B visas. (Since January 1, 2012, RSCP has reviewed 41 internal certifications for faculty, staff, and students.)

Compliance Committee Support

Institutional Review Board (IRB)

| FY12 Human Subjects Research Protocol Activity | |
|--|---|
| <i># of New Protocols</i> | <i>Type of Review</i> |
| 575 | Exempt |
| 134 | Expedited |
| 29 | Full Board |
| 7 | Administrative – determined not to be human subjects research |

| FY12 Human Subjects Research Protocol Activity | |
|--|-----------------------|
| <i># of Protocol Modifications</i> | <i>Type of Review</i> |
| 123 | Exempt |
| 61 | Expedited |
| 34 | Full Board |
| <i># of Protocol Extensions</i> | <i>Type of Review</i> |
| 138 | Exempt |
| 65 | Expedited |
| 13 | Full Board |

No Adverse Events were reported in this fiscal year.

Biosafety Committee (IBC)

| FY12 Biological Safety Research Protocol Activity | |
|---|----|
| New Protocols | 27 |
| Protocol Renewals | 15 |
| Protocol Modifications | 7 |

Institutional Animal Care and Use Committee (IACUC)

| FY12 IACUC Research Protocol Activity | |
|---------------------------------------|-----------------------|
| <i># of New Protocols</i> | <i>Type of Review</i> |
| 44 | Full Committee |
| 10 | Expedited Review |
| <i># of Modification Requests</i> | <i>Type of Review</i> |
| 9 | Full Committee |
| 9 | Expedited Review |

Semi-annual facilities and program reviews were conducted on December 2, 2011 and June 8, 2012. There were no findings of significant noncompliance and now dissenting opinions offered.

Radiation Safety Committee (RSC)

The RSC met a total of four (4) times in FY12. The Arkansas Department of Health performed its annual inspection in March 2012. There were no findings of significant non-compliance

Toxic Substances Committee (TSC)

The TSC met twice during FY12. The Committee addressed the following:

- Revision and update of the UA *Chemical Hygiene Plan* to address the safe use of toxic substances in campus laboratories and to conform to the U.S. Occupational Safety and Health Administration Laboratory Safety Standards (29 CFR 1910 – 1450); the U.S. Environmental Protection Agency Resources Conservation and Recovery

Act of 1984, and the Arkansas Department of Pollution Control and Ecology Regulation 23.

- Modification of UA Policy 727.2 Toxic Substances Use on Campus to address the abandonment of toxic substances in laboratory facilities which have been vacated for any reason.
- Safe handling and disposal of methylmercury hydroxide (CH₄HgO)

Conflict of Interest and Commitment Review Committee (CICRC)

The CICRC along with additional representatives from UA faculty and staff began working on a new Conflict of Interest and Commitment Policy in response to significant changes in the Public Health Service regulations. The Policy is in its final stages and scheduled for implementation on or prior to the August 2012 deadline.

Compliance Training

RSCP staff provides training opportunities in a variety of formats. Training is provided without charge for faculty, staff, and students.

Laboratory Animal Training Association (LATA)

Faculty, staff, and students completed a total of two hundred and twenty-seven (227) LATA training modules.

Collaborative Institutional Training Initiative (CITI) — Human Subjects Research and Responsible Conduct of Research

One hundred and ten (110) people completed one hundred and twenty-three (123) CITI courses.

Live Presentations (external and internal)

- Export Control RSCP sponsored two Export Compliance Conferences in FY12. Guest presenters included representatives from the Department of Commerce, Department of Treasury, the State Department presented six sessions. Also presenting sessions were UA employees from the Office of Technology Licensing, College of Engineering, and RSCP. In addition to faculty, staff, and students, employees from the companies in the Arkansas Technology Park attended.
- The Director provided export compliance training for the Arkansas Department of Finance and Administration, University of Arkansas for Medical Sciences, and University of Arkansas Little Rock.
- Institutional Review Board The IRB Compliance Officer and the Director conducted seven training sessions on the submission of IRB protocols including but not limited to presentations for MAT students, Public Policy students, and various classes.

- Institutional Animal Care and Use Committee The Director was an invited speaker on regulations governing biomedical and agricultural animal research at the National Agricultural Law Center.

The IACUC Veterinarian and the Central Laboratory Animal Facility Manager conducted numerous “one-on-one” training sessions on research/surgical techniques, animal husbandry, etc. for faculty, staff and student researchers.

- Research Ethics The Director spoke on “Research Misconduct – Policies and Consequences” to graduate students in the annual Graduate School Research Ethics Series.
- Research Compliance The Director spoke to the following groups about the UA compliance committees and protocol submission:
 - College of Agriculture Honors Students
 - Carver Students
 - Biology Graduate Student Orientation
 - Graduate School Student Orientation

Clerkships and Traineeships

RSCP negotiated and executed thirteen (13) clerkship and traineeship agreements – for Rehabilitation, Human Resources and Communication Disorders (RHRC).

Material Transfer Agreements

RSCP negotiated and executed seventeen (17) Material Transfer Agreements for seventeen (17) faculty members and one Program Enrollment Agreement to allow all interested University researchers to participate in the Lilly PD2 drug discovery program.

Central Laboratory Animal Facility

The Central Laboratory Animal Facility (CLAF), an area of approximately 9000 sq. ft. located in the basement of the “A” wing of the Animal Sciences Building (AFLS), has been in operation since early 2000. A total of \$ \$15,354.13 in *per diem* charges was collected for FY12.

Technology Licensing Office

The Technology Licensing Office (TLO) touches many aspects of the contractual bases for research and commercialization. We negotiate and sign confidentiality agreements for the University; support the Division of Agriculture and RSSP in negotiating intellectual property (IP) clauses in sponsored research agreements; report inventions to sponsors; negotiate multi-party IP agreements; teach classes in entrepreneurship and patenting; obtain patents; and license companies to commercialize inventions. Recent statistics suggest that UA’s TLO continues to compare well with our peers.

