



Senate Bill No. 287

REPORT TO THE LEGISLATIVE OVERSIGHT COMMISSION
ON EDUCATION ACCOUNTABILITY

WEST VIRGINIA
RESEARCH
TRUST FUND



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REPORT ON THE
**RESEARCH TRUST
FUND**

2015 REPORT ON THE RESEARCH TRUST FUND (RTF)

This report on agency level activities to implement and achieve the goals of WV Code §18B-18A-1 et seq., the Research Trust Fund (RTF) is hereby provided to the Legislative Oversight Commission of Education Accountability (LOCEA). While annual and periodic reports have been provided throughout the first six years of implementation, this report provides a comprehensive assessment in compliance with the authorizing legislation.

Background

Outlined in Series 48, Research Trust Fund Program, the Commission receives annual reports from institutions and is required to submit a combined annual report on the Research Trust Fund to the Governor and the Legislative Oversight Commission on Education Accountability (LOCEA) by January 1 of each year.

In compliance with this statutory requirement, the Commission is provided a draft annual report for FY2015 activities within the Research Trust Fund for review, comment, and approval. The report also includes the most up-to-date figures on the \$50 million account, funds drawn down by Marshall University and West Virginia University, gifts received, endowments established, and reports provided to the Commission by the two universities. In addition, the report includes information on the fund's interest account, which supports competitive research opportunities for the state's other eligible institutions as provided by statute. The FY15 report is the seventh in a series of annual reports provided by staff since the program's inception in 2008.

RTF Activities through November 2015

The Commission completed its initial implementation plan during the fall of 2008 which resulted in Title 133 Legislative Rules Series 48, subsequently approved by the legislature during the 2009 regular session. The rule establishes guidelines, procedures and documentation standards for the distribution of funds in the West Virginia Research Trust Fund. The rule designates the Vice Chancellor for Science and Research as the administrator of the program, under the general direction of the Chancellor and the Commission. The final rules are available at https://www.wvhepc.org/resources/rulesandpolicies_files/Series%2048%20%284-16-09%29.pdf.

Commission staff created an electronic "Match Request System" (MRS) in 2008 that allowed secure transactions for RTF requests made by the universities. All requests, documentation and invoicing are permanently recorded in files that allow sorting, analysis and up-to-date balance information. The MRS is cross referenced with university records annually to ensure accuracy for this report.

Required "Research Plans" specified by the legislation and approved by institutional Boards of Governors' were received from both West Virginia University and Marshall University. Both institutional plans are on file at the Commission and are found to be generally compliant with legislative requirements.

The RTF financial account was established in late June 2008 by the State Auditor and made accessible to Commission staff for distribution. This report provides all transaction activities on the RTF to date from its existence.

Interest funds generated by the RTF account have been separately tracked for distribution to State Colleges as defined by the Legislature. On May 15, 2009, the Commission released the first competitive request for proposals for RTF interest funds collected on the account specifically for state colleges and the WV School of Osteopathic Medicine in accordance with provisions of §18B-18A-10 of the code. A second request for proposals was issued on March 9, 2010 a third on June 2, 2011, a fourth on May 30, 2012 and a fifth on September 21, 2012. Proposals for up to \$100,000 each were received from eligible institutions and subsequently reviewed by external peers for program merit. Two awards were issued in 2009, two in 2010 and one in 2011 as a result. No applications were received in response to the May 2012 request for proposals. A request for proposals was issued on September 7, 2012 – one institution was awarded. A final award was made on May 6, 2013.

TRANSACTION SUMMARY

West Virginia University

- Through 2009, combined funds matched by the RTF and transferred to WVU were \$3,489,235. This represented 9.97% of the total funds available to WVU.
- In 2010, new gifts of \$4,541,851 were submitted and matched by the Trust Fund for a total \$8,031,084 or 22.95% of available funds.
- A total of 37 endowments were created through 2010.
- In 2011, new gifts of \$13,835,180 were submitted and matched by the Trust fund for a total of \$21,866,264 or 62.47% of available funds.
- In 2012, new gifts of \$13,133,763 were submitted and matched by the Trust fund which completed the \$35 million in match funds that were available to WVU.

Marshall University

- Through 2009, combined funds matched by the RTF and transferred to Marshall were \$742,100. This represents 4.95% of the total funds available to MU.
- In 2010, new gifts of \$136,660 were reported but were not submitted for RTF match. Thus, total transfers to Marshall in 2010 were zero.
- A total of (2) endowments were created through 2010.
- In 2011, new gifts of \$8,194,634 were submitted and matched by the Trust Fund for a total of \$8,936,733.93 or 59.6% of available funds.
- In 2012, new gifts of \$2,181,245 were submitted and matched for a total of \$11,117,979 or 74.12 percent of available funds.
- In 2013, new gifts of 3,882,021 were submitted and matched by the Trust Fund which completed the \$15 million that were available to MU.

State Colleges and Universities (Fund Interest Earnings)

- Total "RTF Interest" earnings over the five years are \$921,727.
- An award of \$99,892.50 was made to Shepherd University on 9/17/10.
- An award of \$100,000 was made to Fairmont University on 9/17/10.
 - An award of \$100,000 was made to West Liberty University on 11/13/09.
 - An award of \$100,000 was made to Concord University on 11/13/09.
 - An award of \$100,000 was made to West Virginia State University on 9/16/11.
 - A second award of \$100,000 was made to West Virginia State University on 2/06/2013.
 - An award of \$100,000 was made to WVU Institute of Technology on 5/06/2013.
- By June 30, 2015 and the end of the State College and University RTE, the six institutions who received awards matched and drew down \$582,753.

Combined Disbursements

- Total combined distributions from the RTF to date are \$50M and combined distribution from the RTF interest fund are \$582,753.
- RTF and RTF interest current account balance is \$90,444.
- The remaining balance has been applied to a similar grant program for the predominantly undergraduate institutions. The Innovation Grant requires a 1:1 match and allows the regional colleges and universities to purchase equipment and develop innovations in teaching and research. The Innovation Grant allows for two awards of \$45K each.

Pledge Fulfillment

- Marshall University matched the RTF with gifts and 15 pledges. As of July 1, 2015, \$30,000 in pledges had not been received. However, MU has excess qualified donations in the endowments that cover the shortfall in pledges.
- West Virginia University reported that all pledges were fulfilled by July 1, 2015.

RTF for State Colleges and Universities Activities and Outcomes

In fall 2010, **Shepherd University** received a \$100,000 Research Trust Fund grant from the West Virginia Higher Education Policy Commission (EPSCoR program) for a three year project entitled, Undergraduate Research and Experiments in Robotics-Based Accomplishments for STEM (URERAS). The overall goal of the project is to use the creativity and fun of the science of robotics to encourage more students to pursue and graduate with a STEM career. The URERAS project is designed to positively impact the number of STEM graduates by increasing recruitment and retention efforts at Shepherd University. The four main activities of the project are: (1) undergraduate research; (2) team-based, hands-on experiments; (3) curriculum development; and (4) establishing a robotics competition at Shepherd University (SU) to increase the awareness of STEM careers throughout the region. Shepherd has matched \$92,500 to date.

Fairmont State University's RTF grant supports the New Media Assessment Project, an effort to capture large amounts of national security-related content from new media applications such as Twitter, social networking sites, and discussion boards; parse and database that content into a networked storage system; and apply a variety of search, visualization, and automated warning tools to the content in order to generate new knowledge about national security and law enforcement threats. This program is part of the Open Source Intelligence Exchange (OSIX) which is the laboratory and applied research component of Fairmont State University's National Security and Intelligence (NSI) Program. OSIX Student Analysts gain valuable hands-on experience as they work on real intelligence products for real consumers. Participation in OSIX also serves as a career development opportunity for the students, as they meet routinely with potential employers in national security and law enforcement in the course of their duties with OSIX. Eligible students can receive course credit for their work at OSIX. RTF resources were used to fund IT improvements, provide stipends and travel funds to Student Programmers/System Administrators and Student Intelligence Analysts. FSU has raised the entire \$100,000 for the RTF match.

