

The background is a complex, abstract composition. It features several interlocking gears in shades of blue and green. Large, stylized dollar signs in yellow and green are scattered throughout. A hand, rendered in a blue, textured style, is visible in the lower right corner, appearing to hold or interact with the gears. The overall color palette is dominated by blues, greens, and yellows, with a white horizontal band across the middle.

Senate Bill No. 287

REPORT TO THE LEGISLATIVE OVERSIGHT COMMISSION
ON EDUCATION ACCOUNTABILITY

WEST VIRGINIA
RESEARCH
TRUST FUND

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West Virginia Higher Education Policy Commission
Science and Research Division

www.hepc.wvnet.edu
www.wvresearch.org

2014 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 five 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 2013-14 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 2014 report is the sixth in a series of annual reports provided by staff since the program's inception in 2008.

RTF Activities through November 2014

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\(4-16-09\).pdf](https://www.wvhepc.org/resources/rulesandpolicies_files/Series%2048%20(4-16-09).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 have been 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.

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 six years is \$921,940.
- 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.
- Of the commitments totaling \$699,893 to state colleges, \$570,430 has been matched and withdrawn by the institutions.
- The current uncommitted balance in the "RTF interest" account is \$38,485.

Combined Disbursements

- Total combined distributions from the RTF to date are \$50M and combined distribution from the RTF interest fund are \$570,430.
- Of this amount, \$20,000 was disbursed from the interest account for state college participants in 2014.
- RTF and RTF interest current account balance is \$168,160. This total includes \$129,462 of commitments to state college participants.
- Institutions recently provided updates on their respective fundraising activities that are in agreement with this total.

Pledge Fulfillment

- Marshall University matched the RTF with gifts and 15 pledges in various states of completion. Total amount of pledges was \$10,205,400 and as of September 2014, \$7,074,866.66 had been received. Most of the pledges were up to date on payment; 3 were in arrears. Marshall University has excess qualified contributions that can be used if the remaining pledges are unfulfilled.

- West Virginia University reported that \$18,931,076 was pledged to 44 directed Research Endowments. As of June 30, 2014, ten pledges remained unfulfilled for a total of \$2,249,870. All but two are up to date on payment. WVU is vigorously pursuing completion of these pledges, but also has excess qualified donations that can be used if these pledges are unfulfilled.

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 was 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 was 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 were: (1) undergraduate research; (2) team-based, hands-on experiments; (3) curriculum development and (4) a robotics competition at Shepherd University 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 has been 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." Finding funding for drawing down funds from the RTF continues as an ongoing effort. A total of \$57,930 has been raised and matched with an additional \$2,350 of unmatched donations.

Benefits will extend well beyond the five year award period at **Concord University** as undergraduate research activities become entrenched within a group of STEM faculty and laboratory infrastructure developed with RTF funds continue to be utilized for teaching and research. Fundraising by the Office of Institutional Advancement has targeted a new set of donors beyond the usual athletic and scholarship donors. This has opened the door for academic program fundraising beyond the award. The RTF award provides direct funding to students as stipends and provides valuable one-on-one research experience with a PhD scientist, which has effectively become a necessity for admission to top graduate programs in STEM areas. The award also distributes small seed grants to faculty working with CU undergraduates. It has stimulated submission of several external grants to date to private foundations, NIH and HEPC. Faculty-student grants encourage collaboration on campus and with scientists at other university and federal laboratories. Recent collaborations and use of external laboratory facilities include work with Marshall University, Virginia Tech, Washington State University and Montana State University. Such contacts are necessary in today's highly collaborative and multidisciplinary STEM research environment and provide access to facilities and technology not available at CU or even within WV. Concord has completed its fundraising and has drawn down the entire match.

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, **WVSU** 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 intent and will be strengthened through the recruitment of a research scholar and by incorporating this expertise within the university's research portfolio. The recruited research scholar will interact with graduate and undergraduate students via teaching bioenergy related curriculum and mentoring students' research. A search is currently underway for the the bioenergy research faculty position. WVSU has raised the entire \$100,000 for the RTF match.