Comparison to Peers

The most recent Association of University Technology Managers (AUTM) Report (2010) ranks the University of Arkansas, Fayetteville + Division of Agriculture highly in key areas:¹

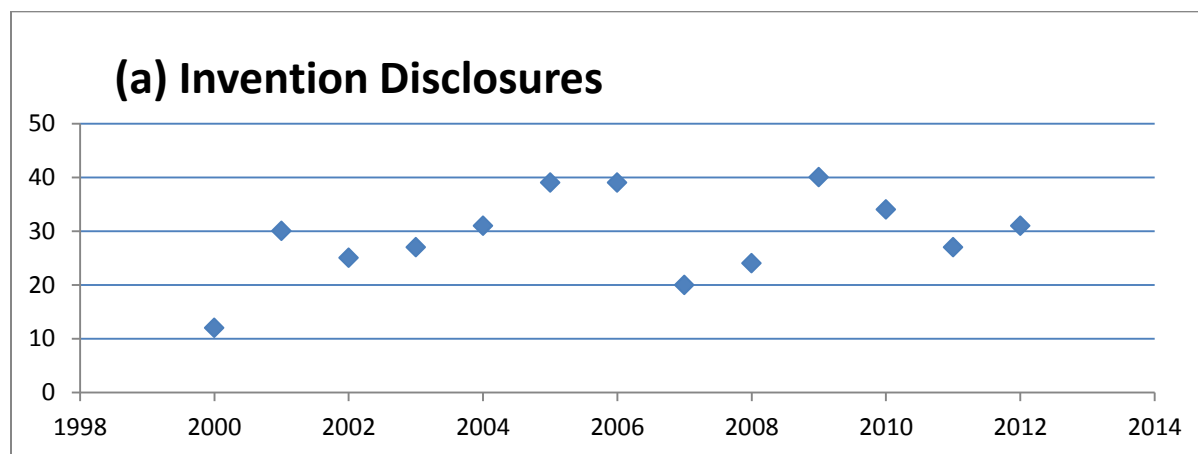
1. 6th in the number of licenses generating income,
2. 9th in cumulative active licenses,
3. Tied for 9th in number of start-ups formed;
4. Tied for 9th in number of licenses/options executed; and
5. Tied for 24th in the number of invention disclosures received.

To put this in perspective, UAF and the Division of Agriculture were ranked 30th in total sponsored research expenditures among these 61 universities.

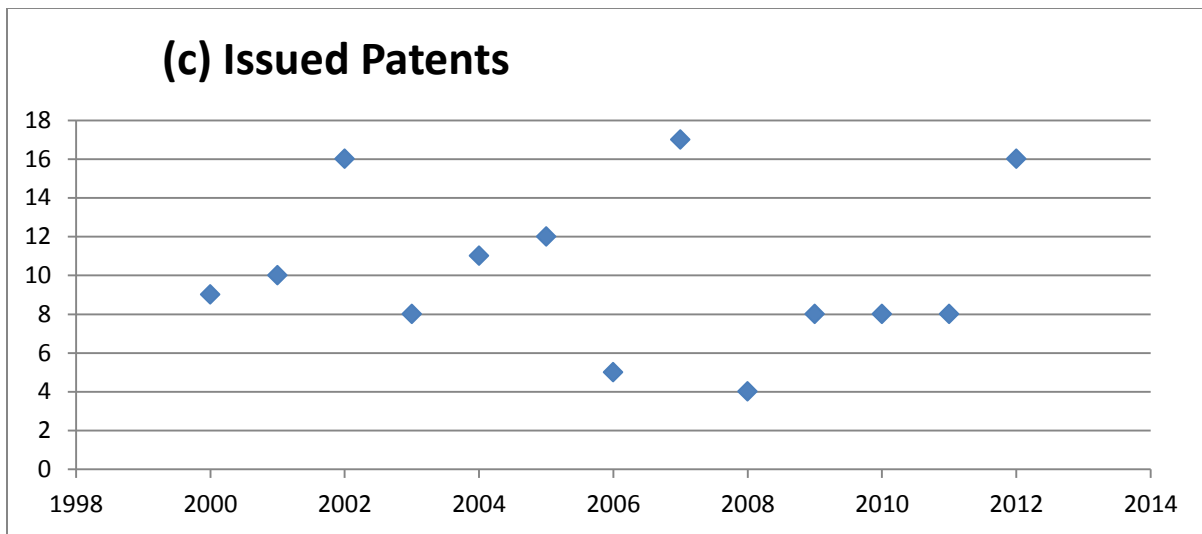
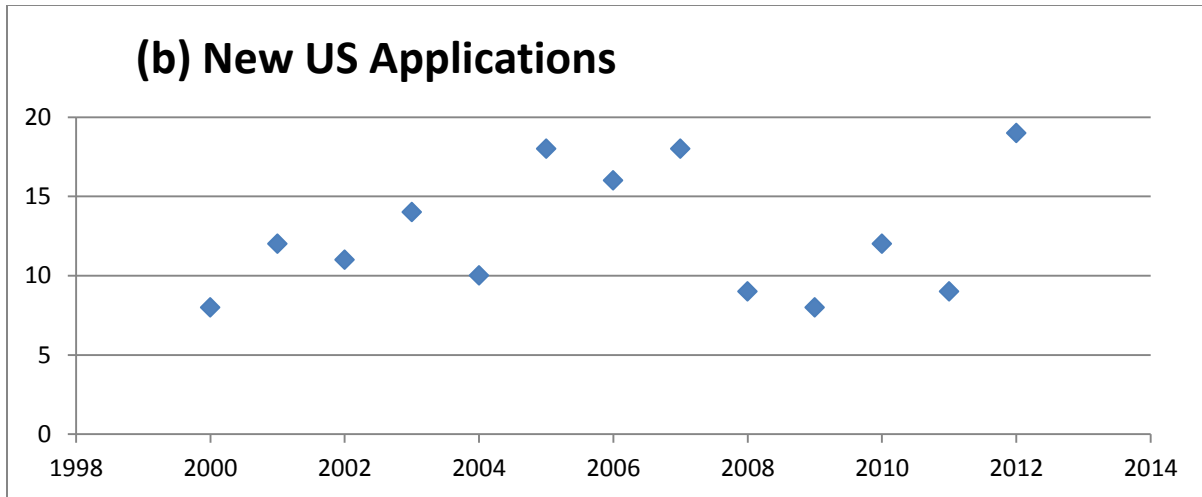
UA Inventions

On the invention side, as can be seen in Figure 3(a-c), the TLO is trending upwards. In FY 2012, TLO received 31 disclosures of inventions or copyrightable works (up 15%), filed 19 new patent applications (doubled), and had sixteen patents issue (doubled). Because the numbers are small, it is hard to find meaningful trends. The increase in issued patents is likely due in part to the US Patent & Trademark Office addressing some bottlenecks, and in part to our continuing to improve in identifying commercially viable inventions.

Figure 3. Patenting Pipeline



¹ Rankings are based on data from the 61 participating schools without medical schools. These FY2010 data include, in our case, data from the small fruits and row crops programs. FY2011 results have not yet been finalized.