At **West Liberty State University**, funds raised specifically for this program as well as matching monies from the RTF will be utilized in one of two key components: Stipend Support for Students and High-end Instrumentation. Both aspects are required to complete and extend WLU's vision of continual support and growth of biology and biological research, its STEM "area of distinction." The students receiving the Bucks for Brains fellowships have refereed research publications from their studies. Leanne Mazzella is published in *Frontiers in Cellular and Infection Microbiology* 2013 3:93. Leah Starkey, working with Dr. Matthew Zdilla, has two publications (*American Journal of Immunology*. 10(2):107-113; doi:10.3844/ajisp.2014.107.113 and *Integrative Medicine: A Clinician's Journal*), and two journal abstracts (*FASEB Journal* 27:860.6 and 27:860/5) that stem directly from her fellowship work. Raquel Fagundo is published in *Zootaxa* (2013 19; 3750:223-36) for her work related to the identification of a new species of crayfish in the Tug Fork River Basin. She also has a published abstract from The Association of Southeastern Biologists meeting in Spartansburg SC, 2014. A total of \$63,030 has been raised and matched.

The goal of the program is to enhance student achievement, promote faculty scholarship, and enhance the research atmosphere and STEM infrastructure in the Division of Natural Sciences at **Concord University**. Over the past five years, the \$100,000 Research Trust Fund grant to Concord University:

- (1) Was matched by a \$150,000 gift from private donors;
- (2) Provided seed funding that led to an additional \$448,000 of external grants from State, Federal, and Private agencies;
- (3) Generated scientific data resulting in publication of 6 journal articles and 42 conference proceedings with Concord faculty and students;
- (4) Sponsored 12 faculty research projects with 22 undergraduate students;
- (5) Enhanced the overall STEM research environment at Concord by increasing the number of STEM undergraduate students engaged in research by 2.5 times, from a mean of 6.2 per semester to a mean of 15.2 per semester;
- (6) Contributed to institutional efforts to increase STEM graduates by 10%; and
- (7) Enhanced STEM research infrastructure and sponsored start-up of the CU Electron Microprobe laboratory, which has: (a) Been utilized by 386 Concord students for class-based laboratory experiences, (b) served 290 visiting K-12 students and parents for scientific outreach, (c) been featured in 5 statewide media reports (magazines, WV public radio, newspaper), and (d) been utilized by 12 research teams from other universities and businesses.

In the 2011 – 2012 academic year, **West Virginia State University** (WVSU) was awarded a Research Trust Fund Grant for \$100,000 to purchase a 400 MHz Nuclear Magnetic Resonance Spectrometer (NMR). This grant was matched by a generous donation from the Dow Corporation in compliance with the guidelines for matching funds. Working in connection with the National Institute for Health's Idea Network for Biomedical Research Excellence (INBRE) [which funded an additional \$30,000] and several in-house funding streams, a new NMR was purchased. This instrument brings a host of research opportunities to the Kanawha Valley that has not been seen since the Dow Chemical Company left the West Virginia Regional Technology Park. In addition to the purchase of the new instrument, WVSU has renovated the NMR lab where the instrument is installed.

In 2013, **West Virginia State University** received a second RTF grant to support the Full STEAM Ahead initiative. This initiative is building institutional expertise in the area of bioenergy by integrating research, outreach, and teaching activities. Bioenergy-related research is a core research program within WVSU's research strategic intents, and was strengthened through the recruitment of a research scholar. Dr. Sanjaya teaches bioenergy-related curriculum and mentors students' research. WVSU has raised the entire \$100,000 for the RTF match through a generous donation from Appalachian Power.

Also in 2013, **WVU Institute of Technology** was awarded an RTF grant of \$100,000. The objective of this project is to create a center of excellence for cyber-physical systems at West Virginia University Institute of Technology (WVU Tech). Cyber-physical systems (CPS) are engineered systems that are built from and depend upon the synergy of computational and physical components. CPS will transform the way people interact with engineered systems, just as the Internet transformed the way people interact with information. A series of research enhancement activities were conducted, including faculty summer salary supplements, professional development, organization of WV CPS workshop, publication, and travel for coordination. Total match and withdrawals from WVU Tech totaled \$20,000.

WEST VIRGINIA RESEARCH TRUST FUND

from

West Virginia University¹

August 15, 2015

INTRODUCTION

This seventh annual report describes the history of the Research Trust Fund, responds directly to the reporting requirements outlined in Series 48 (§ 133-48-14), and lays out the proposed spending plan for the earned interest and carry over funds from each endowment for FY 2016.

History of the Research Trust Fund (2008-2009)

In March 2008, the West Virginia Legislature enacted Senate Bill 287, commonly referred to as the Research Trust Fund, as an effort to build a critical mass in selected areas of research and thus lay the groundwork for future economic development. The initial Bill provided a five year window for the deposit of qualified donations into research endowments. Senate Bill 239 (Passed March 12, 2011) amended §18B-18A-9 of the Code of West Virginia to provide a seven year window. Senate Bill 287 committed \$35 million to West Virginia University as a basis for a 1:1 match with private dollars to create endowments that would provide a sustainable source of funds for research and development. West Virginia University's approved Strategic Research Plan identified four areas for investment:

- Energy and environmental sciences;
- Nanotechnology and material science;
- Biological, biotechnological, and biomedical sciences; and
- Biometrics, security, sensing and related identification technologies.

A brief description of each research area is available at

http://research.wvu.edu/home/research_trust_of_west_virginia_university. These areas were selected because they complemented the expertise of WVU's faculty, were critical issues of importance to the public, and were at the core of WVU's land-grant mission.

An Addendum to WVU's Strategic Research Plan for the Research Trust Fund was approved by the WVU Board of Governors in December 2010 and incorporated therein. Three modifications were made:

1. Adding forensic sciences as an area of emphasis under the biometrics, security, sensing, and related identification technologies, providing the opportunity for private investment into this area of research.
2. Adding a Library endowment to support the acquisition of materials in the four research areas, clarifying the importance that library resources provide to a vibrant research agenda.
3. Removing the language "no research area may receive more than \$17.5 million in private donations within the first two years," allowing WVU to maximize private investment regardless of focus area.

West Virginia University continues to balance its tripartite responsibilities for teaching, research, and service in fulfillment of its land-grant mission. The institution is in the fifth year of its comprehensive strategic plan, WVU's 2020 Strategic Plan for the Future (<http://strategicplan.wvu.edu>). "To excel in research, creative activity and innovation" is one overarching objective of the strategic plan. The Research Strategic Plan for the Research Trust Fund is subsumed within this objective of WVU's 2020 Strategic Plan.

¹ Address questions and requests for additional information regarding WVU's Strategic Research Plan and the Research Trust Fund initiative to Provost Joyce McConnell, West Virginia University (joyce.mcconnell@mail.wvu.edu) or Vice President for Research, Dr. Fred King, West Virginia University (fred.king@mail.wvu.edu).

Achieving the Goal: \$70 million in Private and State Endowments

During the first four year period after the inception of the Research Trust Fund, West Virginia University received gifts and pledges totaling \$35 million, the total amount allocated to the University through the Research Trust Fund initiative. Each endowment was qualified by the West Virginia University Board of Governors and thus eligible for state matching funds. **Thus the University's goal was achieved.**

The seven year pledge period has officially concluded. The 85 endowments in Appendix A represent the final portfolio established under the Research Trust Fund initiative. These endowments include five generic types of gifts: 12 chairs and professorships, 12 undergraduate scholarships, 14 graduate fellowships, 2 graduate or undergraduate fellowships, 43 broad-based research support funds, and 2 library endowments.

Compliance with Legislative Rule for Research Trust Fund

Three specific reporting requirements are identified in Series 48 (§ 133-48-14), the Research Trust Fund Program.

1. 14.1. By August 15, 2009, and annually thereafter, each participating institution shall provide an annual report to the Commission that includes a full accounting of the trust funds, endowment proceeds, and adherence to the objectives established by the research plan.
2. 14.2. Each participating institution shall detail in its annual report to the Commission the total amount of qualified donations received, the investment earnings realized and any anticipated expenditures of the research endowment proceeds in its annual operating budget.

