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Annual Report, 2013-2014

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*Office of the Vice Provost for
Research & Economic Development*

Annual Report 2013-2014

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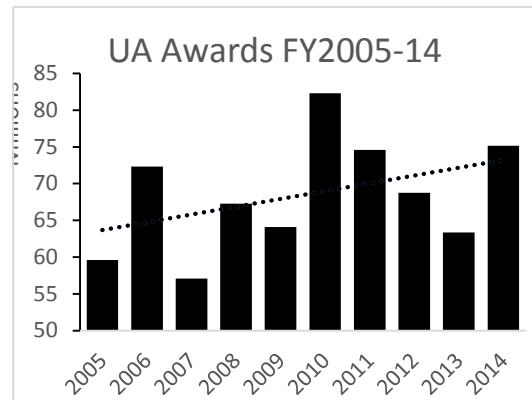
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Executive Summary

FY14 was a year of substantial growth for all units reporting to the Office of the Vice Provost for Research and Economic Development.

VPRS: Permanent staff were recruited to positions of Associate Vice Provost for Research (2) and Assistant to the Vice Provost for Research and Development. In addition, a search was initiated for the next Director of RSSP. At the time of this report, the search is nearing completion and a hire is forthcoming.

RSSP: The UA research community reversed a recent downward trend in external awards in FY14. This change in direction reinforced an upward decadal trend in growth of research awards at the UA (Fig. 1). Total external support for sponsored activities in FY2014 was \$79,037,732, an overall increase of 24.8% from the previous year. RSSP awards were \$59,144,206 (+31.4%). Proposal submissions (918) increased by 12.6%. Division of Agriculture awards were \$19,893,525 (8.4%).



Research Compliance: Major efforts in FY14 included a quality assurance investigation of the animal care facility and export classification assessments for 12 laboratories.

Tech Ventures: Technology Ventures negotiated 21 licenses/options/amendments/agreements. Licensing revenues of \$134,268 and reimbursement of patenting costs of \$140,418 were realized in FY2014. The ARK Challenge Accelerator Program was selected by the Department of Commerce to develop startups in mobile and cloud-based computing. The University of Arkansas inducted UA system president Don Bobbitt in the National Academy of Inventors at a recognition banquet held in May 2014.

Entrepreneurship: Student teams swept the graduate awards in the Donald W. Reynolds Arkansas Governor's Cup. Overall, UA teams won almost \$140,000 in cash prizes in FY14. Since 2009, twelve student teams have gone on to start businesses conceived of in the New Venture Development classes. Also in FY14, 75 faculty members and administrators from four Arkansas research universities (UAF, UAMS, UALR, ASU and UAPB) attended the third commercialization retreat at Petit Jean hosted by the Office of Entrepreneurship in June 2014.

Space Center: The Arkansas Space and Planetary Science Center presented nearly 70 research articles, invited talks and oral presentations and submitted \$1,994,609 in competitive grant proposals in FY14.

Arkansas Press: Mike Bieker became new Director of the Press, who, with restructuring, ended FY14 with a balanced budget. eBook sales increased 44% over FY13.

HPCC: Arkansas High Performance Computing Center had 203 active users (+27.7% over FY13) in twenty-five departments across five UA colleges and units. AHPCC also supported research collaborations at seven external academic institutions. AHPCC computing, storage and networking resources support more than \$25M in active extramural research grants and contracts.

Office of the Vice Provost for Research and Economic Development

Office Structure: Staff recruitment during the year focused on filling key leadership positions in the front office. Dr. Cynthia Sagers who had been serving as interim Associate Vice Provost for Research and Economic Development was hired to a permanent post. Dr. Bob Beitle joined the office in a second AVPRED. In addition, a search was begun for the next Director of Research and Sponsored programs. At the time of this report, a candidate has been identified and offer will soon be extended.

Strategic Planning: The worked with the key researchers and departmental and college leadership in the Office's first strategic planning effort. Six priority areas emerged from these exercises:

1. University Culture of Discovery and Innovation
2. Nationally-recognized Research Clusters
3. State-of-the-art Research Infrastructure
4. Thriving Student Research Community
5. Research-based Economic Growth
6. Public Awareness of the Value of Research

At the close of FY14, the strategic planning team was reviewing implementation steps, relevant metrics of success and draft timelines for each priority area.

Faculty development: The VPRED office initiated or continued several programs in FY14 to enhance the UA research enterprise. Hanover Research, Inc., an external consultant on project and proposal development, partnered with UA researchers on approximately \$30M in new proposals. Office staff took the lead with on-campus events hosting six proposal development workshops in WCOB, MULN and ARSC, as well as a target workshop focused on NSF CAREER applications.

An Arts and Humanities Seed Funding program initiated in the VPRED office is in its third 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. IN 2014, awards went to UA Libraries, Music, Art, History and Drama.

The SEC announced a faculty travel grants and collaborative grants program for FY14. The travel program allowed each awardee to use up to \$2,500 to travel to another SEC campus to facilitate collaboration. Four recipients from UA represent AGRI, CHEG, PSYC and CVEG. A single collaborative proposal (C. Reeves) is still pending. The VPRED office served as the campus organization in charge of this initiative.

The Office sponsored recognition ceremonies for recipients of major awards, including the NSF CAREER awards. This is part of ongoing efforts to recognize and promote research excellence from our faculty and students.

Institutional Reputation: The Office took a leadership role in entering an MOU with the Federal Demonstration Partnership (FDP). The FDP is a cooperative initiative among 10 federal agencies and 119 institutional recipients of federal funds. Its purpose is to promote increased research productivity, provide for enhanced stewardship under federally supported programs, and achieve reductions in administrative burden and costs associated with sponsored research and education.