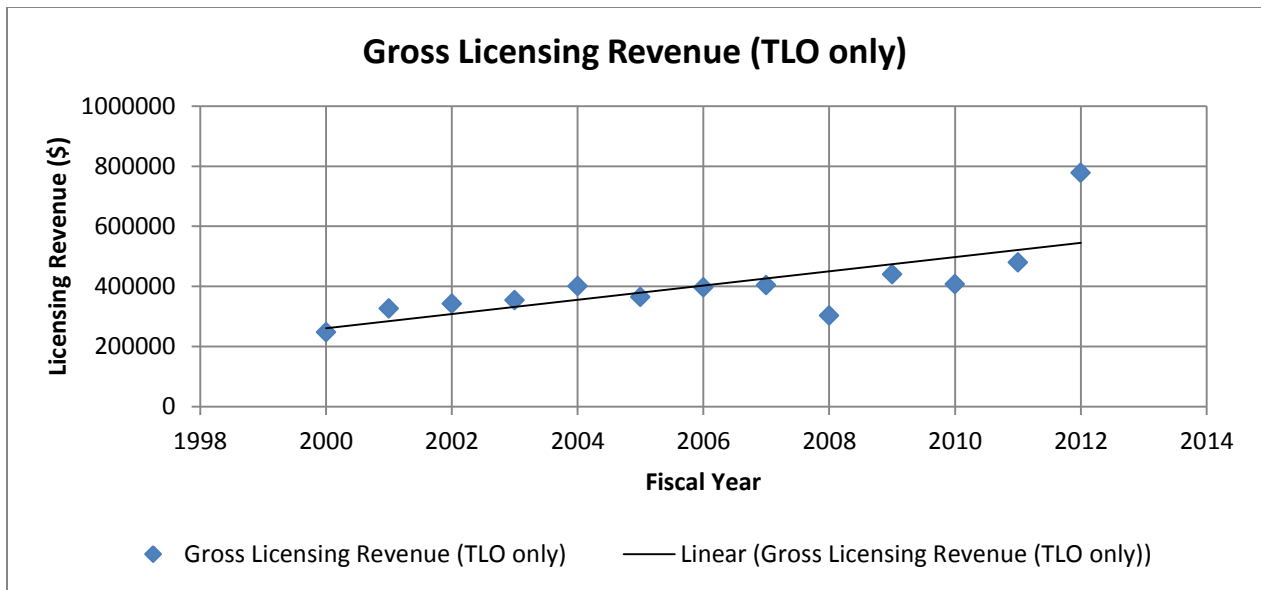


Licensing, Start-Ups, and Revenue

The TLO negotiated four licenses in FY11, including two to Arkansas start-ups (Global Institute for Nanotechnology and NanoWatt Design LLC) and two to existing companies, as well as three options, including a Walton College team (participating in NSF’s iCorps process), a Colorado company, and a larger company.

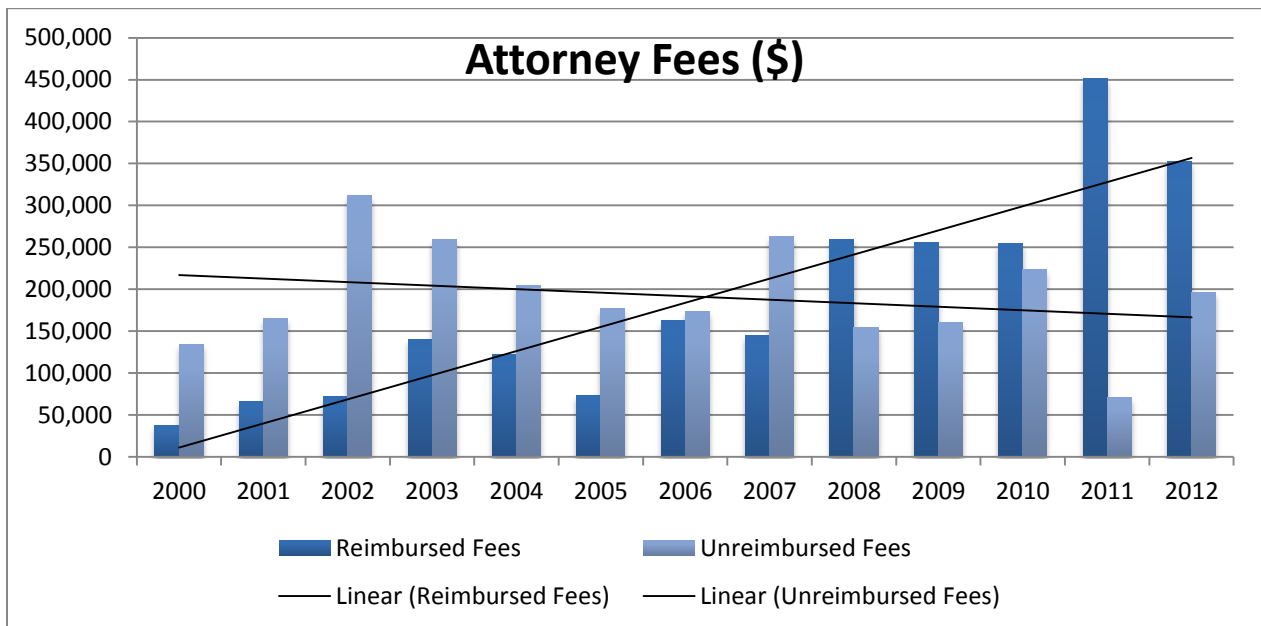
Gross licensing revenue continues to trend upward. The surge this year is due primarily to a one-time payment by a UAF licensee.

Figure 2. Gross Licensing Revenue.



While reimbursed patent attorney fees (paid by commercial licensees) continue to go up, unreimbursed fees (e.g., the fees over which TLO has some control) remain essentially flat. See Figure 3.

Figure 3. Attorney fees



In FY2012, UA spent \$196K on unreimbursed attorney fees (patent costs for unlicensed technologies). UA averages about \$10,000 in unreimbursed patent costs per \$10MM research expenditures over the last several years. Similarly-situated universities reported spending an average of \$25,000/\$10MM research expenditures in 2010. Especially with the US patent laws moving to a first-to-file protection scheme and removing some of the protections for pre-filing

disclosure, UA must continue to file patent applications to protect inventions before a commercial licensee is found.

UAF generated about 56% of the total revenue that came through TLO this year, up from 28% for FY2011. The Division of Agriculture generated the remaining 44%. (These data capture all the revenue, except that generated by licenses of row crops and small fruits.) UAF's net revenues this year were \$199,318. The net revenues for the Division of Agriculture were \$199,665. Over the last four years, TLO-managed licenses generated \$324,000 in net revenues for UAF, and \$849,000 for the Division. (Net revenues, as defined by Board Policy 210.1, may be used for patent administration and research purposes.)

In contrast to some universities, TLO does not have a dedicated budget for legal fees, so they are paid by our licensees or by reinvesting the net revenues from existing licenses. Net revenues also support the unfunded portion of UAF TLO salaries and fringe (about \$111,000). (The Division of Agriculture fully funds its share of TLO's salaries and fringe.)

TLO Supports Research Support and Sponsored Programs

TLO successfully negotiated 44 non-disclosure agreements in FY2011. Nearly all of these were to support the research process for other units in the University, and not to facilitate technology commercialization directly. Nearly a third involved three or more parties. TLO also was involved in negotiating intellectual property clauses in industry contracts, and supporting the close-out process.