The data in APPENDIX A summarize much of the information requested by the Legislative Rule.

Through June 30, 2015 the following results have been achieved:

- **FY15 Market Value for all the Private RTF Endowments**
The market value of Directed Research Endowments established with private gifts invested in the Research Trust Fund Program of the WVU Foundation Endowment for fiscal year ending June 30, 2015 is \$40,953,666.
- **FY16 Spend Available for the Private RTF Endowments**
The available proceeds from Directed Research Endowments established with private gifts invested in the Research Trust Fund Program of the WVU Foundation Endowment for FY16 are \$1,789,243, compared to \$1,616,222 in FY15 and \$1,547,270 in FY14.
- **FY15 Market Value for all the State RTF Endowments**
The market value of Directed Research Endowments established with trust distributions (state funds) to the Research Trust Fund Program of the WVU Foundation Endowment for fiscal year ending June 30, 2015 is \$37,530,535.
- **FY16 Spend Available for the State RTF Endowments**
The available proceeds from Directed Research Endowments established with trust distributions to the Research Trust Fund Program of the WVU Foundation Endowment for FY16 are \$1,552,880, compared to \$1,559,607 in FY15 and \$1,253,163 in FY14.
- **FY15 Total Number and Amount of Gifts Received that Qualified for State Funds**
The WVU Foundation fulfilled the \$35 million Legislative appropriation in fiscal year 2012.
- **Total Number and Amount of Gifts Received since Inception that Qualified for a State Match**
During the period from March 08, 2008 to June 30, 2012, the WVU Foundation received 1210 qualified private gifts (donations and pledges) totaling \$35,000,000; matching funds equal to this amount were requested from the Research Trust Fund.
- **Total Number and Amount of Gifts Received since Inception from the State for Matching Funds**
During the period from March 08, 2008 to June 30, 2012, the WVU Foundation received 19 distributions from the Research Trust Fund totaling \$35,000,000 to match 1210 qualified gifts (donations and pledges) to Directed Research Endowments.

3. 14.4. Each participating institution's research corporation and/or foundation shall provide the Commission with an audited financial statement annually. These statements shall be treated as confidential.

A copy of the audited financial statements for years ending June 30, 2014 and 2013 for the WVU Foundation has been forwarded to the Policy Commission through Director Jan Taylor under separate cover. Because of timing of submission of this report relative to the receipt of the audited financial statement, the audited financial statement of the WVU Foundation, Inc. will always be a year in arrears.

Impact of the Research Trust Fund Initiative

The impact of the Research Trust Fund is the 85 different endowments that were created. President E. Gordon Gee added the following comment to the power of the Research Trust Fund initiative and its importance to West Virginia University.

I want to thank our donors and State leaders for their vision and commitment to the future of our University. The University's donors believe in our research mission and their generous donations fuel the discoveries that will transform the lives of people in West Virginia and beyond. The partnership between our private donors and the State has led to the largest single gift ever to WVU and a college—the naming of the Benjamin M. Statler College of Engineering and Mineral Resources—and the largest gift ever benefitting graduate research fellowships at WVU—the Ruby Scholars Graduate Fellowship Program. Along with other endowed professorships, student scholarships, graduate fellowships, and research support, we are able to build on our research success while empowering our faculty and students to make positive differences in the world.

Vice President for Research Fred King remarked that “the Research Trust Fund is not only an investment in our University, it is an investment in the future of our state. We know that research and innovation are the key economic drivers as we move forward in the 21st Century and compete in a global economy. The ideas generated and the students educated through the endowments establish under the Research Trust Fund initiative provide a basis for West Virginia's future prosperity. We are thankful to the donors and the West Virginia legislature for their confidence in our ability to deliver the innovation and education essential to the state's economic future.”

BUSINESS PLAN

In addition to the legislatively mandated reporting requirements, the Higher Education Policy Commission requires a business plan for each research area. APPENDIX A reflects the anticipated use of the money available to spend in FY16.

In FY15, \$2,978,434 of Research Trust Fund dollars, both that from private accounts and matching state accounts, was spent on research – for scholarships, fellowships, prominent scholars, and in support of ongoing research initiatives.

For FY16, \$8,882,800 will be available. This number includes the proceeds from each private endowment and its equivalent state matching endowment plus any unspent money from the preceding year. Of this amount, \$3,342,123 will come from interest earned on both the private endowments and that from the matching state endowments established from the Research Trust Fund; \$5,540,677 will come from unspent funds from the previous year. The significant amount of interest dollars reflects the positive impact of a healthy stock market and the fact that all endowments are fully funded. Last year ten funds were reported as having an outstanding pledge balance; each was paid by the March 8, 2015 deadline. When the amount of available funds was insufficient to meet the objectives of the endowment, the money accrues, accounting in part for the carryover of unspent funds from the previous year. This is especially pertinent to the funding for named professorship and chairs which requires having a consistent source of funds from year to year. The funds for each endowment are being distributed according to the intent of the respective endowment.

WVU looks forward to the significant and sustained impact that programs supported by the Research Trust Fund will have on addressing some of the nation's most important issues in energy, health care and security.

APPENDIX A. Endowments established in the West Virginia University Foundation under the Research Trust Fund program and their anticipated use in Fiscal Year 2016. Amounts available include proceeds from endowment plus unspent funds from previous years.

Fund Name	Brief Description	Total	Anticipated Use
Frederick P. Jr. & Joan C. Stamp Cancer Research	Broad-based Research Support	\$13,244	Operational support for ongoing research
Norma Mae Huggins Cancer Research Endowment	Basic and Clinical Colon Cancer	\$44,829	Operational support for colon cancer research Research
Walter H. Moran Jr. General Surgery Resident Research	Research Opportunity for Surgery Resident	\$103,273	Stipend for resident to engage in research
Schoepp Neurosciences Research Student Support	Graduate Fellowships and Support for Research	\$19,850	Support for student research activities
Verizon WV for Biometrics	Broad-based Biometrics Research	\$32,113	Operational support for ongoing research
Raymond Brooks Vanscoy Cancer Research Endowment	Broad-based Cancer Research	\$13,340	Operational support for ongoing research
Allen S. Pack Endowment for Mining Engineering	Energy Research in Mining Engineering	\$18,763	Operational support for ongoing research
L. Zane Shuck Laboratory Endowment in Nanobiotechnology	Facilities Support in Nano-biotechnology	\$27,578	Supplies and equipment for a shared facility
Alpha Natural Resources Endowment for Energy Research	Energy and Environmental Research	\$69,385	Supplies and equipment for two new faculty
Alan Susman Cortico-basal Ganglionic Degeneration Research	Degenerative Neurological Research	\$48,452	Projects that lead to extramural funding
Blaine S. West Endowment for Civil and Environmental Engineering	Broad-based Research Support	\$38,098	Part of start-up packages for two new faculty
William J. Maier, Jr. Chair of Research	Create a Chair in Biomedical Research (Charleston Division)	\$312,999	Hold until Chair is appointed
Branson-Maddrell Endowed Professorship in Orthodontics	Create a Professorship in Dentistry professorship	\$125,756	Salary enhancement for recipient of the
George B. Bennett Dean's Research Opportunity Endowment	Broad-based Research Support	\$202,444	Develop new research opportunities
E. Elizabeth Morgan Cancer Research	Broad-based Research Support	\$2,972	Operational support for ongoing research
Badzek Family Endowment for Nursing Research	Nursing Research to Support Quality of Life	\$8,724	Nursing research supporting the Institute
Ruth and Robert Kuhn Nursing Faculty Research	Broad-based Research Support	\$8,045	Seed grant for new research effort
Hall - de Graaf Endowment for Women in Science & Engineering	Research Support for Women, Faculty and Students, in STEM Disciplines	\$5,440	Operational support for ongoing research
Fithian Family Foundation #2/ Behavioral Medicine-Psychiatry	Research Support in Behavioral Medicine	\$33,124	Operational support for ongoing research
WVUH Evidence Based Practice Research Professorship/Nursing	Create a Professorship	\$126,287	Hold until Professorship is created
Grace C. Clements Speech Pathology and Audiology Research	Broad-based Research Support	\$14,205	Operational support for ongoing research
Virginia Oil and Gas Research Endowment for PNGE	Research Activities in Appalachian Shales	\$20,942	Operational support for ongoing research