Also in 2013, **WVU Institute of Technology** was awarded an RTF grant of \$100,000. The objective of the funded 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. Faculty have submitted 12 proposals to further fund their efforts. Nine are still pending, two were funded from the WV Research Trust Fund and one from the WV Geological and Economic Survey. The program held a Symposium on Cyber-Physical Systems on May 2, 2013 with an attendance of 30 people. To date, WVU Tech has drawn down \$20,000 from the RTF.

Appendix A: Annual RTF Reports from WVU and MU

WEST VIRGINIA RESEARCH TRUST FUND ANNUAL REPORT

from

West Virginia University

August 15, 2014

INTRODUCTION

This sixth 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 from each endowment for FY 2015.

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 laid 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 fourth 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.

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

During the first four-year period of the Research Trust Fund, West Virginia University created 86 private endowments. These 86 endowments totaled \$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. Through the combined support of private donors and the state legislature, WVU has established \$70 million in endowments to support research. These endowments include five generic types of gifts: 12 chairs and professorships, 14 undergraduate scholarships, 15 graduate fellowships, 43 broad-based research support funds and 2 library endowments.

It is important to note that 88 endowments currently exist. At least one and possibly two more will not meet the pledge deadline for continuation as part of the Research Trust Fund initiative. The initial pledges were well-intentioned but were not sustainable. Two additional endowments take the place of those that will be removed from the Trust Fund portfolio. The annual report issued after the seven-year pledge period ends will identify the final endowments within the portfolio.

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.

Through June 30, 2014 the following results have been achieved:

- **FY14 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, 2014 is \$39,599,497, up from last year's value of \$32,645,180.
- **FY15 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 FY15 are \$1,616,222, up from last year's value of \$1,547,270.
- **FY14 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, 2014 is \$39,308,997, up from last year's value of \$38,523,005.
- **FY15 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 FY15 are \$1,559,607, up from last year's value of \$1,253,163.
- **FY14 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.
- **FY14 Total Number and Amount of Gifts Received from the State for Matching 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 1,210 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, 2013 and 2012 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.

The impact of the Research Trust Fund is the 86 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.

Business Plan

In addition to the legislatively mandated reporting requirements, the Higher Education Policy Commission requires a business plan for each research area.

In FY14, \$1,745,034 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 FY15, \$6,295,522 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, \$3,172,297 (50%) will come from interest earned on both the private endowments and that from the matching state endowments established from the Research Trust Fund; \$3,123,225 (50%) will come from unspent funds from the previous year. The significant amount of interest dollars reflects impact of a growing national economy and the fact that most endowments were fully funded over the past year. When the amount of available funds was insufficient to meet the objectives of the endowment, the money was allowed to accrue, accounting in part for the carryover of unspent funds from the previous 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.

Marshall University Research Endowment Plan Annual Report

2013-2014

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

I. Summary

The West Virginia Research Trust Fund program has spawned 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 14 involved utilization of these funds as endowment proceeds became available and the accumulation of further pledge fulfillment.

To date, the Bucks for Brains Endowments total \$27.31 M, with \$3.48M in pledges receivable. All pledges are expected to be received by the deadline. Marshall currently has a surplus of unmatched pledges in excess of \$500M which is available to cover any unforeseen non-fulfillments. Earnings to date have amounted to \$3.4M.

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, \$9M in qualifying donations and pledges were received and matched for eleven endowments. In FY 2013, the remaining \$6M was raised and the total number of endowments brought to sixteen. During FY 2014, pledge fulfillment continued with a total of \$12.31 M received. Receipt of all pledges is anticipated by the program deadline.

B. Description of Existing Endowed Research Areas

A brief summary of the purpose of the endowments is included below. The current corpus balances and earnings-to-date 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-A below.