Entrepreneurship

The Office of Entrepreneurship continued to support entrepreneurship activities by current and former students in FY 2012. In addition, the office expanded its efforts to promote entrepreneurial activities and create an entrepreneurial culture among University of Arkansas faculty. The office also reached out to faculty and administrators from other state universities, and to government and private sector individuals who affect and are affected by entrepreneurship initiatives. The UA's contributions to the entrepreneurial ecosystem were publicized throughout the state.

Current Student Activities and Results

Three University of Arkansas student teams competed in state, national, and international business plan competitions in 2012. Two of these teams, Boston Mountain Biotech and SpatiaLink Solutions, are based on UA intellectual property (IP). The third team, Learning DifferentiatED, based its product on its own IP. These three teams accomplished something never before accomplished in the 25-year history of the Venture Labs Investment Competition (VLIC, aka Moot Corp); all three won a VLIC-qualifying competition and competed at the season-ending VLIC competition. This achievement was noted by numerous speakers during the event, giving well-deserved recognition to these students and the UA in general. The teams won over \$107,000 in cash through their accomplishments at the following competitions:

- 1st, 2nd, 3rd and elevator pitch awards at AR Governor's Cup competition
- 1st place, Ivey (U of Western Ontario) Business Plan Competition (Learning DifferentiatED)

- 1st place, Cardinal Challenge (U of Louisville) Business Plan Competition (SpatiaLink Solutions)
- 1st place, New Venture Challenge (U of Nebraska) Business Plan Competition (Boston Mountain Biotech)
- 2nd place, New Venture Championship (U of Oregon) (Boston Mountain Biotech)
- 1st and 2nd place, Gone in 60 Seconds Elevator Pitch Competition (SpatiaLink Solutions and Boston Mountain Biotech)
- 1st, Elevator Pitch Competition, DWR Tri-State Competition

All three of these teams are trying to raise funding to start their businesses.

The success of the UA teams is due largely to their interdisciplinary student composition. The UA has distinguished itself in this regard, and the UA will continue expanding the Graduate Certificate in Entrepreneurship program for non-business students. As an example of how the University benefits from the Certificate program, Ellen Brune, CSO of Boston Mountain Biotech, built her company around IP generated during her dissertation research with her advisor, Dr. Bob Beitle. Ellen and Bob participated in the NSF I-Corps program at Stanford in Spring 2012. Another former Certificate participant, Douglas Hutchings, CEO of Silicon Solar Solutions, participated as a mentor for a company based on Dr. Nilanjan Banerjee's research. From all reports, these teams excelled during the sessions, and have set an excellent example for future UA I-Corps participants.

Previous Student Activities and Results

Six of the previous UA student teams have continued to operate successfully, and three of their companies are generating non-grant revenue. In addition to operating six start-ups, these founders have started five other companies, and several other students who participated in the entrepreneurship program have started companies that were not based on their competition business plans. Over the past six years UA student teams have raised \$12.5 million in grants and investment and employ over 100 Arkansans. These students have been instrumental in establishing a vibrant entrepreneurial ecosystem in Arkansas and serve on an advisory board to the Associate Vice Provost for Entrepreneurship (AVPE).

Faculty Activities

The Office of Entrepreneurship has pursued several initiatives to increase commercialization activities among faculty. The AVPE held two luncheon meetings to get input from faculty members regarding gaps they see in the UA's commercialization efforts. As a result of these meetings, a multi-university (UAF, UAMS, UALR, ASU) commercialization retreat will be held in mid-July 2012.

The AVPE scheduled numerous individual and group meetings between faculty and venture capitalists and angel investors who were visiting the University of Arkansas. These meetings exposed faculty to the risk capital funding process and exposed investors to the potential of UA IP. Because these meetings have been so successful, the office plans to increase them in the future.

Outreach

The AVPE has worked to increase publicity around the UA's entrepreneurship activities. Numerous articles on the students' success were published in the *Arkansas Democrat-Gazette*, the *Arkansas Business Journal*, the *NWA Business Journal*, and *citywire.com*, among others. Carol Reeves was personally featured in the High Profile section of the *Arkansas Democrat-Gazette* and *Fortune* magazine, which recognized her as one of the 10 most powerful women entrepreneurs in the United States. The University of Arkansas was also mentioned prominently in these articles.

Dr. Reeves has made numerous presentations to groups such as the Chancellor's Board of Advisors, the NWA Council, local Rotary Clubs, and the Arkansas Economic Development Commission, and has met one-on-one with many state government officials and others entrepreneurial leaders. These outreach activities have raised the profile of entrepreneurship activities at the University of Arkansas and have contributed to a growing entrepreneurship culture in the state.

Arkansas Center for Space and Planetary Sciences

1 Executive Summary

Academic Year 2011 – 2012 has been a challenging year of many transitions within the Arkansas Center for Space and Planetary Sciences (the Space Center or SCTR). Despite significant changes to the physical facilities and general operations of the Space Center, it continues to move forward with meeting its objectives, as well as those of the University, of providing high-quality research and educational opportunities for its graduate and undergraduate students in a diverse and interdisciplinary environment.

The Space Center serves two distinct but interrelated roles at the University. It is a research center which maintains facilities, equipment, instrumentation, and computers for truly interdisciplinary research over a wide range of space and planetary sciences. Education and outreach are also important parts of the Center's activities. Additionally, the Space Center is the home for the interdisciplinary graduate degree programs in Space and Planetary Sciences (SPAC), created in AY 2006, and maintains most of the experimental, computational, and administrative facilities necessary for these programs.

At the beginning of the fall semester of 2011, the Center had 25 graduate students, three of whom were new, and 15 regular faculty members, from four departments within the J. William Fulbright College of Arts and Sciences and two departments within the College of Engineering. By the end of the academic year, the Space Center had 21 graduate students, as one completed a terminal M.S. degree and three completed Ph.D. degrees during the year. Of the current 21 students, two seek terminal master's degrees and 19 are en route to the Ph.D. Nine students walked in the May 2012 graduation ceremony as they had either completed or were in the final

few months of completing Ph.D. degrees. Several more Ph.D. degrees are thus expected to be completed within the first half of AY 2012-2013.

1.1 Physical Facilities

The Space Center's research laboratories, Director's and staff offices, graduate student offices, one faculty office, a seminar room, library, and research support space for the Arkansas Galaxy Evolution Survey (AGES) program are located within the university's old Museum building or Field House (FELD). During the previous academic year, the Space Center dismantled its Planetarium, student lounge, shop, and some additional research space and consolidated its activities largely to the basement of the building in order to provide swing space for the students of the School of Architecture during the renovation of Vol Walker Hall. Some printing and shop needs of the Space Center have been handled this year by working with the facilities and staff of the School of Architecture. Other benefits were also derived by the Space Center in the form of new graduate student offices and air conditioning throughout much of the building. Though most renovations to the Field House were completed by late August 2011, work on the Space Center's ICPMS laboratory (room 117) continued well into AY 2012 as air-handling and control systems were added to provide a proper research environment for the more than \$1M of instrumentation within the clean room there. Walter Graupner dismantled a clean room facility in another part of the building during the renovations and used it to enlarge the clean room in 117 after the HVAC work there was completed. This was to provide space for the laser ablation (LA) ICPMS system that has always been envisioned as part of a suite of instrumentation for sample analysis to be added to the current ICPMS lab. A large NSF proposal was generated and submitted in January seeking funds for the LA-ICPMS.