Fund Name	Brief Description	Total	Anticipated Use
Michael Baker Corporation Endowment/ CEE	Broad-based Research Support	\$22,535	Operational support for ongoing research
Darrell & Diane Williams Research for PNGE	Research Activites in Appalachian Shales	\$17,663	Operational support for ongoing research
Preservati Cancer Research	Broad-based Research Support	\$14,409	Operational support for ongoing research
Martha Gaines & Russell Wehrle Pediatric Research Endowment	Broad-based Research Support	\$15,393	Operational support for ongoing research
E. Jane Martin Research Doctoral Fund	Research Support for Doctoral Students in Nursing	\$7,552	Support research of doctoral students
John T.& June R. Chambers Chair of Oncology Research	Create a Cancer Research Chair	\$219,955	Hold until chair is created
Christopher Cline Chair in Orthopedic Surgery	Create a Chair in Orthopedic Surgery	\$433,589	Hold until chair is created
Mabel C. Phares Leukemia Research Endowment	Broad-based Research Support	\$43,789	Support for leukemia research
Gary and Lisa Christopher Graduate Fellowship	Create a Graduate Fellowship in CEMR	\$29,835	Support for a student who will work in industry upon graduation
WV United Health System Evidence- Based Nursing Practice Research	Research Awards for Faculty and Students in Nursing	\$12,585	Annual support for ongoing research
Mike Ross Family Pediatric Diabetes Research Endowment	Broad-based Research Support	\$121,614	Support for faculty engaged in research in pediatric research
Van Wyk Cancer Research Endowment	Broad-based Research Support	\$2,374	Operational support for ongoing research
Robert T. Bruhn Physics Research Endowment	Broad-based Research Support	\$20,330	Operational support for ongoing research
Women in Science and Engineering Giving Circle Endowment	Support for the Women's Giving Circle	\$8,332	Research support for women faculty and students in RTF areas
Jarrett Family Research Endowment for Dentistry	Research Support in Orthodontics	\$33,031	Support for faculty guided research projects for pre/post doctoral students
Donald R. & Linda E. Holcomb Research Endowment Dentistry	Braod-based Research Support	\$24,781	Support for pilot research and bridge funds
Arch Coal Inc. Endowment for Mine Health & Safety Research	Mine Health and Safety Research	\$71,499	Support for the continual study of mine safety and the health of mine workers
Shaw Pathology Research	Broad-based Research Support	\$17,518	Support for ongoing faculty research
Dr. Mohindar S. Seehra Research Award	Physcis Doctoral Student Awards	\$9,777	Awards for meritorious doctoral students
Oleg D. & Valentina P. Jefimenko Library Resources #2	Library Resources Endowment	\$19,603	Acquire library resources for physics
Frank and Susan Klatshin Cerminara Endowment	Research Support for Industrial & Safety Management Engineering	\$10,820	Support for ongoing faculty research
Nesselroad Family Glaucoma Research	Glaucoma Research in WVU Eye Institute	\$13,807	Support for research directed to glaucoma
Salvatore and Josephine Cilento Research Endowment	Broad-based Research Support in CEMR, Preference to Chemical Engineering	\$3,485	Support for faculty research
Statler Research Endowment	Support for 3 Statler Chairs and a Graduate Fellows Program in CEMR	\$2,053,320	Support for fossil-energy research
WVU School of Medicine Research Endowment	Broad-based Research Support	\$117,396	Research support funds

Fund Name	Brief Description	Total	Anticipated Use
Quad/Graphics Chair in Internal Medicine, Eastern Division	Create a Research Chair	\$348,661	Hold until Chair is appointed
James H. Walker Chair of Pediatric Cardiology	Create a Research Chair Dr. William Neal	\$189,029	Support for the Walker Chair,
James A. Kent Endowment for Biomedical Engineering	Broad-based Research Support	\$17,139	Supplies and equipment for recently hired faculty
Osborn Professorship in Hemato-logical Malignancies Research	Create a Research Professorship	\$66,745	Support for the Osborn Professorship, Dr. Laura Gibson
BrickStreet Neurology Fellowship	Create a Graduate Student Fellowship	\$39,472	Create a student fellowship
Robert E. Murray Chairmanship Mining Engineering Department	Create a Named Department Chairmanship	\$259,760	Support for the Chair of Mining Engineering
Rita Radcliff-Deppe & Brian Deppe Fellowship Award	Create a Graduate Student Fellowship	\$15,058	Create a graduate student fellowship
Oleg D. and Valentina P. Jefimenko Library Resources	Library Resources Endowment	\$49,062	Acquire library resources to support research
Oleg D. and Valentina P. Jefimenko Physics Fellowship	Create a Graduate Student Fellowship	\$13,912	Create a graduate student fellowship
WVU Hardwood Research Trust	Create a Graduate Student Fellowship	\$137,890	Create a student fellowship
James P. Boland, M.D. Department of Surgery Endowed Research	Broad-based Research Support	\$94,786	Operational support for ongoing research
WVU Ruby Scholars Graduate Research Fellowships	Create Merit-based Graduate Fellowships for Exceptionally Talented Students	\$1,598,908	Create fellowships for highly meritorious students
Robert E. Pyle Chemical Engineering Graduate Fellowship	Create a Graduate Student Fellowship	\$9,139	Support for a graduate student
James & Ruby Romano Civil & Environmental Engineering Endowment	Energy and Environmental Research Support	\$99,186	Operational support for ongoing research
Robert & Stephany Ruffolo Pharmacy Graduate Fellowship	Create a Graduate Student Fellowship	\$10,191	Research support for a graduate student in pharmacy
James and Betty Hall Fellowship	Create a Graduate Fellowship in CEMR	\$17,982	Research support for a meritorious student
Stuart M. & Joyce N. Robbins Distinguished Prof/Epidemiology	Create a Distinguished Professorship	\$263,743	Support for a professorship in School of Public Health
Academy of Chemical Engineers Graduate Fellowship	Create a Graduate Fellowship in Bioengineering in Chemical Engineering	\$26,774	Support the research of a meritorious graduate student
J. F. Brick Chair in Neurology	Create a Named Chair in Neurology	\$433,074	Ongoing support for the Brick Chair
Jack and Marietta Mullenger Fellowship	Create a Graduate Research Fellowship in CEMR	\$5,976	Support for graduate student research in any RTF area
Wells Fargo Energy Group Scholarship	Create a Student Scholarship	\$20,204	1 undergraduate student scholarship
Benjamin James Galford Research Scholarship	Create an Undergraduate Research Scholarship in Physics	\$15,759	Support research activities of undergraduates
Carl Del Signore Foundation Graduate Fellowship	Create a Graduate Student Fellowship	\$15,974	Support for a graduate student
George M. & Mary Freda Vance Medical Scholarship-Fellowship	Create a Student Scholarship/ Graduate Student Fellowship	\$37,001	Create 1 prestigious post doctoral fellowship
William S. Clapper Mechanical & Aerospace Engineering Scholarship	Create Undergraduate Student Scholarships	\$3,526	5 undergraduate student scholarships