2-Rahall Transportation Institute (RTI)

Intelligent Transportation Systems (ITS) combines computers and sensors in integrated systems to assist in making our transportation system safer and more efficient. On one end of the spectrum ITS will facilitate crash avoidance technologies for the typical motorists on our highways and allow all types of transport vehicles to use less fuel helping to reduce our nation's dependence upon foreign oil. At the other end of the spectrum, ITS technology steers visitors to tourist spots, ambulances to 911 calls and commuters to parking spots in busy downtown districts or around college campuses.

Marshall University is leveraging the capability of the Rahall Transportation Institute and its proximity to the nation's largest inland river port and some of the busiest freight rail lines in the Appalachian Region. Through attraction of prominent faculty focused on the significant deployment and customization challenges inherent in transferring urban highway ITS technologies into rural America and the rail and water modes of our nation's transportation system, Marshall is developing a significant research cluster in this growing area of technological enterprise that will be critical for the nation to meet its energy and logistics needs of the future.

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.

4-Pew Endowment for River Research

The proceeds of the requested endowment will be used to support the research of the ESRE Professor of Aquatic Ecotoxicology, Dr. Mindy Armstead (see ESRE section IV-B below). It is anticipated that the endowment proceeds will be used to support the purchase and maintenance of research equipment, the purchase of research supplies and/or the support of undergraduate and graduate research fellows who are working with the ESRE Aquatic Ecotoxicology.

5-Maier Endowment for Dementia Research

The endowment will support the work of promising biomedical/clinical scientists in the Marshall University School of Medicine, engaged in translational dementia research.

Dr. Shirley M. Neitch, professor of internal medicine and chief of geriatrics at the Joan C. Edwards School of Medicine at Marshall University, was named the inaugural Maier Clinical Research Professor.



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 will support 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.

7-The Endowment for Summer Undergraduate Research in Chemistry

The endowment has been created by individual donations and departmental royalties 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 Principal Investigator (PI) for this fund.

8-Fred and Isabella Zacharias Endowment for Obstetrics and Gynecology Research

Funds from the Fred and Isabella Zacharias Endowment will be used to support the activities of PI Dr. David C. Jude in biomedical research. His research interests include:

- Identification of characteristics of hypertensive, diabetic and obese women that increase their likelihood of having poor pregnancy outcomes and investigating the outcomes of the infants born to these mothers.
- Determining what pre-pregnancy and pregnancy-related interventions may improve maternal health during pregnancy.
- Determining what interventions before and during pregnancy may impact the short and long term health of these women.

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

The endowment will support 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 will be conducted. The endowment proceeds will be 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 has been appointed PI of this program. The Sports Medicine Translational Research being conducted at the Joan C. Edwards School of Medicine will advance 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. A multidisciplinary team will 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 team will investigate 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.

11-BrickStreet Wellness Research Endowment

This 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 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. We firmly believe that tomorrow's clinical therapies are being developed now and we propose that a portion of the BrickStreet research endowment be 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

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 appointment of an Endowed Chair of Geriatrics named in honor of Frank E. Hanshaw, Sr.

13-The Rezulin Endocrinology Research Fund

In a court settlement concluded in 2007, funds were set aside for use in the Marshall University Joan C. Edwards School of Medicine for Endocrinology. In the spirit and intent of the settlement agreement and to dedicate investment of these settlement funds for the benefit of those presently afflicted with diabetes and advance research related to diabetes and its related metabolic disorders, the Rezulin Endocrinology Research Fund was created.

14-The Herbert Louis Eiselstein Memorial Scholarship

This 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.