1.2 Personnel

Management of the Space Center continued this year under William (Lin) Oliver from Physics as Director and John Dixon from Geosciences as Deputy Director. The primary role of the Deputy Director is to serve as the Graduate Program Coordinator for the Space Center.

University Professor Derek Sears, who also held the W. M. Keck Professorship of Space and Planetary Sciences, formally retired from the University of Arkansas on July 31, 2011 after 30 years of teaching, research, and service, and left for a new position at the NASA Ames research facility in California. Professor Sears was a founding member and director of the Space Center, and remains active in the Center as an adjunct faculty member, serving on some graduate committees and directing one of them.

Other Space Center personnel include:

1.2.1 Research Assistant Professor – Vincent Chevrier

Dr. Chevrier is the only faculty member whose efforts are full-time with the Center. He is the major professor for six SCTR students, and plays an important advisory role to several others. In addition, he has over 70 publications and presentations and is a major initiator of Center research proposals.

1.2.2 Office Manager—Kate Dreier

Kate Dreier was formally hired into the position of Office Manager in April of 2011 and held this position for almost all of AY 2012. She resigned in late June of 2012. Administrative duties required to close out fiscal year 2012 were then handled by the director with great assistance from Amita Patel and Cary Dewey in the office of the VP for Research and Economic Development. Student appointments for the second summer session were handled with assistance from office personnel within our member departments and the Graduate School.

1.2.3 Laboratory Manager—Walter Graupner

Walter has worked for the Center since June 2005 (under the university title of Scientific Research Technologist) and has a wide range of responsibilities in the research laboratories and throughout the building. He assists with construction and repairs to laboratory systems, and maintains much of the experimental research equipment used by Space Center students, including plumbing and electrical service, cryogenic systems, vacuum systems, instrumentation maintenance, servicing of vacuum pumps, thermal control systems, etc. Furthermore, Walter was factory trained in the maintenance of the ICPMS instrumentation at Nu Instruments in England, and he spends considerable effort keeping it running smoothly.

Walter is also responsible for general lab and chemical safety within the Center, he maintains the University inventory for equipment allocated to the Center, and he is one of the Building Executive for the Field House.

1.3 Research

The Center's research programs continued to thrive during AY 2011 – 2012, despite several challenges noted above. Table 1 lists the 13 grants that were active during the academic year. These grants have a total value of approximately \$1.8 M, which does not include significant matches to some of these grants and which does not include a large grant that was transferred to NASA AMES early in AY 2012 when Prof. Sears moved there. Of particular note are the new Space Center REU grant with Julia Kenefick as PI and Adam Huang as Co-PI, which was written and submitted in August of 2011 and funded for three years during the spring of 2012. In addition to providing quality research experiences to about a dozen undergraduate students from around the nation each year, the REU program has proved to be a solid recruiting vehicle for the Space Center's graduate program. Also, of particular note is the prestigious NSF CAREER award of Feng-Zhen Teng, which started during the final month of AY 2011-2012. Dr. Teng was hired into the Geosciences department with significant startup and other support from the Space Center, and we were indeed very pleased with his success at winning the CAREER award. In AY 2012, Dr. Teng supplemented his CAREER award with another \$50,000 grant from the NSF.

During AY 2011-2012 Space Center faculty, students, and postdoctoral fellows submitted 20 proposals totaling nearly \$3.8 M. Several of these have already been declined; however, more than \$750,000 were awarded, though Prof. Kral's new astrobiology grant doesn't officially start until AY 2012-2013, and another \$1.77 M are pending as we enter AY 2012-2013. In addition to proposal activity, Center faculty and students produced over 28 publications in refereed journals and gave at least 16 invited talks and 64 contributed presentations at major national and international conferences. A complete list of proposals, publications, and presentations are in the individual Space Center annual report.

Table 1. Grants active during the academic year 2011-2012.

| PI | Co-I | Title | Agency | Amount |
|-------------------|---------------------------------|--|--------------------|---------------------|
| Vincent Chevrier | L. Roe, R. Ulrich | Experimental Study of the Stability of Prebiotic Organic Volatiles on the Surface of Titan | NASA | \$516,049 |
| Vincent Chevrier | | Study of the Stability and Dynamics of Water at the Phoenix Landing Site | NASA | \$249,456 |
| Vincent Chevrier | | Experimental simulations of the mineralogical properties and alteration of the surface of Venus | ASGC (New) | \$5,400 |
| Po-Hao Adam Huang | | Understanding Corrosion and Diffusion Behavior in Metal Particle Polymer Composites for Corrosion Sensing | NSF (REU Suppl.) | \$6,000 |
| Dan Kenefick | J. Kenefick, C. Lacy, M. Seigar | Arkansas Galaxy Evolution Survey (AGES) | NASA-EPSCoR | \$503,838 |
| Julia Kenefick | Po-Hao Adam Huang | REU Site: Interdisciplinary Research Experience in the Astronomical, Space, and Planetary Sciences | NSF (New) | \$357,585 |
| Julia Kenefick | | An Investigation of the Evolution of Spiral Galaxies Using N-Body Simulations and the Possible Effects of Dark Matter Concentration and Galaxy Environment | ASGC | \$9,600 (New) |
| Claud Lacy | A.J. Salois | Absolute Properties of the Binary Star System V1094 Tau | SURF | \$2,750 (New) |
| Claud Lacy | | “Coudé spectroscopy of Eclipsing Binaries” 5 nights of coudé-feed time | Kitt Peak Nat.Obs. | |
| Derek Sears | | Radiation and Thermal History of Stardust Particles | NASA | \$421,090 (Transf.) |
| Fang-Zhen Teng | | Magnesium Isotopic Investigations of Oceanic Basalts and Olivines | NSF | \$175,022 |
| Fang-Zhen Teng | | Constraints on Martian Magmatism by Studying Mg Isotopic Composition of Martian Meteorites | ASGC | \$7,500 |

| PI | Co-I | Title | Agency | Amount |
|----------------|-------------|--|--------------------------------|----------------|
| Fang-Zhen Teng | | Studies of Magnesium Isotope Geochemistry | NSF CAREER | \$458,928 |
| Fang-Zhen Teng | | Acquisition of a micro mill for <i>in-situ</i> isotopic analysis of zoned minerals: A supplement for NSF CAREER: EAR-1056713 | NSF | \$50,000 (New) |
| Jason Tullis | B.E. Gorham | Arkansas View: Expanding the Use and Value of Remote Sensing through Education, Research, and Outreach | US Geol. Survey & America View | \$23,400 (New) |

1.4 Education

1.4.1 Undergraduate education—the REU program

The Research Experience for Undergraduates (REU) program is an interdisciplinary summer program that the Center began conducting in 2002. Though it has not always been funded by the NSF during 11 years of operation at the Space Center, the current REU program is funded by a three-year grant from the NSF astronomy division. AY 2011 – 2012 began with the second half of the summer 2011 REU program and it concluded with the first half of the summer 2012 REU Program. Twelve students participated during the summer of 2011 and another 13 during the current summer. Students from a variety of science and engineering backgrounds are recruited to the Center through a competitive process to conduct research projects relevant to the research programs in the Space Center. Each REU student works under a faculty mentor, although many work day-to-day with a graduate student or postdoctoral fellow in a faculty mentor’s research group, and they get a taste of life as a graduate student. REU research projects cover topics from astronomy and astrophysics to geomorphology, planetary simulations, and instruments for spacecraft.