Research and Sponsored Programs

The Office of Research Support and Sponsored Programs (RSSP) accepted a total of 446 awards from various sponsors during FY2014. Total sponsor awards administered by RSSP for FY2014 was \$59,144,206 representing a decrease of 31.4% over FY2013. This remarkable growth is largely the result of increased proposal submissions as the success rates for proposals in FY 14 (48.6%) and FY13 (48.2%) are similar. The Division of Agriculture administered research support in the amount of \$19,893,525

Table 1: Summary of Awards FY04 to FY14										
Unit	FY2005	FY2006	FY2007	FY2008	FY2009	FY2010	FY2011	FY2012	FY2013	FY2014
ADMIN	3,047,822	5,641,669	5,118,183	4,130,794	4,148,068	6,521,614	5,297,357	4,228,831	3,882,716	4,290,679
AFLS	17,335,331	14,931,201	13,696,441	15,930,946	20,007,692	21,290,763	25,573,607	25,618,983	20,957,305	22,576,402
ARDO	1,433,944	1,778,349	1,043,038	586,961	855,246	468,085	191,493	95,720	33,825	156,500
ARSC	20,634,520	19,886,493	17,220,638	19,891,658	21,308,726	21,858,369	18,666,359	14,662,942	13,438,270	16,985,882
EDUC	5,348,988	7,676,504	6,368,064	7,372,031	7,176,954	8,698,295	8,226,951	11,338,163	14,148,152	17,310,084
ENGR	10,399,587	20,994,561	10,992,697	17,935,215	8,755,641	19,326,484	15,474,529	10,528,923	9,981,270	16,431,771
GRAD	197,136	615,541	1,527,150	436,831	649,833	3,477,614	490,240	348,475	232,121	200,000
LAW	39,744	46,510	117,853	87,529	11,000	39,744	39,412	39,744	50,000	428,024
MULN	30,000	-	-	-	-	-	-	5,590	152,399	70,000
VPRS	-	-	-	-	-	-	-	-	-	252,389
WCOB	1,135,109	775,381	1,004,007	918,644	1,197,457	618,478	640,988	1,868,823	466,686	335,999
Total	59,602,181	72,346,209	57,088,071	67,290,609	64,110,617	82,299,446	74,600,936	68,736,194	63,342,744	79,037,732

Note: ADMIN includes AVCB, Clinton, UDEV, VPDV, VPRS, & VPSA

representing an increase of 8.4%. As shown in Table 1, University of Arkansas external support for sponsored activities received in FY2014 was \$79,037,732, an overall decrease of 24.8% from the previous year.

The composition of total FY2014 awards processed by RSSP is \$41,904,613 (70.9%) from federal sources, \$11,223,898 (19.0%) from state sources, and \$6,015,605 (10.2%) from other sources such as industry and private foundations. This is a striking shift in funding sources from FY13 (40.4/18.2/41.1, respectively). The change is almost entirely due to increased federal funding and decreased funding from other sources.

RSSP assisted with the development and submission of 918 proposals and requests for continuation, exclusive of requests for no-cost extensions, in FY2013. The number of proposal submissions to all sources increased by 12.6% over the previous fiscal year. Total funds requested were \$279,857,802. This includes requests of \$175,668,854 (62.8%) for federal funding, \$52,125,740 (18.6%) for state funding and \$52,063,208 (18.6%) for other types of funding.

In addition to processing a record number of proposals and awards, RSSP committed resources to faculty and staff development throughout FY14. RSSP grants specialists contributed to each of six proposal-writing workshops for faculty hosted by the VPRED. In addition, research specialists lead monthly trainings for departmental personnel on topics ranging from the quest for top 50 status to budget revisions. RSSP staff continued to work diligently on implementation and use of the Kuali Coeus electronic routing system, RazorGrant.

Research Compliance

- Successfully renewed Assurance of Compliance with PHS Policy on Humane Care and Use of Laboratory Animals (#A3878-01). A new condition of the Assurance is that all individuals who have significant contact with research animals must participate in a health screening program to determine their health status, and identify potential health issues.
- Conducted a quality assurance investigation, using the external reference laboratories of IDEXX-RADIL, a leading laboratory animal diagnostic service, to assess the quality of animal care provided by the Central Laboratory Animal Facility. All laboratory parameters showed that animals were in an excellent state of health for both short and long term residents.
- Completed export classification assessments for 12 laboratories and reviewed and cleared 42 I-129 Certifications for employees and guests seeking H-1B visas to work and/or conduct research at UA.
- Renewed the university’s defense contractor registration with the Dept of Defense Trade Controls.
- Renewed the US Department of Defense Registration DD-2345 for access to controlled technical data by University researchers.
- Sponsored two Federal Bureau of Investigation (FBI) threat update briefings.

Institutional Review Board (IRB)

FY14 Human Subjects Research Protocol Activity	
<i>New Protocols</i>	<i>Type of Review</i> 588 Exempt 159 Expedited 35 Full Board 2 Administrative –not human subjects research
<i>Protocol Modifications</i>	<i>Type of Review</i> 138 Exempt 59 Expedited 33 Full Board
<i>Protocol Extensions</i> 167	<i>Type of Review</i> 167 Exempt 78 Expedited 22 Full Board

No reportable Adverse Events were reported in this fiscal year.

Biosafety Committee (IBC)

FY13 Biological Safety Committee Research Protocol Activity	
New Protocols	43
Protocols Renewals	22
Protocol Modifications	25

Institutional Animal Care and Use Committee (IACUC)

FY13 IACUC Research Protocol Activity	
<i>New Protocols</i>	<i>Type of Review</i> 40 Full Committee 26 Expedited Review
<i>Modification Requests</i>	<i>Type of Review</i> 29 Full Committee 23 Expedited Review

Semi-annual facilities and program reviews were conducted on December 13, 2013 and June 44, 2014. There were no findings of significant noncompliance and no dissenting opinions offered. Disaster and Emergency Preparedness Plans were updated for all campus animal facilities and holding areas.