Fund Name	Brief Description	Total	Anticipated Use
Everette C. Dubbe Research Scholarship	Create a Undergraduate Student Scholarship	\$17,345	3 undergraduate student scholarships
Oleg D. and Valentina P. Jefimenko Physics Scholarship	Create an Undergraduate Scholarship	\$5,122	1 undergraduate student scholarhsip
James Bergen and Randy Monteith Anderson Scholarship in MAE	Create Undergraduate/Graduate Scholarhsips in Energy Research	\$2,907	Support research by undergraduate students in energy and environment
Morton Scholarship	Create Scholarships for Students in CEMR	\$17,190	Support undergraduate student research in energy
David VanDorn Sutton Scholarship	Create Undergraduate or Graduate Scholarships	\$128,219	Support students in any of the RTF areas
Morrissey-Ropp Scholarship	Create Scholarships in Arts and Sciences in any RTF area	\$6,938	Support for undergraduate student research
Martha Hopkins Hashinger Scholarship	Create a Scholarhsip in CEMR in Chemical Engineering	\$2,581	Support for undergraduate student research
J. Leland & Clara Virginia (Grosscurth) Taylor Scholarship	Create a Scholarship in CEMR, Preference to Petroleum and Natural Gas	\$4,409	Support for undergraduate student research
Mitchell-Morey Scholars Program	Create a Scholarship in Any RTF Area	\$4,560	Support for undergraduate student research
Statler Research Scholars Program	Create Undergraduate Scholarhsip Program in CEMR	\$90,915	Support for undergraduate students doing research
Bettie D. Gallaher Research Fellowship	Create a Graduate Fellowship in Any RTF Area	\$130,774	Fellowship to be awarded to meritorious students
Research Trust Fund Jefimenko Professorship in Physics	Create a Professorship in Physics	\$50,073	Hold until professorship is awarded
William E & Bonnie Kucan Coleman	Create Research Scholarship in any RTF	-\$2,045	Support for undergardaute student research
TOTAL		\$8,882,800	

Annual Report

from

Marshall University Research Endowment Plan Annual Report

2014-2015

Submitted to the Division of Science and Research at the
West Virginia Higher Education Policy Commission

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I. Summary

The West Virginia Research Trust Fund program has originated sixteen endowments at Marshall University to fund allowed research-related activity. These endowments span research areas from Engineering to Clinical and Translational Research and specify uses from direct research support to student research stipends. In FY 2013, the full \$15MM in gifts and pledges was raised, along with an excess of over \$500,000. The progress in FY 15 involved the utilization of these funds as the endowment proceeds became available and the accumulation of final pledge fulfillment.

To date, the Bucks for Brains Endowments total \$ 34.54MM - Up from \$27.31 MM last year. \$30,000 of pledges were not received by the deadline, but there are excess private contributions in the endowments to cover these. Earnings to date have amounted to \$4.3MM.

II. Review of the Marshall University Research Endowment Plan

Marshall's original Research Endowment Plan approved by the University's Board of Governors in 2008, directed donations to:

- Endowment of the Marshall Institute for Interdisciplinary Research (MIIR), continuing with the plan laid out in Marshall's application to the Eminent Scholars Recruitment and Enhancement (ESRE) initiative; and
- Advancement of Intelligent Transportation Systems research at the Rahall Transportation Institute (RTI).

In November 2010, the Marshall University Board of Governors approved a Research Trust Fund Addendum (Appendix One) that broadened the recognition of Biomedicine/ Biotechnology as a focus for donor activity across the University, and further included aspects of Engineering, Environmental Science and the Physical Sciences.

III. Research Endowment Plan Fundraising Review

A. Fundraising Progress

Through FY 2012, \$9MM in qualifying donations and pledges were received and matched for eleven endowments. In FY 2013, the remaining \$6MM was raised, and the total number of endowments brought to sixteen. During FY 2014, pledge fulfillment continued with a total of \$12.31 MM received. At the close of the program, \$32,060 in pledges were not fulfilled, which were covered by excess monies already in the endowments

B. Progress in the Endowed Research Areas

A brief update on activities of the endowments is included below. A comprehensive summary of the endowments is included in previous versions of this report. The current corpus balances and earnings-to-date and expenditures are provided in Table One, at the end of this section.

1- The Marshall Institute for Interdisciplinary Research (MIIR)

The Marshall Institute for Interdisciplinary Research (MIIR) was created to advance Marshall University's strategic objective of advancing economic development through entrepreneurship and commercialization of scientific discoveries. This institute facilitates the transfer of scientific knowledge into applications that have potential for generating business ventures and corporate partnerships. The institute also aims to be a self-sustaining enterprise that creates intellectual property through innovation, enhances economic development, advances intellectual infrastructure and increases employment opportunities in West Virginia.

MIIR enables commercially relevant bioscience activity by affording companies the opportunity to develop and mature promising new technologies and products within the university environment. Research is directed with licensable endpoints in mind and corporate partners play important roles in selecting and developing projects that have commercial potential. Scientists within the institute monitor scientific progress and obtain extra-mural grant funding to support and accelerate the progress of these projects.

The recent activities of the Institute are discussed in the ESRE Section IV below.

2- Rahall Transportation Institute (RTI) - nothing to report

3- Fletcher Mechanical Engineering Endowment-

The Fletcher family's generous gift supports the position of a founding chair of the department of Mechanical Engineering. Dr. Asad Salem has joined Marshall as full professor of Mechanical Engineering and will also serve as the new Chair of the Weisberg Division of Engineering.

Fletcher Fund's support for Dr. Salem has led to a very productive program. He has received a total of \$394,000 from grants from J. H. Fletcher, WV-NASA, and CDC. In addition to the grant funds, he also arranged for Siemens PLM Software to allow their software to be used by students and faculty. Dr. Salem has also published the following four papers in technical journals:

1. Salem, A. and E. Hudiab "Evaluation of Al Qattara Depression Renewable Energy Potentials', WSEAS TRANS ACTIONS on ENVIRONMENT and DEVELOPMENT, pp 444-452, Vol. 10, 2014 E-ISSN-2224-3496.
2. Salem,A. and E. Hudiab,"LNG Regasification System to Enhance the Performance of Gas Turbines and Water Desalination Systems", Inter. J. of Energy, pp. 84-90, Vol. 8, 2014, ISSN: 1998-4316
3. Salem, A. and E. Hudiab," Solar Powered LNG Regasification: Enhancing Power Generation and Water Desalination", Adv. in Environmental Sciences, Development and Chemistry, Proceedings of the 2014 International Conference on Energy, Environment, Development and Economics (EEDS 2014) pp. 73-78, 2014 ISBN: 978-1-61804-239-2
4. Asad Salem, "Analysis of Two Plane Fluid Layers in Narrow Rectangular Cavity' Proceedings of the 5th Inter. Conf. on Fluid Mechanics and Heat &Mass Transfer, Lisbon Portugal, Oct. 30-Nov. 1, 2014.

4-Pew Endowment for River Research-Nothing to report

5-Maier Endowment for Dementia Research- Nothing to Report

6-BrickStreet Endowment for Safety Engineering Research

The College of Information Technology and Engineering's Safety Engineering Research Program is undertaking an initiative to expand its activity in risk management research. Risk management is a highly interdisciplinary field that involves applying the principles of safety engineering and industrial hygiene and integrating them with economic and financial analysis.

This discipline is extremely important to the transportation and logistics and energy sectors. The BrickStreet endowment supports the development of research expertise in the school of engineering in the area of risk management, by promoting these highly interdisciplinary studies at the interface of management, engineering and applied mathematics.

The Brickstreet Endowment for safety research has been used to support Jim McIntosh. Jim submitted a research proposal titled "Evaluation of the Current Safety Culture within the West Virginia Department of Transportation". He has also been working on a project with Brickstreet personnel titled "Safety – Beyond Compliance" will be the focused topic at the first Marshall Safety Conference that will be held on September 16-17, 2015.

7-The Endowment for Summer Undergraduate Research in Chemistry

The endowment has been created by individual donations and departmental royalties from the sale of laboratory manuals set aside for this purpose. The proceeds will be used to support endowed rotating professorships and undergraduate summer research fellowships in Chemistry.

These summer positions are a central component in the Department's long-term strategy to increase research output and obtain sustainable external funding. Each student selected will do an original, collaborative research project with a supervising faculty member. Dr. Mike Castellani is the PI for this fund.

The Chemistry endowment supports undergraduate summer research programs by providing stipends to students working in Chemistry research laboratories. Three awards were scheduled to be made from this fund during the reporting period, but all three students received funding from alternate sources. In future years, alternate awardees will be named to provide for this possibility.