In a new effort, spearheaded by Co-PI and mechanical engineering professor, Adam Huang, three REU participants with engineering and astronomy backgrounds teamed to begin the design and construction of a cubesat telescope. This is envisioned to be a three-year REU project, i.e., it will be continued with two more teams in each of the next two summers of the current funding cycle. In 2012, the student team of three did the basic design of the optics and housing for the cubesat telescope. This will be followed next summer by the implementation of position control actuators and control circuitry, and the following summer by development of the control code and final testing.

REU participants are also required to present midterm oral presentations and end-of-term posters. In addition, they are encouraged to attend a national conference during the following year, and we had four from the 2011 program attend and present posters at the Lunar and Planetary Sciences Conference last March in The Woodlands near Houston, Texas. **Error! Reference source not found.** below contains partial information on the 2010 and 2011 program participants. It does not list the graduate students and postdocs with whom these students worked.

1.4.2 Graduate degree programs in Space and Planetary Sciences

The Space Center's degree programs produced three Ph.D. degrees in AY 2012, bringing the total of Ph.D. degrees granted by our six-year-old graduate program to 13. Two additional students are expected to complete their degree requirements by the end of the summer of 2012 and two to three more by December 2012. The Space Center annual report lists all SPAC students to date and their current status. Two students completed M.S. degrees in AY 2011-2012 and three students completed Ph.D. degrees. Two additional Ph.D. dissertation defenses are scheduled for August 2012.

1.4.3 Public Outreach

Outreach is an important aspect of the Center's educational activities. It takes many forms and a few examples from many during AY 2011-2012 include:

- October 2011: Prof. Dan Kennefick and graduate student Jazmin Berlanga were interviewed in English and Spanish, respectively, at the Space Center by Belen Gomez with Univision Arkansas, an Hispanic television station based in Little Rock, about the near-earth asteroid that was about to pass closer to Earth than the moon's orbit. Univision Arkansas host Belen Gomez returned on December 19, 2011 and conducted an interview with Space Center graduate student and Ph.D. candidate Rob Pilgrim about the subject of *Solar Storms*, which are currently prevalent as the sun is going through a solar maximum (11-year cycle of solar activity).
- December 8, 2011: Will Bryan and others hosted three different groups of students from Lingle Middle School as they visited the Space Center on a field trip, which was their reward for hard work over the fall semester. They met in Room 308 of the Arkansas Union for a presentation and hands-on activities.
- Space Center graduate student, Robert Beauford, and NASA AMES space scientist (and former Space Center Director) Derek Sears serve as the editors of *Meteorite* magazine and published four issues during AY 2012.
- Robert Beauford was also very active in public outreach this year in other ways as well. He served a guest lecturer at the Arkansas Oklahoma Astronomical Society annual meeting and he was featured in a Channel 40/29 television interview on meteorites at the Space Center.
- A Public Outreach Lecture, sponsored by the Arkansas Space Grant Consortium was given on Monday, November 14, 2011 by students Patricia Gavin and Erika Kohler of the Space Center. In it, they described their work on "Simulating the Extreme Temperatures and Pressures of the Venusian Surface in the Laboratory." They conducted experiments on samples at conditions of the surface of Venus at the NASA Goddard Space Flight Center last fall, before returning to laboratories at the Space Center for further analysis.
- Kim Zoldak: Presented (March 10th, 2012) "An Introduction to Telescopes: Discovering the Night Sky," at the Springdale Public Library's series *Visions of the Universe*. Kim is a Space Center Ph.D. candidate and a NASA Space Science Student Ambassador.
- Rebecca Mickol: Solar Observing Day at the Union Fountain introducing student and the public to sunspots and solar flares (April 6, 2012); three elementary schools with approximately 200 students also participated. In June, she went to the West Fork Public Library (Monday, June 25th, 2012) presenting a tour of the Solar System to ~40 K-4th graders; and to the Prairie Grove Public Library (Wednesday, June 27th, 2012) presenting

the same show to a similar number of K-4th graders. Rebecca Mickol is a Doctoral Academy Fellow in the Space Center's graduate program.

- Will Brian: Presented (April 7th, 2012) "Life After the Space Shuttle: The Future of the American Manned Spaceflight Program," at the Springdale Public Library's series *Visions of the Universe*. Will is an M.S. student in the Space Center's graduate program.
- Cassandra Marnocha: AAAS Excellence in Science Program award. Cassie also participated as part of the SPACE Hogs RSO in the Solar Observing Day on April 6, 2012.
- June 5th, 2012: Organized by Rebecca Mickol and SPACE Hogs and other Space Center graduate students and faculty, a Venus Transit Viewing was held at the University of Arkansas Campus Agricultural Extension allowing the public to view a once-in-a-lifetime event. Hundreds of people attended and we were interviewed live by Channel 40/29, 5 News, the Spanish Speaking Univision Arkansas, and the Arkansas Democratic Gazette.

With regards to the truly remarkable public outreach ethic exhibited by our Space Center graduate students, two of them were singled out recently by Anne Gresham, a reference librarian at the Springdale Public Library, who wrote after presentations there by graduate students Will Bryan and Kim Zoldak:

Will and Kim both delivered fascinating and thought-provoking presentations, and their enthusiasm for astronomy and knowledge of their field made for an entertaining and educational experience for our patrons. Northwest Arkansas is extremely fortunate to have such bright, engaging, and committed students living in our midst.