Radiation Safety Committee (RSC)

The RSC met 6 times in the 2014 fiscal year. The Arkansas Department of Health (ADH) inspection was in April. There were no items of non-compliance on the broadscope campus license. Three items of noncompliance were found on the SRCC individual license (an alarm reset issue, a failure to revoke an employee code upon the employee's departure from the university, and failure to perform annual audits since 2011). All items of non-compliance have been corrected in accordance with ADH requirements.

Toxic Substances Committee (TSC)

No meetings were scheduled for the TSC in FY14.

Conflict of Interest and Commitment Review Committee (CICRC)

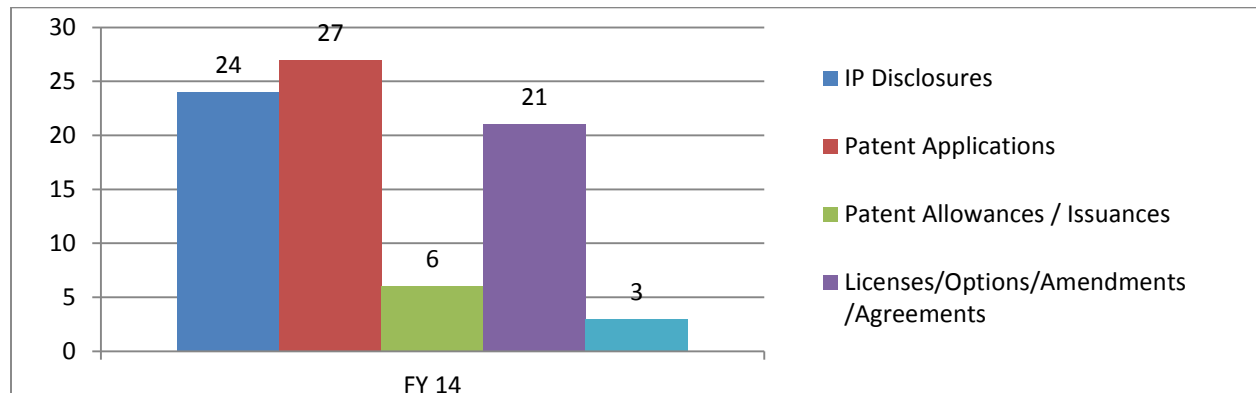
No meetings of the CICRC Committee were held in FY14

Technology Ventures

The Technology Ventures team plays the lead role in the commercialization of world-class, University of Arkansas intellectual property through aggressive researcher, student, community, and industrial engagement. The Technology Ventures' team consists of three professionals. The team is led by a director and supported by two experienced commercialization managers.

Key performance metrics for Technology Ventures in fiscal year 2014 are shown in the graph below. The office received 24 invention disclosures and filed 27 patent applications. Note that this is the first year post reorganization that does not include any Division of Agriculture statistics. Technology Ventures increased licensing activity and was successful in negotiating 21 licenses/options/amendments/agreements.

Metrics



For fiscal year 2014, licensing revenues of \$134,268 and reimbursement of patenting costs of \$140,418 were realized. The team is very focused on driving new sources of license and soft funding from multiple domestic and international sources going into fiscal year 2015.

In addition to advancing the core commercialization performance metrics shown above, the Technology Ventures team helped accelerate the regional and state economic development agenda by active leadership in the development of the programs, events, and networking required to sustain an innovation-driven venture ecosystem.

Programs

Technology Ventures served as the UA lead for the much heralded ARK Challenge Accelerator program. The program is jointly managed by Winrock International and the University of Arkansas and resulted from being selected by the Department of Commerce from a field of 125 national proposals. The objective of the program is to develop startups that provide needed solutions in mobile and cloud-based computing for retail, transportation/logistics, and food processing. The format of the program is a boot camp that compresses 1-2 years of startup development into 14 weeks. When the teams leave the program they have beta customers, a minimum viable product/service, and are seed-investment ready. The ARK is a public/private partnership that has included over \$1 million in federal funding, in-kind matching support, and \$1.1 million in private investment funding. The companies in the second cohort in 2013 were chosen from 93 applications from 14 countries. The 9 selected companies have representation from Arkansas, India, Argentina, and Uruguay. This program launched 9 new technology

companies from the second cohort that ran from June through September 2013. Three of the companies from the first cohort have received additional rounds of finance. Technology Ventures realized \$22,304 in revenue from the ARK Challenge F&A.

Outreach Events and Networking

During the course of fiscal year 2014, Technology Ventures played a central role in advancing the statewide and regional economic development agenda. These activities included but were not limited to support for Accelerate Arkansas, NWA Council, the Commercialization Retreat, bi-monthly Natural State Angel Association meetings, recurring G60 Elevator Pitch Contests, the DWR Governor's Cup Competition, along with numerous community speaking engagements to promote the importance of creating and supporting a strong venture/startup ecosystem in Arkansas. Technology Ventures directly mentored two successful undergraduate business plan teams; Biobotic Solutions and Anova Energy. Biobotics Solutions received \$71,000 in startup funding by winning the TCU Values and Ventures contest, and coming in 2nd place at the DWR Governor's Cup, 2nd place at the Tri-State Competition, and 2nd place at the Nebraska Global Venture Competition. This venture included team members from the Sam M. Walton College of Business, College of Engineering, Hendrix College, and inventor and intellectual property contribution from UAMS. Biobotics Solutions is moving forward as a real venture. Anova Energy won 3rd place at the Nebraska Global Ventures contest, 2nd place at the Louisville Regional Walmart Sustainability competition, and finished in the top 6 at the DWR Governor's Cup.