8-Fred and Isabella Zacharias Endowment for Obstetrics and Gynecology Research- Nothing to report

9, 10-The Cline and Underwood Endowments for Translational Sports Medicine Research

The endowment supports Translational Sports Medicine Research at the Joan C. Edwards School of Medicine at Marshall University where comprehensive interdisciplinary research that translates to advances in human injury prevention, injury recovery and accelerated therapeutic outcomes is being conducted. The endowment proceeds are being used to initiate and develop a nationally-competitive research program that enhances human function and quality of life through discoveries which protect human health and enhance injury repair, while advancing human performance capacity.

Dr. Nader Abraham was PI of this program and subsequent to his return to NYMC, Dr. Joe Shapiro assumed the role. The Sports Medicine Translational Research being conducted at the Joan C. Edwards School of Medicine is advancing personalized, evidence-based healthcare by researching the mechanisms behind athletic injuries, develop interventions to improve prevention of these injuries and create innovative technologies and techniques to enhance recovery and prevent re-injury.

Multidisciplinary teams include not only clinicians and basic science researchers, but also, biomechanical engineers, kinesiologists, exercise physiologists, physical therapists, athletic trainers, and coaches to measure how athletes and non-athletes move, with the goal of creating and improving strategies to prevent and treat injuries while optimizing performance. The teams will investigate the neuromuscular and musculoskeletal adaptation to injury and rehabilitation and will focus on biomechanical and neuromuscular analysis which will allow for identification of neuromuscular impairments following injury.

The initial phases of the work focused on the phenomenon of oxidative stress. In two separate but related lines of investigation, researchers from the School of Medicine and MIIR have published on the role of oxidative stress inhibition on inhibiting adipogenesis. Increased expression of heme oxygenase (HO-1) through upregulation of the Wnt signaling pathway resulted in decreased adipogenesis in adipocytes. Suppression of the HO-1 and Wnt10 genes with siRNA led to increased adipogenesis. In an article soon-to-be published in Science Advances, administration of a peptide, pNa/Ktide, shown to inhibit the oxidative signaling amplification of Na/K ATPase, reduced oxidative stress and lipid accumulation in a dose dependent manner in adipocytes. Similarly, administration of pNa/Ktide to mice fed a high fat diet reduced body weight gain, restored systemic redox and inflammatory milieu, improved insulin sensitivity.

This research was also conducted under the auspices of the Brickstreet Wellness Research endowment.

Over the next fiscal year the oxidative stress activities will continue at MIIR and SOM laboratories, and with the opening of the new Translational Sports Medicine Institute at Marshall, a new set of projects have been sponsored:

- The Changes in Windmill Pitch Kinematics and Kinetics Over Time During a Throwing Session
- The Effect of Repeated Overhead Arm Motions on Scapular Kinematics and Subacromial Space Outlet Width
- The Effect of Eccentric Exercise on the Thickness of the Rotator Cuff Tendon
- The Assessment of Shoulder Pain, Scapular Motion, and Function of Upper String Musicians

11 BrickStreet Wellness Research Endowment was created to conduct research on workplace health issues that impact workers' safety, productivity and wellness.



The charter is to use the endowment to conduct research that will span the spectrum from basic molecular research to practical, work-place based research. A number of common clinical problems (e.g., obesity, metabolic syndrome) still lack easily implemented treatments, and greater understanding of these problems at a basic level is necessary to formulate novel approaches. One example for this is the area of obesity and obesity related diseases such as metabolic syndrome, osteoarthritis and cardiovascular disease. Recent work from Marshall University investigators (see preceding section) suggests that alteration in the expression of antioxidant enzymes at a molecular level will have markedly beneficial effects on total body fat burden as well as downstream effects

on other organ systems. Furthermore, it appears that there are a number of genetic, pharmacological and nutritional manipulations which can affect marked increases in the expression of these antioxidant enzymes. The BrickStreet research endowment is being used to fund high impact, novel treatments potentially relevant to workplace health at a preclinical level.

12 The Huntington Foundation, Inc./ Frank E. Hanshaw, Sr. Endowed Chair of Geriatrics- Nothing to report

The Huntington Foundation created an endowment fund to support research in the field of geriatrics encompassing a spectrum of issues relevant to aging such as hypertension, obesity, and diabetes. The endowment provides for the appointment of an Endowed Chair of Geriatrics named in honor of Frank E. Hanshaw, Sr.

13-The Rezulin Endocrinology Research Fund- Nothing to report

14-The Herbert Louis Eiselstein Memorial Scholarship was established by his wife, Maryellen, in her husband's memory. Herbert spent his entire career with Inco Alloys International and retired as Vice President of Technology, Research and Development.

Freshman recipients of the support are to be full time chemistry majors in the College of Science (COS) and have a minimum high school GPA of 2.9. Priority shall be given to students considering a career in metals and materials science or who have aspirations of becoming a professional scientist. The recipient shall engage in a minimum of 90 hours per semester of original student faculty collaborative research.

An award was made from this fund to Mr. Brian Warner, a senior Chemistry major, for the amount of \$1,000. Mr. Warner worked in the lab of Dr. Laura McCunn. His research resulted in a presentation at the regional meeting of the American Chemical Society in Pittsburgh, PA in October 2014. Brian is attending Marshall University Joan C. Edwards School of Medicine starting this fall.

15-The Donald Cain Tarter Biological Sciences Student Research Scholarship- Nothing to report

16-The Steve and Mary Beckelheimer Science Education Graduate Scholarship- Nothing to report

C-Current Fund Balances

The current fund balances for the Marshall University Research Trust Fund Endowments is shown in Table One, below. \$32,060 of outstanding pledges is were not paid by the program deadline. An excess of private donations is available to fund these pledges.

Expenditures in FY 2015 amounted to \$259,000.

Table One- Fund Balances for Marshall University's Research Trust Fund Endowments at the End of FY15

#	Fund	Total Corpus	Total Earnings
1	MIIR	\$ 6,379,847	\$ 1,319,550
2	RTI	\$ 378,260	\$ 75,192
3	Maier Dementia Research	\$ 2,000,000	\$ 314,498
4	Fletcher Engineering	\$ 1,693,595	\$ 213,200
5-6	Pew River Research	\$ 430,200	\$ 86,019
7	Brickstreet Safety Research	\$ 400,000	\$ 77,643
8	Chemistry SURF	\$ 197,682	\$ 32,821
9	Zacharias OB/GYN	\$ 796,714	\$ 122,140
10	Translational Sports Medicine Research	\$ 10,100,000	\$ 1,148,060
11	Eiselstein Scholarship	\$ 32,600	\$ 7,174
12	Tarter Scholarship	\$ 55,320	\$ 2,611
13	Beckelheimer Scholarship	\$ 100,000	\$ 7,363
14	Hanshaw Geriatric Research	\$ 1,000,000	\$ 64,020
15	Rezulin Endocrinology Research	\$ 1,782,021	\$ 179,934
16	Brickstreet Wellness Research	\$ 5,000,000	\$ 300,751
	Total	\$ 30,346,239	\$ 3,950,977



IV. ESRE Update-Progress at MIIR- MIIR Advances with Hiring of New Scientists and Announcement of New Collaborations

MIIR is Marshall University’s key vehicle to advance regional economic development through entrepreneurship and commercialization of scientific discoveries. Scientists at the institute are developing an intensive program of biotechnology research dedicated to producing patentable scientific breakthroughs a breakthroughs and creating new businesses based on those discoveries.

The Marshall Institute for Interdisciplinary Research concluded a national search with the appointment of Dr. Zijian Xie as Director. Dr. Xie, whose laboratory is internationally recognized for its groundbreaking work to understand the behavior of cellular pathways and their relationship to cancer, renal disease and cardiac failure, was named the director of the Marshall Institute for Interdisciplinary Research effective November 1, 2013.

Dr. Xie came to Marshall from the faculty of the University of Toledo’s College of Medicine, where he was a professor of physiology, pharmacology and medicine, and served as the co-director of the M.D./Ph.D. program. In addition to conducting his own active research program at MIIR, Xie is responsible for adding to the team of interdisciplinary researchers who comprise the core of the institute and for fostering collaborations with other scientists at Marshall.