2 Space Center Significant Achievements and Changes

2.1 Faculty

1. Dr. Fang-Zhen Teng of the Space Center and the Department of Geosciences conducted his first year of research on the prestigious **NSF CAREER award**. This award of more than \$90,000 per year for five years is for the study of magnesium isotope geochemistry, an area in which Dr. Teng is a world expert. Dr. Teng was hired largely with funds from the Space Center and he conducts his work in the ICPMS (inductively coupled plasma mass spectroscopy) laboratory here in the Space Center. We are actively working to recruit a new graduate student matched to this grant.
2. The Space Center's NSF REU program was renewed for another three-year cycle with a new grant for \$357,585 entitled: *REU Site: Interdisciplinary Research Experience in the Astronomical, Space, and Planetary Sciences*. Dr. Julia Kennefick of the Space Center and Physics department is the PI and Dr. Adam Huang of the Mechanical Engineering department is the Co-PI on this grant.
3. Prof. Tim Kral, a founding member of the Space Center and member of the Biological Sciences department, was awarded a significant new NASA grant for \$391,675 entitled: *Metabolism and Survival of Methanogens under Martian Conditions*, to conduct research in astrobiology.
4. Biological Sciences professor Dan Lessner became increasingly active within the Space Center community this AY. He gave a talk at the Space Center's Seminar class last fall and has now officially committed to being the dissertation director and research mentor

for incoming DAF student Ryan Sheehan, who was recruited to work in his group. Dr. Lessner was the recipient of a large >\$600k NSF grant last year for work in astrobiology.

5. Dr. Vincent Chevrier graduated his first Ph.D. student this year and has two more finishing up this summer. His first student, Patricia Gavin, has been awarded a postdoctoral fellowship at the Johnson Space Flight Center in Houston, Texas.
6. A publication of Dr. Chevrier that appeared in May 2012 was just singled out and featured in the **Editor's choice section in Science!**

2.2 *Students* (Student achievements are listed in the Space Center annual report.)

2.3 *Physical Facilities*

1. The Space Center consolidated its operations largely to the basement of the Field House after renovations last year.
2. As a result of this consolidation, the Space Center lost the operation of its Planetarium, which significantly impacted part of its educational mission as astronomy labs serving more than 460 non-honors and 80 honors undergraduate students per year could no longer make use of this facility. The loss of the planetarium also had a major impact on outreach activities. Each of the outgoing Ph.D. students this year lamented the Planetarium's loss during their exit interviews. Two of these newly minted UA Ph.D.'s had sweat equity in developing the Planetarium.
3. Regular news articles have appeared throughout this spring discussing UA plans to convert the Field House into a new Concert Hall starting in the fall of 2013 when renovations to Vol Walker Hall are scheduled for completion. No discussions have yet been held about a permanent new location for the Space Center. We anticipate that this will be a major focus during the next AY.

2.4 *Publications and Conference Presentations*

During AY 2012, Center faculty and students produced over 16 invited and 64 contributed conference presentations, as well as 27 refereed journal publications and one invited book chapter on work directly related to the Space Center's research and its graduate degree programs. A complete listing can be found in the Center's individual report.

3 **Progress and Accomplishments Related to UA Priorities and Goals**

1. Increased Ph.D. production played a critical role in the University of Arkansas' promotion in the Carnegie classifications from "Research University/High Activity" to the highest category of "Research University/Very High Activity," a category achieved by only 108 institutions. The Space Center has demonstrated that it can consistently recruit high-quality students and graduate them in a timely manner, adding to the number and quality of Ph.D. production at the UA. With appropriate resources, its contribution to Ph.D. production will be even greater.
2. Students in STEM fields are recruited to pursue graduate degrees in the Space Center and women remain a significantly under-represented group in these fields. Of the two

M.S. degrees award in Space and Planetary Science this year, one was male and one was female. Two of the three Ph.D. degrees awarded this AY were women.

Furthermore, exactly half of the 22 remaining students in our program are women and these statistics will not change with the new incoming class this fall.

3. Nearly one third of our students are internationals consistent with the Graduate School's goal of growing the international component of the University's graduate programs and providing a diverse educational experience for all.

University of Arkansas Press

The University of Arkansas Press reports the following significant items for FY2012.

- Annual sales were essentially **flat** compared to FY2011. Retail sales lagged; Borders Bookstores closed doors; backlist sales were in decline (though buoyed somewhat by front list sales).
- Following several years of cost cutting, including salaries and benefits, especially, but also discretionary spending, cost containment continues with the effect that operating expenses were down \$134,000 and every single line on financial/operating statement shows a reduction in costs compared to FY2011.
- New distribution deals were completed with Larry Foley/DVD and UA Music department.
- New negotiation were completed with AETN for distribution of DVD programming.
- A successful negotiation was completed with Apple /I-Books for sales and distribution of UAP electronic titles.
- A merger was negotiated between UA Press and University Press Content Consortium (UPCC) to strengthen sales to University and college libraries.
- Currently in a year-long negotiation with Amazon--which is about to close--for listing in their electronic book (i.e. Kindle) catalog.
- UA Press completed a successful application for major title subsidy with Arkansas Game and Fish for the publication of a new edition of THE FISHES OF ARKANSAS.
- UA Press received the first material sales report (\$15,000) from an e-book partner UPCC.
- About 100 print books were converted to e-book files.
- UA Press signed 25-30 advance contracts--the largest number of commitments in our history. The targeted list for Spring 2013 the best in UA Press history.

- Current best-sellers are **MEDGAR EVERS : Mississippi Martyr** and **CAMP NINE : A Novel** and, most recently, **UNBELIEVABLE HAPPINESS** and **FINAL SORROW**. Each has nearly three thousand copies in print. These represent large critical and financial successes by any measure.

Arkansas High Performance Computing Center

1.0 Executive Summary

During fiscal year 2012 the Arkansas High Performance Computing Center (AHPCC) greatly expanded the computing hardware available to the research and education community at the University of Arkansas. This hardware expansion includes the purchase and installation of a new backup system which robustly and invisibly records snapshots of specific directories on the AHPCC systems to prevent user data loss. In addition, expansion of the Razor supercomputer started in June; when completed this expansion will more than double the computing power in the AHPCC. Both the backup system and the new computing hardware were purchased using funds from NSF MRI grant #0959124. Further, this expansion would not have been possible without the infrastructure enhancements to the data center funded by NSF ARI grant #0963249. The ARI supported chilled water infrastructure and rear heat-exchange doors on the Razor supercomputer dramatically reduce the load on the air conditioning in the UITTS data center.

During fiscal year 2012 the AHPCC was under the interim co-directorship of Douglas Spearot (Associate Professor of Mechanical Engineering) and Jackson Cothren (Associate Professor of Geosciences and Director of the Center for Advanced Spatial Technologies). During this period the AHPCC supported:

- Nearly **\$13 Million** in active externally funded research
- Over 30 journal or conference publications
- Over 40 presentations at national meetings or conferences

A successful search for a permanent director for the AHPCC was conducted in the spring of 2012 and concluded recently with the hiring of Dr. Rick McMullen from the University of Kansas. Dr. McMullen will start August 13, 2012 as the Director of the AHPCC.