Researcher Engagement


To continue improving researcher engagement, Technology Ventures held the 2nd Annual Inventor Awards Banquet and were honored to initiate Dr. Donald Bobbitt into the National Academy of Inventors. During the event, researchers who had received patents were recognized with plaques memorializing their important achievements.

The Technology Ventures' team began in January 2013 holding monthly UA inventor lunches to raise awareness of intellectual property management and to expand and improve relationships within our most important constituency. In 2014, the staff continued this successful endeavor and reached even more faculty to cultivate relationships.

Entrepreneurship

The student teams that competed in business plan competitions in 2014 continued to build on the University of Arkansas' legacy. In addition to sweeping the graduate awards at the Donald W. Reynolds Arkansas Governor's Cup competition, an undergraduate team, BioBotic Solutions, won the prestigious TCU Values and Ventures competition and came in 2nd at the University of Nebraska, the Governor's Cup, and the Tri-State competition. Overall, the teams won almost \$140,000 in cash prizes this year. More important, one of the graduate teams, DataVis, which is developing a software solution to help manage retail store shelves, has started operations and BioBotic Solutions and a second graduate team, LumaDrop, continue to work on their businesses.

Twelve student competition teams have now gone on to start the businesses they pursued in the New Venture Development classes. Students in the classes have founded at least 10 additional companies over the past five years. Particularly noteworthy are the following:

 **Movista** (2008) has developed a robust software platform to help companies manage their off-site workers and now has more than 15 national accounts, 26 employees making 150% of the state

average wage, a projected \$4 million in contracted revenues in 2014, and state and private funding of more than \$3 million. They will be seeking \$3-5 million in growth capital in the upcoming year.



cycleWood Solutions (2011) has developed and produced lignin-based biodegradable plastic bags. They raised Series A-1 funding in 2014, and the round was oversubscribed. Their bags are now on retail store shelves, and they have supplied raw materials to other manufacturers. Academic and industry peers consider them to be the foremost experts in commercial modified lignin technology. They have generated significant interest among several potential acquirers.



Silicon Solar Solutions



Silicon Solar Solutions/Picasolar (2010, 2013). Picasolar, a 2013 student team whose technology was invented by the first employee of Silicon Solar Solutions, has made tremendous technical and business progress over the past year. They received a prestigious Department of Energy SunShot award in 2013 and far surpassed the milestones required by the grant. The SunShot award enabled them to have their efficiency, cost saving and reliability metrics validated by the National Renewable Energy Laboratory. This has resulted in them securing letters of intent with key industry players and R&D partnerships with two of the global top 10 solar. They have added a Board member who is well-connected with Silicon Valley venture capitalists and will be seeking a \$11 million funding round next year to establish local equipment manufacturing. If they cannot secure the financing, they have a letter of intent from a leading German equipment manufacturer to build/service the equipment. The company will hear about the next tier of the SunShot funding by October 2014.



Biologics MD (2010) recently brought on a CEO with 30 years of biopharmaceutical experience. As a result of current market need, they have moved fracture repair to the forefront of their development plans. To aid in this effort, BiologicsMD has recruited a world-class scientific advisory board in the areas of orthopedics and biopharmaceuticals. They are currently seeking \$5 million in Series A2 funding to move their lead drug into the clinic.



Boston Mountain Biotech (2012) made the first sale of their Lotus cell line to a prestigious research hospital. Additionally, they have begun to offer contract research services to commercial and academic researchers nationally, which has resulted in five revenue generating contracts.

In addition to student successes, the Office of Entrepreneurship has continued to develop and implement programs that are having an impact on the state. For example, we have collaborated with Noble Impact, an organization that engages high school students in social entrepreneurship, and have brought their students to campus to hear distinguished speakers. In Fall 2013, the Office developed and ran a four-day social entrepreneurship experiential class for MBA students that was very well-received by the students and the partnering not-for-profit organizations. We hosted the third faculty commercialization retreat at Petit Jean in June 2014. This retreat, which included faculty members from

UA, UAMS, UALR, ASU, and UAPB, had 75 attendees and a waiting list. Numerous cross-campus initiatives have come from the retreat.

The Walton College of Business developed a strategic plan in 2014, and entrepreneurship was identified as one of the strategic priorities for the College. We have continued to solicit feedback from constituents around the state on a School of Entrepreneurship and Innovation and hope that a transformational gift for the School will be forthcoming soon. Such a gift will allow us to build on our past successes and hire the faculty and staff needed to expand our entrepreneurship efforts to help drive the economic future of Arkansas.

Arkansas Center for Space and Planetary Sciences

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 have been located for many years within the university's old Museum building or Field House (FELD). Three years ago, 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. In late summer 2013, the School of Architecture returned to the newly renovated Vol Walker Hall. During the previous AY, considerable effort went into planning for a move of the Space Center to new locations in order to make way for renovating the Field House into a new performing arts center for the University. By June 30, 2013, planning had reached an advanced stage though renovations to future facilities of the Space Center had not yet commenced. Hence, the Space Center continued its research activities throughout the fall semester of 2013 in the Field House, which enable Ph.D. candidate Adrienn Luspay-Kuti to complete work toward her Ph.D.

Renovations to Stone House North commenced in the fall of 2013 to prepare it for the administrative and graduate offices, the AGES research group, one faculty office, the library, seminar room, curation facility, and an instrumentation prototyping facility of the Space Center. Under plans worked out in the previous AY, the Space Center will share Stone House North with the computational materials research group of Prof. Laurent Bellaiche from the physics department. Renovation to Stone House North enabled ultra-high-speed internet capabilities, ADA accessibility to both levels, and a few other modifications. In the spring of 2014, both Space Center facilities and those of Prof. Bellaiche moved into Stone House North, however, it was June of 2014 before all old office furniture was moved out and all Space Center facilities were moved into Stone House North.