A molecular biologist/pharmacologist, Xie has focused his research for nearly 30 years on an enzyme commonly referred to as the “sodium-potassium pump” because it controls the levels of potassium and sodium entering and exiting cells. This pumping process is vital to transporting essential nutrients like glucose and amino acids into cells and maintaining the electrical charge within cells, which is particularly important in controlling normal functions in nerves and muscles, as well as in the kidney and heart.

Xie’s research shows that in addition to its critical pumping function, which was discovered by scientists in the 1950s, this “pump” plays a second, distinct role by directing a variety of cellular processes in the heart, kidneys and other tissues. Through their studies to learn more about the molecular mechanisms by which this cellular signaling occurs, Xie and his colleagues are working to develop new treatments for cancer, heart and kidney disease.

Xie holds international patents and patent applications on seven medical inventions resulting from his research. He has served as principal investigator, project leader or co-investigator on National Institutes of Health-funded projects totaling more than \$10 million, and has established active international collaborations with total funding of more than \$1 million. He has been involved with the creation of two spin-off companies from his research, and has attracted commercial funding of over \$2.5 MM since arriving at Marshall.



Dr. Sandrine V. Pierre has been named associate investigator and education coordinator at the Marshall Institute for Interdisciplinary Research.

Pierre most recently was on the faculty of the University Of Toledo College Of Medicine, where she had served as an associate professor in the Department of Biochemistry and Cancer Biology since July 2013. Prior to that, she was an assistant professor in the same department. From 2003 to 2011, she was an assistant professor in the college’s Department of Physiology and Pharmacology. In addition, she was a research instructor and post-doctoral fellow in the Department of Physiology at Texas Tech University from 2000 to 2003.

She has a bachelor’s degree in cell biology and a doctorate in cell communication in endocrinology from Aix-Marseille II University in France. She is an active member of the steering committee of the American Physiology Society’s Cell and Molecular Physiology section.

Pierre’s group at MIIR will explore new treatments for heart attacks and other cardiovascular conditions by studying how the dual role of this sodium-potassium pump regulates cardiac cell physiology in health and diseases.

As the institute’s education coordinator, Pierre will work with Marshall academic program directors to facilitate students’ access to research opportunities in the MIIR labs.

1-Three Additional Investigators Join the Marshall Institute for Interdisciplinary Research:

Dr. Jinsong Hao, an assistant professor of pharmaceutical sciences and research at the Marshall University School of Pharmacy since 2013, has been named adjunct assistant investigator at MIIR. An expert in drug formulation and drug delivery to the nail, eye and inner ear, Hao obtained her bachelor of engineering degree and Ph.D., both in pharmaceuticals, from Shenyang Pharmaceutical University in China. Before joining Marshall, she held various academic and research appointments at the School of Pharmacy of the National University of Singapore, the College of Pharmacy of Nova Southeastern University in Florida and the College of Pharmacy at the University of Cincinnati. She has more than 40 publications in peer-reviewed journals and has published several book chapters.

Dr. Jiang Liu, an associate professor in the Department of Pharmacology, Physiology and Toxicology at the Marshall University Joan C. Edwards School of Medicine, has been named MIIR associate investigator. He holds an M.D. from Peking University School of Medicine and a Ph.D. from the Chinese Academy of Preventive Medicine. Before joining Marshall in 2012, he was an assistant professor in the Department of Medicine at the University of Toledo. Liu’s research at MIIR focuses on how endogenous cardiogenic steroids stimulate Na/K-ATPase signaling and its role in renal pathophysiology.

Dr. M. Isabel Larre Perez has been named assistant investigator in residence. She obtained her bachelor's degree in experimental biology from the Metropolitan Autonomous University of Mexico and earned a master's degree and a Ph.D. in cellular and molecular physiology, both from the Center for Research and Advanced Studies of National Polytechnic Institute (CINVESTAV) in Mexico. In 2012, she secured a postdoctoral fellowship from the Institute of Science and Technology, Rosalind Franklin, at CINVESTAV in Mexico City. She most recently was on the faculty of CINVESTAV, where she had served since 2013 as a visiting professor in the Department of Neurosciences, Biophysics and Cell Physiology. Her research at MIIR focuses on receptor pathway in the regulation of epithelial cell physiology. Therapeutically, the mechanisms she studies are critical to cellular dysfunctions observed in numerous conditions, ranging from cognitive disorders to cancer and cardiovascular diseases.

2- MIIR Partners With HD Biosciences

The Marshall Institute for Interdisciplinary Research (MIIR) and the Marshall University Joan C. Edwards School of Medicine today announced last year that they will be partnering with an international biosciences company to develop potential anti-cancer drugs.

Under the agreement with Shanghai-based HD Biosciences Co. Ltd., the three partners will share the costs and risks of discovery and development of these new drugs. They also will jointly own any intellectual property and commercialization rights to products developed through the collaboration.

This joint effort with HD Biosciences will significantly shorten the process because of their expertise in drug discovery, and ultimately will reduce the risk for all the partners. The partnership was formed with the goal of bringing new treatments to cancer patients as quickly as possible.

This agreement brings HD Biosciences' extensive capabilities in preclinical drug discovery and new drug development in the Chinese market, together with Marshall University's expertise in translational medicine, clinical trials and the U.S. Food and Drug Administration guidelines.

Marshall and HD Biosciences will work together to examine the commercial viability of the disease targets and treatments being developed at MIIR and the medical school, and accelerate the translation of research from the lab into discoveries that will both help improve human health and stimulate economic development in the region.

B- ESRE Professor of Aquatic Ecotoxicology -College of Science

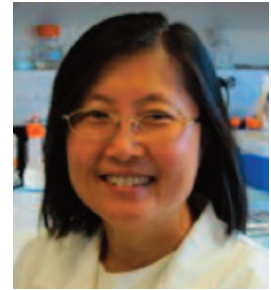


At the beginning of FY 2012, the search for the Eminent Scholar in the College of Science was initiated. This Eminent Scholar is to continue the creation of a strong research cluster in freshwater resources, particularly in the scientific focus areas of Energy and the Environment. Dr. Mindy Yeager Armstead, a nationally respected aquatic ecologist from the commercial sector was selected. Dr. Yeager Armstead is leading an interdisciplinary team of faculty members focused on research and economic development activities associated with West Virginia's extensive water and energy resources.

Dr. Yeager has immediately brought grant activity to her new laboratories. She is the recipient of a sub-award under the Appalachian Research Initiative for Environmental Science (ARIES) project. Her activities will be given additional support from the Pew River Research Endowment.

C-ESRE Professor of Diabetes and Cardiovascular Disease- Joan C. Edwards School of Medicine

Professor Jung Han Kim was recruited from the University of Tennessee and began her appointment with Marshall in July of 2009. Dr. Kim studies the link between gene dysfunction and type 2 diabetes and obesity, a major health issue for Appalachia. She has major NIH R01 funding, along with funding from foundation sources.



Professor Kim has performed extensive work on the genetic link involved in development of obesity and Type 2 diabetes, and has over \$1MM in NIH funding over the next several years to develop a new animal model for studying this important problem.

Currently, she is studying the molecular basis of an obesity susceptibility gene on mouse chromosome 6, named *tabw2*, derived from the TALLYHO (TH) mouse model for polygenic Type 2 diabetes and obesity. *Tabw2* gene appears to interact with high fat/ high sucrose diets to make mice overtly obese. In that respect it is an excellent model for human obesity, which most often results from interactions between genetic susceptibility and an obesity promoting environment – i.e., diets enriched in calories from fat and sugar. Therefore, understanding the molecular basis for diet-induced obesity in *tabw2* mutant mice may uncover new cellular regulatory pathways that can then be exploited in the control of human obesity.

She is also studying the molecular basis of a diabetes susceptibility gene on mouse chromosome 4, *tanidd4*, and an obesity susceptibility gene on mouse chromosome 1, *tabw3*, derived both from the TH mice. The diabetogenic and obesigenic effects of TH alleles at these loci have been confirmed by congenic mice strategy. Physiological and biochemical characterizations of diabetes and obesity mediated by these loci are also ongoing using the congenic mouse strains.