2.0 Expansion of AHPCC Hardware

In 2010, the “phase 1” portion of the Razor supercomputer was installed in the AHPCC. This equipment was funded primarily by NSF EPSCoR grant #0918970, with additional funds provided by NSF MRI grant #0959124, and from internal capital investment by the university and university faculty through a “condo” model program. The first phase of Razor consists of 126 compute nodes (18 of which were purchased via the condo program), each with 2 Xeon X5670 processors from Intel having a clock speed of 2.93 GHz. The total core count is 1,512 and the system has a theoretical peak performance of 17.75 TFlop/s. Each node is configured with at least 24 GB of memory, with four nodes having 96 GB for research simulations with large memory requirements. Razor’s nodes are interconnected with both Gigabit Ethernet (for administration) and 40 Gbps QLogic quad-data rate Infiniband. An IBM GPFS file system is implemented with 74 TB of long-term storage, 27 TB of scratch storage and 1 TB of local storage on each of the 126 nodes. Razor is cooled by chilled water heat-exchange rear doors, leveraging the ARI supported infrastructure.

During fiscal year 2012 a disk-to-disk backup system for critical data belonging to users of the AHPCC was purchased. Installation of this new backup system was completed at the end of 2011. The backup system has a capacity of 96 raw TB via 48 2-TB drives and has a usable formatted capacity of 75 TB. Total backup capacity with compression is approximately 150 TB, depending on the format of the data to be backed up. An existing IBM X3550M3 server was used as the backup device. It is connected to the parallel GPFS filesystems via Infiniband networking and backs up those filesystems to a Fibrechannel-attached local disk array. Procured equipment includes:



Razor Supercomputer

IBM System Storage DS3512 Dual Controller:

- 2 Expansion Units
- 2 Fibrechannel Daughter Cards
- 48 2-TB Nearline SAS Disk Drives
- 2 Fibrechannel and 6 SAS Cables

IBM Server X3550M3 Upgrades:

- 1 Dual-port Fibrechannel HBA
- 1 Single-port Infiniband HCA
- 1 QDR Infiniband Optical Cable

IBM Server X3550M# Upgrades:

- 1 Xeon 5506 Processor
- 5x4GB Memory
- 1 PCI-E Riser card
- 3-Yr NBD warranty



New disk-to-disk backup system

The IBM Tivoli Storage Manager (TSM) was selected as our backup software because it has an interface to the GPFS file system, and because the software (with a list annual license price of \$39,700) was available free through the IBM Academic Program. Several obstacles were encountered during implementation (a persistent hardware problem was fixed, and the AHPCC staff needed to learn the complex TSM software from scratch without dedicated support). Regular backups are now being made to both /home and /storage directories on Razor.

Negotiations regarding the “phase 2” portion of Razor began in September 2011 when representatives from IBM visited the University of Arkansas to learn from the computational researchers about their requirements. The configuration of the Razor expansion was developed

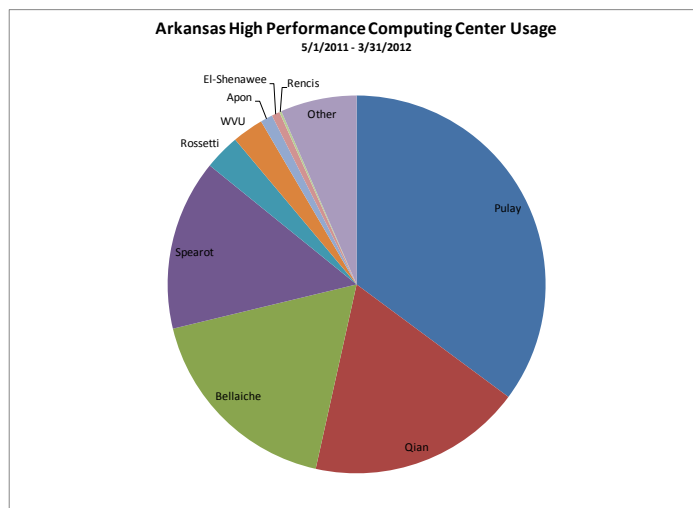
through multiple meetings between IBM and the AHPCC staff; however, final pricing could not be provided until March 2012 when the Intel Sandy Bridge processor was finally available to the public. The phase 2 portion of Razor was purchased in May 2012 using funds from NSF MRI grant #0959124, and from internal investment by the university and university faculty through a condo model program. The majority of the hardware for the Razor expansion arrived in June 2012 and IBM will be working with the AHPCC staff in July 2012 to install the new system and to integrate the new system with the existing hardware in the AHPCC. The Razor expansion consists of 112 nodes with 8 processing cores per node, providing 1,792 new processing cores to the research and education community at the University of Arkansas. The expansion leverages the existing Gigabit Ethernet (for administration) and 40 Gbps QLogic quad-data rate Infiniband hardware for communication and uses the existing IBM GPFS file system installed previously. The system should be fully operational and released to the users by the start of the fall semester.



Razor 2 supercomputer installation

3.0 Usage and Research Productivity

The total usage of the resources in the Arkansas High Performance Computing Center separated by user group is illustrated in the pie chart below.



Among the researchers originally identified in NSF MRI grant#0959124, the computational chemistry research group lead by Prof. Peter Pulay is the largest user of the AHPCC, followed by the computational nanoscience (physics) group lead by Prof. Laurent Bellaiche, and the computational materials science group directed by Prof. Douglas Spearot. In 2011, the University of Arkansas hired Prof. Xianghong Qian from Colorado State University. Prof. Qian

is a NSF CAREER award winner (as are Prof. Bellaiche and Prof. Spearot) and has quickly become a very important user of the high performance computing resources on the University of Arkansas campus. Her group focuses on quantum chemistry calculations for biofuels research. Prof. El-Shenawee and her research group require fewer cores for their research, but they are the largest users of the large-memory nodes within Razor and the AHPCC.

At the time of this report, there are over 200 users with HPC accounts, with the majority being post-docs, graduate students and undergraduate students. In addition to local users, several other users from our partner institutions in the State of Arkansas (UALR, UAPB, etc.) and other organizations, such as St. Jude's Children's Hospital are active users of Razor. To provide a conservative estimate of the impact of the AHPCC on research at the University of Arkansas, Mark Larmoyeux, Staff Member in the Office of the Vice Provost for Research and Economic Development provided the AHPCC Interim Co-Directors with a report detailing the active grants during fiscal year 2012 for the top 10 user groups of the AHPCC. This group includes: Pulay, Bellaiche, Spearot, El-Shenawee, Cothren, Qian, Amy Apon formerly in Computer Science and Computer Engineering, Manuel Rossetti in Industrial Engineering, Barraza-Lopez in Physics, and Douglas Rhoads in Biosciences. Only grants that had computational components were considered. ***The sum of the active externally supported research grants during fiscal year 2012 from the above researchers is \$12.89 million.*** This research resulted in over 30 journal or conference publications and over 40 conference or workshop presentations. In addition, the AHPCC also supports the educational mission of the University of Arkansas; several faculty request temporary access to students in their classes to provide hands-on high performance computing experiences.