Research laboratories of the Space Center were moved to the basement areas of Ferritor Hall after much more significant renovations were made. In particular, the Space Center's Keck Laboratory for Planetary Simulations, wet lab, ICPMS, Gully, and Microprobe laboratories will be moved to Ferritor, along with facilities for its Lab Manager. The Andromeda Chamber and three other chambers in the Keck Laboratory and the Space Center's ICP Mass Spectrometer facility were decommissioned, packaged up and moved in March of 2014 to new locations in Ferritor Hall. An engineer from Nu Instruments in the U.K. then spent two weeks on site working to bring the ICPMS back on line. All final laboratory equipment, shop facilities, chemicals, etc., were moved to Ferritor Hall in a series of moves by both Facilities Management movers and Space Center personnel in June 2014.

Our plan had been to spend the summer bringing research facilities back on line and we had originally incorporated some of these activities into summer REU projects. Unfortunately, it was realized shortly after moving into new facilities in Ferritor Hall that the laboratory exhaust systems that had been installed during the renovations were not sufficient to provide safe working environments for our faculty and students. By the end of AY14, new plans were worked up for a redesign of the exhaust system and parts were ordered. The specialized ducting needed for these labs require nearly a two month lead time before delivery, which means that new renovations to the exhaust system will commence during August and we will not have labs back on line until sometime in the mid to late fall semester of 2014. This has resulted in a huge setback to grant activity, graduate student timelines, etc. We have been working hard to mitigate these effects by working on new proposals, papers, and other research activities that do not require the labs, such as modeling.

When all renovations are completed and our new labs are fully on line, we look forward to a future free for the first time in many years of the uncertainty of what our permanent locations will be. Already four grant proposals have been submitted for research in the new facilities and at least that many more are planned for submission deadlines in the fall of 2015.

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.

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 currently the major professor for four Ph.D. students within the Center, and plays an important advisory role to several others. In addition, he has over 75 publications and presentations and is a major initiator of Center research proposals.

1.2.2 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 our laboratory facilities. 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 put considerable effort keeping it running smoothly.

1.3 Research

The Center's research programs continued during AY 2013 – 2014. Several large research grants totaling \$2,716,239 continued during the past year, as well as several smaller grants. Furthermore, several proposals were also submitted during the year. It was the toughest period we have witnessed in recent

years for success on new grants as all large new multi-year NASA grant proposals were declined last year, despite the fact that \$1,884,609 in grant proposals were submitted, mostly to NASA. We believe there are multiple factors in this: (i) NASA announced a complete restructuring of its programs during the year, meaning they were less likely to fund significant new grants under the old structure, (ii) federal funding in general is tighter in the current climate, and (iii) the Space Center faculty enjoyed considerable success in the previous AY, bringing in three major grants totaling \$1,399,316, which now support four Space Center Ph.D. students. Table 1 lists the 19 grants that were active during the academic year. These grants a total more than \$2.7M, a value that does not include other support obtained last year such as telescope time at major national observatories, nor does it include one of Prof. Dan Lessner's large grants for \$613,000, since this grant did not support a Space Center student during AY14. This is up slightly from \$2.58M the previous year. Smaller proposals to the ASGC, NSF, and other sources totaling \$46,543 (plus telescope time) were successful during AY14 and supported Space Center research activities. Of particular note, Ph.D. candidate Erika Kohler wrote a proposal for and was awarded a prestigious **NASA Graduate Fellowship** for \$135,000 to support her graduate research! She is the first Space Center student to win a NASA graduate research fellowship, despite many attempts by other students.

1.4 Education and Outreach

1.4.1 Undergraduate education—the REU program

The Research Experience for Undergraduates (REU) program is an interdisciplinary summer program, whose latest funding cycle began in 2012. The current REU program is funded by a three-year grant from the NSF astronomy division. AY 2013 – 2014 began with the second half of the summer 2013 REU program and it concluded with the first half of the summer 2014 REU program. Twelve students participated in each of these summer REU programs. 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 geochemistry, planetary simulations, and instruments for spacecraft. In the 2014 summer program, 12 very high quality students were recruited from nearly 150 applicants. We see this as a significant recruiting tool for the Space Center's graduate research program.

In an effort new to this funding cycle and 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 was envisioned as a three-year REU project, i.e., it was continued with a second team during the 2013 summer and concluded with a third team this summer. In 2012, the student team of three did the basic design of the optics and housing for the cubesat telescope. During the 2013 program, a new team of three worked on construction of a prototype and testing of the optics. The 2014 team worked on implementation of position control actuators, control circuitry, and code.

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 from the 2013 program, we had six present posters at the *45th Lunar and Planetary Sciences Conference* last March in The Woodlands near Houston, Texas; another attended the *223rd American Astronomical Society* meeting last January in National Harbor, Maryland. Table 3 below contains information on the 2013 and 2014 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 officially produced four Ph.D. degrees in AY 2014 and one M.S. degree. This means that the Space Center has now produced a total of 22 Ph.D. and four M.S. degrees since its graduate program began eight years ago, **significantly adding to the University of Arkansas' Ph.D. production** over that time. We project that three more will complete Ph.D. degrees by May 2015. Table 4 below lists all SPAC students to date and their current status. Those completing M.S. and Ph.D. degrees in AY 2014 are listed below the table along with their dissertation titles and directors.