15-The Donald Cain Tarter Biological Sciences Student Research Scholarship

Dr. Tarter received his Bachelors of Science in Biology and Chemistry from Georgetown College, his MAT in Zoology from Miami University and his PhD in Zoology from the University of Louisville. His tenure from 1960 to 2001 at Marshall included six years as Chairperson for the Department of Biological Sciences where he taught Animal Ecology, Entomology, General Biology, Ichthyology and Limnology. He was also the thesis director for 93 graduate students. Dr. Tarter's research interests were in the taxonomy/ecology of benthic macro invertebrates and fishes and he was awarded over \$600,000 in grants and contracts in projects involving aquatic biology. He devoted his research energies to furthering understanding of the aquatic ecosystem and environmental disturbances which disrupt it.

Dr. Tarter authored or co-authored over 100 papers in aquatic biology in 11 journals and presented over 100 papers at state and national meetings throughout the country. He served on the Environmental Quality Board in West Virginia for 12 years and was president of the West Virginia Academy of Science. Dr. Tarter was the honored recipient of the "Meet the Scholars" award at Marshall University in 1991.

The recipient shall be a full-time student (undergraduate of junior level or greater, or graduate), majoring in Biological Sciences or Integrated Sciences. The student must be involved in research in biological, biotechnical, biomedical sciences or in energy and environmental sciences. The award shall be made just before or during the fall semester of the academic year if possible. The Dean or appointed faculty members in the College of Science, in collaboration with the Office of Student Financial Aid, shall select the recipient(s) and renew the award as long as full-time status and good academic standing.

16-The Steve and Mary Beckelheimer Science Education Graduate Scholarship

This scholarship was established by the couple, who are public school educators and Marshall University alumni. This scholarship endowment will be established to provide aid to recipients who are accepted to a research-based (thesis required) graduate program in the Marshall University College of Science and are planning to become science educators in the public school system. Priority shall be given to students from West Virginia. Recipients must be graduates of the Marshall University College of Education or hold a degree from an accredited undergraduate education program or hold a valid teaching certification in the state of West Virginia.

C-Current Fund Balances

The current fund balances for the Marshall University Research Trust Fund Endowments is shown in Table One, below. Payment of all outstanding pledges is anticipated by the program deadline.

Table One- Fund Balances for Marshall University's Research Trust Fund Endowments at the End of FY14

#	Fund	Total Corpus	Total Earnings
1	MIIR	6,166,032	1,012,330
2	RTI	344,990	73,873
3	Fletcher Engineering	1,693,855	197,763
4	Pew River Research	530,200	82,115
5	Maier Dementia Research	2,000,150	294,016
6	Brickstreet Safety Research	441,600	74,172
7	Chemistry SURF	232,970	31,466
8	Zacharias OB/GYN	796,714	114,004
9,10	Translational Sports Medicine Research	8,162,449	1,020,259
11	Brickstreet Wellness Research	4,166,667	258,325
12	Hanshaw Geriatric Research	800,000	53,726
13	Rezulin Endocrinology Research	1,782,021	169,977
14	Eiselstein Scholarship	67,600	7,584
15	Tarter Scholarship	43,415	2,227
16	Beckelheimer Scholarship	87,500	6,283
	Total	27,316,162	3,398,120

IV. ESRE Update

A-Progress at MIIR- MIIR Advances with the Hiring of New Director and Senior Scientist

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 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 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.

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.



B- ESRE Professor of Aquatic Ecotoxicology -College of Science



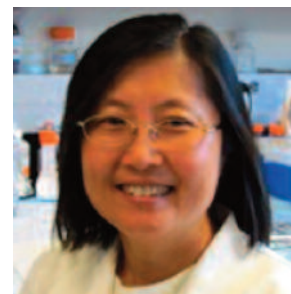
At the beginning of FY 2012, the search for the Eminent Scholar in the College of Science was initiated. This Eminent Scholar is to continue the creation of a strong research cluster in freshwater resources, particularly in the scientific focus areas of energy and the environment. Dr. Mindy Yeager Armstead, 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 Armstead 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 on going 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 transfer of her laboratory activities to the Byrd Biotechnology Science Center and provided 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 legislation². 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 will be requested to enhance 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.

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.

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.

“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 Sargent 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).



Senate Bill No. 87