Future research will include gene discovery, genetic resource development, and biochemical and physiological studies associated with Type 2 diabetes and obesity.

ESRE funds facilitated the transfer of her laboratory activities to the Byrd Biotechnology Science Center and provided the major equipment funds to facilitate the laboratories.

Appendix One- Marshall University's Research Trust Fund Addendum

The University's directed research endowment plan has concentrated initially in two domains of interdisciplinary research, which are strengths at Marshall: research clusters in biomedicine/biotechnology/ bionanotechnology and transportation technology/logistics. Marshall's Research Trust Fund activities are to be expanded to include the following areas:

I. Engineering

Engineering is a foundational discipline essential to the development and implementation of research in the approved areas in the Research Trust Fund legislation . Marshall has recently achieved ABET accreditation of its engineering program, and has experienced dramatic facilities growth with the construction and occupation of The Arthur Weisberg Family Engineering Laboratories facility and is planning for the future addition of an Advanced Engineering and Technology Center Complex. Development of robust undergraduate and graduate programs and the associated integral research opportunities are essential to developing and enhancing the capabilities and profile of the school.

Match from the Research Trust Fund enhanced private donations for endowed professorships and other research-related positions and initiatives in all aspects of Engineering as they relate to the allowed subject areas of the Research Trust Fund Program and the associated uses allowed in the legislation.

Two examples of gifts that have been received in support of engineering endowments are included, and a third solicitation is discussed:

A. Applied Research- Safety Engineering Program

Risk management is a highly specialized field that involves applying the principles of safety engineering and industrial hygiene and integrating them with economic and financial analysis. Marshall University will expand its Research Trust Fund Plan in this area important to transportation and logistics and energy to support an endowment in risk management research. The proposed endowment will support the development of research expertise in the school of engineering in the area of risk management, a highly interdisciplinary pursuit at the interface of management, engineering and applied mathematics.

The proposed applied research employs advanced risk management concepts and research to identify, trend, estimate and reduce workplace hazards in industry based in WV. The area will be supported by a \$100,000 endowment received from BrickStreet and the corresponding state match.

Risk management is of particular interest to the energy industry in our state because of the safety and economic risks associated with the extraction process. In energy, risk management research is essential to find new ways to:

- deal with its high element of monetary risk due to the uncertainty of the economic and regulatory outlook
- reduce the physical risk associated with extraction and development activities, and improve the safety of individual employee

In transportation and logistics research, risk management has become central to understanding many critical elements such as:

- the robustness and resilience of our transportation systems to interruptions due to system load, natural phenomena, and man-made disruptions
- the risks associated with transport of hazardous materials and the potential benefits of mitigation of those risks
- the robustness of logistics networks
- the risks associated with logistics and supply chain outsourcing

These benefits are of particular relevance to the state given current events, and are particular interests of the donor.

B. Mechanical Engineering

Mechanical engineering applies the principles of physics and materials science for analysis, design, manufacturing, and maintenance of mechanical systems. Mechanical engineers use the core principles of mechanics, kinematics, thermodynamics, materials science, and structural analysis along with tools like computer-aided engineering and product lifecycle management to design and analyze items as diverse as manufacturing plants, industrial equipment and machinery, heating and cooling systems, motorized vehicles, aircraft, watercraft, robotics, medical devices and more.

The field has continually evolved to incorporate advancements in technology, and mechanical engineers today are pursuing developments in such fields as composites, mechatronics, and nanotechnology. Mechanical engineering overlaps with aerospace engineering, civil engineering, electrical engineering, and petroleum engineering to varying amounts.

A gift from the Fletcher family will endow a founding Chair of Mechanical Engineering. Mechanical Engineering is an important discipline in Bioengineering and energy sectors. This endowment is essential to developing a Department of Mechanical Engineering, by attracting a senior-level professor to Marshall, with his/her associated research programs. Another area that is endorsed by the Board of Governors for planning and an active source of solicitation is:

C. Bioengineering

In the translation of biomedical and biotechnology advances, bioengineering is a lynchpin in bridging the transition from academe to commercialization. Marshall University is planning to develop a Bioengineering Department contemporaneously with the construction of the Applied Technology and Engineering Complex. The development of the Department would follow a trajectory very similar to that of Mechanical Engineering, with the attraction of a founding research scientist/bioengineer.

² 4.3.1. Energy and environmental sciences;
4.3.2. Nanotechnology and materials sciences;
4.3.3. Biological, biotechnical and biomedical sciences;
4.3.4. Transportation technology and logistics;
4.3.5. Biometrics, security, sensing, and related identification technologies; and
4.3.6. Gerontology.

“Biological engineering, biotechnological engineering or bioengineering (including biological systems engineering) is the application of engineering principles to address challenges in the life sciences, which include the fields of biology, ecology, and medicine. Biological engineering is a science based discipline founded upon the biological sciences in the same way that chemical engineering, electrical engineering, and mechanical engineering are based upon chemistry, electricity and magnetism, and statics, respectively”³

“Biological Engineering can be differentiated from its roots of pure biology or classical engineering in the following way. Biological studies often follow a reductionist approach in viewing a system on its smallest possible scale, which naturally leads toward the development of tools such as functional genomics. Engineering approaches using classical design perspectives are constructionist, involving the building and research of new devices, approaches, and technologies from component concepts. Biological engineering utilizes both of these methods in concert relying on reductionist approaches to define the fundamental units, which are then commingled to generate something new”⁴. “Although engineered biological systems have been used to manipulate information, construct materials, process chemicals, produce energy, provide food, and help maintain or enhance human health and our environment, our ability to quickly and reliably engineer biological systems that behave as expected remains less well developed than our mastery over mechanical and electrical systems”⁵.

Given Marshall’s research strengths in the biological and biomedical sciences and the emphasis of new initiatives, like the Marshall Institute for Interdisciplinary Research (MIIR), on translating key research findings into commercialization, the discipline of bioengineering sits at a nexus of opportunity for the University. It will be a critical element in fully developing the potential of Marshall’s applied research enterprise and its translation to economic development.

II. Mathematics and the Physical Sciences

Mathematics and the Physical Sciences are basic sciences that have relevance to all aspects of the allowed areas of the Research Trust Fund legislation. Research Trust Fund match will be sought to enhance private donations supporting endowed professorships and other research-related positions and initiatives focusing on research in the allowed areas in these disciplines.

The first application will be for an endowed rotating professorship to promote an undergraduate summer research experience in Chemistry.

This match for the undergraduate research endowment is being requested under the Research Trust Fund because undergraduate summer research in Chemistry is relevant to so many of the legislatively enabled areas:

- Chemistry is one of the fundamental underpinnings of nanoscience because of the molecular nature of the discipline
- The Department of Chemistry at Marshall University has core groups in biochemistry/biotechnology and materials science
- Faculty members also work on energy research and molecular energetics.

These summer positions are a central component in the Department’s long-term strategy to increase research output and obtain sustainable external funding. Each student selected does an original, collaborative research project with a faculty member. The relevance to the Research Trust Fund is clear from the work of the two most recent awardees, Austi Sergent Roush (2009) and Tiffany Bell (2010), who worked with Drs. McCunn and Frost respectively. Ms. Roush assisted Dr. McCunn in her first summer at Marshall establishing her lab and generating the preliminary results essential to her obtaining her recent award from the Research Corporation. Tiffany Bell identified transiently palmitoylated proteins while working on Professor Frost’s research project “Identifying Post-translational Protein Modifications via Mass Spectrometry”.

³ Cuello J.C., “Engineering to biology and biology to engineering, The bi-directional connection between engineering and biology in biological engineering design”, *Int. J. Eng. Ed.*, 21,1-7 (2005).

⁴ Riley MR, “Introducing Journal of Biological Engineering”, *Journal of Biological Engineering* 1, 1 (2007).

⁵ Endy D, “Foundations for Engineering Biology”, *Nature*, 438, 449-4 (2005).



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