Four students completed Ph.D. degrees and one completed an M.S. degree in Space and Planetary Sciences during AY 2014:

- **Robert Pilgrim**, Dissertation Title: "Design and Evaluation of a Fiber Optic Probe as a Means of Subsurface Planetary Exploration." Dissertation Director: Rick Ulrich (Chemical Engineering). Defended on April 30, 2013; turned in July 2013. Rob currently works at the University of Arkansas in the office the Vice Provost for Research and Economic Development.
- **Cassandra Marnocha**, Dissertation Title: "Bacterially-mediated formation of rock coatings in Karkevagge, Swedish Lapland as an astrobiological analog for mars." Dissertation Director: John Dixon (Geosciences). Defended Friday, November 2, 2013. Cassie currently holds a postdoctoral position in geomicrobiology at the University of Delaware.
- **Katherine Auld**, Dissertation Title: "Classification and experimental simulation of Martian gullies." Dissertation Director: John Dixon (Geosciences). Defended and turned in during the spring semester of 2014. Kate currently teaches at a Junior College.
- **Adrienn Luspay-Kuti**, Dissertation Title: "Titan from the Surface to the Atmosphere: Experimental and Numerical Study of Titan's Methane-Ethane Chemistry." Dissertation Director: Vincent Chevrier (Space Center). Defended on March 13, 2014. Adrienn currently holds a postdoctoral research fellowship at the prestigious Southwest Research Institute in San Antonio, Texas.
- **William Bryan**, M.S. in Space and Planetary Science. Defended and turned in his thesis during the fall semester of 2013.

Three students that graduated toward the end of the last academic year now have postdoctoral positions at prestigious institutions. They include:

- **Fatemeh Sedaghatpour** completed her dissertation during the spring of 2013. She started a postdoctoral position at Harvard University in the fall of 2013. Fata is thus the second Ph.D. graduate of our program in the past three years to take a postdoctoral position in the Ivy League, the other being Dr. Edgard Rivera-Valentin, who was a postdoctoral fellow at Brown University the past two years.
- **Jennifer Hanley** (DAF) completed her Ph.D. in April 2013, and started a postdoctoral position at the prestigious Southwest Research Institute in Boulder, Colorado shortly thereafter.
- **Scott Barrows** also completed his Ph.D. during April 2013. During this past year, Scott wrote a proposal for Cycle 16 of NASA's Chandra X-Ray Observatory, which was recently approved.

He will thus start a postdoctoral position in the department of Astrophysical and Planetary Sciences at the University of Colorado at Boulder soon.

Our continued success in recruiting high-quality students and in their placement into top-ranked institutions and jobs after graduation speaks to the strength of our graduate program. Furthermore, it is *this type of quality Ph.D. production that will help the University of Arkansas to both maintain its status with the Carnegie Institution of Very High Research Activity and propel us toward being a Top 50 Public Research University.*

1.4.3 Public Outreach and Service

Outreach and Service has always been an important aspect of the Center's educational activities. It has traditionally taken many forms. In AY2014, outreach was on a smaller scale than in previous years due to many reasons, most notably that we were in a shutdown and move mode throughout much of the year as we shutdown activities and laboratories in the Fieldhouse and moved to new laboratories in Ferritor Hall as well as new space in Stone House North. In addition, Will Bryan, an avid outreach ambassador of our graduate program focused on completing his M.S. degree and leaving. Nevertheless, some outreach activities did occur. A few examples include:

- Ph.D. candidate Robert Beauford is highly engaged in outreach as part of his scientific pursuits. Last year he continued running the Space Center's Meteorwrongs program, in which people bring or send in potential meteorite finds for identification. Furthermore, he gives weekly geology tours in the Eureka Springs area where he lives, he was a guest lecturer in local area K-12 schools, and he consulted with a team from Windfall Films regarding impact crater information that will be included in a series looking at the history of the North American continent for PBS.
- Space Center graduate student, Robert Beauford continued to serve during AY 2014 on an editorial team of eight for *Meteorite* magazine a publication for amateurs, collectors, meteorite hunters, educators, and researchers. In AY14, he co-edited four more volumes of *Meteorite* and was asked to write a series of specialized articles for it.
- Will Bryan and Kim Zoldak visited Elementary and Middle Schools in NW Arkansas during the fall of 2013, doing presentations on Space and Planetary Science and on the future of NASA.
- NASA Ambassador Kim Zoldak held star parties at the UA and in the community on several occasions throughout the year.
- October 16, 2013: The RSO Space HOGS set up special viewing telescopes and held a Solar Observing Day by the Union Fountain.
- December 3, 2013: The RSO Space HOGS presented "Santa Claus Conquered the Martians, which opened with a discussion on Life in the Universe" in the Union Theatre for UA students and the community.
- May 5, 2014: Space Center Ph.D. student and NASA Ambassador Kim Zoldak had an 8th grade student from Lingle Middle School job shadow her for a day in which she also organized conversations between this student and other Space Center students about the research we do.
- May 19, 2014: Space Center Research was highlighted in the UA Newswire: http://newswire.uark.edu/articles/24365/earth-organisms-survive-under-martian-conditions?utm_source=Newswire&utm_medium=email2014-05-19&utm_campaign=earth-organisms-survive-under-martian-conditions

1.5 Selected Faculty Highlights

1. The Space Center's **NSF REU Program** continued with the second and third years of a three-year cycle (See Table 3 above) with a grant for \$357,585 entitled: *REU Site: Interdisciplinary Research Experience in the Astronomical, Space, and Planetary Sciences*. **Prof. Julia Kennefick** of the Space Center and Physics department is the PI and **Prof. Adam Huang** of the Mechanical Engineering department is the Co-PI on this grant.
2. **Prof. John Dixon** graduate two Ph.D. students in Space and Planetary Sciences this year: Cassie Marnocha and Kate Auld.
3. **Prof. Julia Kennefick** was awarded tenure and promotion this AY.
4. **Prof. Tim Kral**, a founding member of the Space Center and member of the Biological Sciences department, worked in the second year of a NASA grant for \$391,675 entitled: *Metabolism and Survival of Methanogens under Martian Conditions* during this AY. He along with graduate students Rebecca Mickol and Navita Sinha presented their work on this grant at multiple national and international conferences this year. It has garnered a lot of attention and has been picked up on web-based news outlets around the world.
5. **Dr. Vincent Chevrier graduated another Ph.D. student** this past year: Adrienn Luspay-Kuti, making it five Ph.D. students in the last three years. His first Ph.D. student, Patricia Gavin, who is a postdoctoral fellow at the Johnson Space Flight Center in Houston, Texas, hosted the REU trip to the JSC in June of 2014.
6. **Dr. Chevrier** and his Titan research group were invited this year to a Titan researchers meeting at MIT. This is a meeting of the current big-players in Titan research discusses current research results and directions for the next couple of years for the Cassini-Huygens mission to Saturn, and it reflects the fact that he is now considered a major player by his peers.
7. A publication of **Dr. Vincent Chevrier** that appeared in *Geochimica et Cosmochimica Acta* **90** 47–63 (May 2012), entitled: "Evaluating the role of sulfide-weathering in the formation of sulfates or carbonates on Mars," and on which he is second author was highlighted as an Editor's Choice in the July 13 issue of **Science!** These comments in the Editor's Choice section can be found at: <http://www.sciencemag.org/content/337/6091/twil.full>.

Scroll down to the section on GEOCHEMISTRY entitled: "It's All About the Sulphides."

University of Arkansas Press

Fiscal Year 2014 was a year of transition for the University of Arkansas Press. Mike Bieker, business manager of the Press since 2004, was appointed director in December 2013 following the retirement of Larry Malley, who had served as director since 1998.

Shortly after his appointment, Bieker began negotiations with the University of Chicago Press's Distribution Center to assume fulfillment duties for the Press. The warehouse migration was well under way late in FY'14, and the transition will be completed by the beginning of FY'15.

Further, a national search for the Press's open acquisition editor position was initiated in June, with a projected start date in early FY'15. The field of applicants was tremendous and a decision was imminent on June 30, 2014.

- The new edition of *Arkansas: A Narrative History* outperformed all expectations. Sales in FY'14 totaled 2,224 copies and \$67,323.
- Although annual net sales were down from the previous year, restructuring allowed the Press to balance its budget for the first time in several years.
- New distribution agreements were completed with Brian Walter Productions and FL Films LLC. Both partners add to the wonderful line of documentary films in our catalog.
- E-book sales were \$30,274 for the year, a 44% increase over FY'13.
- The Press entered several more digital sales platforms, including JSTOR, AcademicPub, and Proquest, making our content more accessible than ever.
- The Press secured grants and subsidies to underwrite the publication of several book projects in FY'14. Grants awarded for the year totaled over \$77,000.

Arkansas High Performance Computing Center

1.0 Executive Summary

Building on the expansion in computing power provided by two recent NSF awards, the Arkansas High Performance Computing Center (AHPCC) continues to provide leading edge support for computationally intensive research to the campus, UA system, and the State of Arkansas.

Use metrics: 26M core hours delivered to **203 active users** (440 total users) in **twenty five departments** across **five UA colleges and units** (ENGR, ARSC, AFLS, GRAD, & VPRED). In addition to intramural clients, the AHPCC also supported research collaborations at seven external academic institutions: UALR, UAMS, UAPB and ASU in Arkansas, the West Virginia University, and two research institutions in Europe and Asia.

AHPCC computing, storage and networking resources support more than \$25M in active extramural research grants and contracts.

Capacity metrics: 4,985 cores across three generations of Intel Xeon CPUs, **73 TFlop/s CPU peak performance**, **13.4TB of system memory**, **117 TB long-term storage**, **374 TB high speed scratch storage**, and **96 TB backup storage**.

2.0 AHPCC highlights for FY 2014

Improved computing capabilities – The “Science DMZ” node (see <http://fasterdata.es.net/science-dmz/>) data mover node added last fiscal year was upgraded with the assistance of the ITS Networking group to have a direct 10Gbps connection to ARE-ON. This node allows researchers to transfer data to and from the HPC complex to other state, national and international research institutions at about ten times the previously available maximum throughput. *Globus Online* (<http://www.globusonline.org>), an optimized high-throughput file transfer service, is available to users at UA-F to implement start-and-

forget file transfers to the UA-F Science DMZ node. This new service is made possible by implementation of a campus “research network” funded by a prior NSF ARRA grant.

Improved computing environment – Building on infrastructure improvements in data center power, cooling and campus networking that were substantially completed in FY2013, the Center added seven liquid-cooled rack-mounted heat exchangers to racks that were not previously actively cooled. The result is that the HPC equipment is now heat-neutral and does not contribute to the cooling load of the ITS data center air conditioners. In addition, the following services were added:

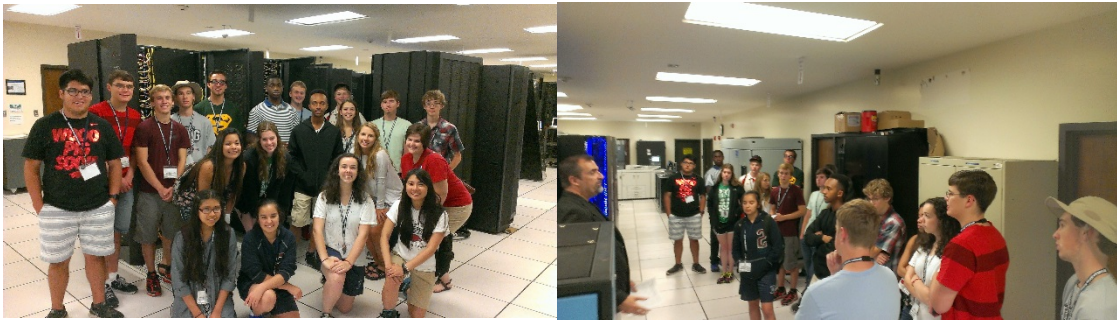
- A wide-area federated storage server based on the iRODS system (<http://irods.org>)
- A load-balancing front-end system to handle a larger number of simultaneous interactive users
- A web-based job submission portal to make it easier for new or occasional users to work efficiently
- A web portal for bioinformatics software (<http://hpcgalaxy.uark.edu>)

Expanded support for bioinformatics research – The Center is building expertise and computing resources to respond to the University’s commitment to grow health and life sciences research capacity. More detail is provided in Section 3 below.

Outreach, education and training –A core part of the mission of the AHPCC is to provide training in high performance computing for graduate students (and professional development for faculty). In addition to real-time consulting with faculty, staff and students the Center engaged in the following outreach and training activities:

- Participated in a research exhibit at SC13, the global supercomputing conference in November 2013. This display included discussions of materials research and astrophysics work that the Center supports.
- Conducted four Linux 101 and four HPC 101 workshops to introduce new users to the tools and technologies required to efficiently use our scientific and research computing infrastructure. Attendance was excellent with between 15 and 20 attendees at every workshop.
- One-on-one consulting and training has increased greatly with many new users interacting very efficiently by e-mail or chat. Often, these users simply need a bit of a re-alignment to their thought process to become very productive in their research and it is frequently the case that a few short digital communications during their efforts make all of the difference.
- Held 20-30 one-on-one "Office Hours" sessions in which a researcher came in person (or an AHPCC staffer visited a researcher's lab or office) for an in depth discussion and work session to kickstart the research on the computational side of things.
- AHPCC staff taught CSCE 4013/5013 Intro to Cluster Computing course for the CSCE Department in the fall of 2013. This is a new course, so everything had to be created from scratch. Enrollment was above expectation with 24 students (twelve undergrads and twelve grads) attending the course. In the end, undergrads (CSCE students) and grads (domain sciences) were paired up to do a final project where they could learn more about their how their specific roles and skill sets played into their final product. The course was sufficiently attended and received high enough review remarks that it has been added as a permanent course in CSCE to be offered every other semester in the fall.

- Participated in the CSCE Department's high school summer computing camp through talks about scientific computing and building a simple cluster, and touring the HPC part of the data center. (Pictures below).



- Visit and talk to campus by Dr. Steve Gordon of Ohio Supercomputer Center to discuss ways to better serve our community from an educational perspective. Discussions included what other states are doing and their level of success, offering certificates as a means of enticing students to enroll in workshops or HPC specific courses, courses needed to form a solid degree program in Computational Science, etc.
- AHPCC members began attending more lectures and presentations at key conferences to interact with other groups involved in furthering Computational Science training and education as a means of disseminating what seems to be working, what isn't, and what seem to be the "sweet spots" to target initially.

3.0 Usage and Research Productivity

As of the end of FY13 there are more than 400 users with HPC accounts, with the majority being post-docs, graduate students and undergraduate students. Of the total number of accounts 203 of these accounts are in active, regular use. The Center provided more than 26M core-hours of computing to users in twenty five departments at UA and to collaborators at other institutions in Arkansas and around the world.

During FY14 the Center saw a continuing increase in use by researchers in biology and agriculture. These researchers are engaged in a range of computationally intensive work, with the leading application being assembly of genomes using data acquired from next generation DNA and RNA sequencers. The process of validating input data and assembling genomes is computationally intensive and requires much more memory and storage than our physics and computational chemistry workloads. The AHPCC is responding to the growth in bioinformatics and other life sciences computing research activity at UA by starting a collaboration with UAMS and the Myeloma Institute and continuing to:

- Develop expertise in bioinformatics codes and processing pipelines
- Install and tune bioinformatics codes used by UA researchers and students
- Working with life sciences research community to understand their new computing and resource requirements
- Organize existing large memory nodes to be more useful for bioinformatics computing

The Center actively seeks to support collaborations with other UA campuses and other institutions of higher education in Arkansas. For example, the AHPCC provides expertise, computing and storage resources to UAMS, the Arkansas Center for Plant Power Production (<http://www.plantpoweredproduction.com>). Other examples of new research projects related to energy and

life sciences that the AHPCC supports include: (1) Analysis of genomic data from diverse crop plants, (2) Comparative analysis of microeukaryote genomes and large-scale phylogenomics (3) Ab initio molecular dynamics simulations for the investigation of the mechanisms and energetics for biomass conversion to biofuels, (4) Biomagnetics and terahertz imaging of human tissues to detect tumors, and (5) analysis of cancer genomes for St. Jude's Hospital and UAMS.

4.0 Looking forward to FY15

The Center continues to submit proposals for infrastructure and provides material support to other researchers' proposals. The Center will be working on the following priorities:

- Developing a more sustainable funding scheme for both staffing and hardware
- More computing and storage capacity for AHPCC academic clients
- More outreach to researchers who could be "non-traditional" supercomputer users (e.g. in computational neuroscience, linguistics and textual analysis, and business analytics)
- More education and training events for faculty and graduate students
- Working with UITS to develop a strategic plan for research computing that includes both UITS and VPRED priorities
- Collaboration with a statewide bioinformatics consortium including the U.S. Food and Drug Administration, the Arkansas Governor's office, Arkansas Research Alliance, UALR, UAMS, Arkansas State University and UAF
- Developing a chargeback service to support technical computing by Arkansas businesses and government agencies
- Working with ASTA and ARA to develop a statewide HPC consortium that can make its participants and the state as a whole more responsive to large, complex funding opportunities
- Working with ASTA, ARA and AEDC to develop an "industrial outreach" program to make the technical computing resources and expertise of the Center more available for commercial use and economic development.