

Senate Bill No. 287

# West Virginia Research Trust Fund

Report on the Research Trust Fund to the Governor  
and the Legislative Oversight Commission on Education Accountability

West Virginia Higher Education Policy Commission  
Science and Research Division  
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The background of the top half of the page is a complex, semi-transparent collage. It includes a scientific microscope, a profile of a person's head, and several dollar signs in various colors (orange, yellow, green). The text 'Senate Bill No. 287' is overlaid on this collage in a white, serif font.

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**Report on the Research Trust Fund to the  
Governor and the Legislative Oversight Commission  
on Education Accountability**

# 2016 REPORT ON THE RESEARCH TRUST FUND (RTF)

## 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 annual report for 2016 activities within the Research Trust Fund is provided. The 2016 report is the eighth in a series of annual reports provided by staff since the program's inception in 2008.

## RTF Activities through November 2016

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%20284-16-09%29.pdf](https://www.wvhepc.org/resources/rulesandpolicies_files/Series%2048%20284-16-09%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 was cross referenced with university records annually to ensure accuracy in drawdown reporting for previous reports.

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

The institutions who received awards from the RTF for State Colleges and Universities were Shepherd University, Fairmont State University, West Liberty University, West Virginia State University and West Virginia University Institute of Technology.

The Research Trust Fund has been fully matched and no additional funds are available for distribution.

Marshall University and West Virginia University reports for 2016 are attached.

**MARSHALL UNIVERSITY**  
**Research Endowment Plan Annual Report**  
**2015-2016**

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 16 involved the utilization of these funds as the endowment proceeds became available.

To date, the Bucks for Brains Endowments total \$ 33.98MM, with \$650,000 total proceeds expenditure. FY 16 expenditure was \$450,000. Earnings to date have amounted to \$4.63MM.

**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- 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, 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 Section 9, 10 below

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

#### **3 - Fletcher Mechanical Engineering Endowment-**

Dr. Wael Zatar, dean of Marshall University's College of Information Technology and Engineering (CITE), has been named the Fletcher Endowed Chair of Engineering at the university.

As endowed chair of engineering, Zatar will continue to develop and lead the partnership between Marshall University and J. H. Fletcher & Co. He will lead a group of investigators who will actively participate in structures research aimed at finding innovative engineering solutions for the region's and nation's challenges, utilizing equipment generously provided by J. H. Fletcher & Co.

#### **4 - Pew Endowment for River Research-Nothing to report**

#### **5 - Maier Endowment for Dementia Research-**

The endowment has funded the establishment of the Maier Institute for Excellence in Prescribing for the Elderly with Dementia. The Maier Institute's vision is to be a nationally recognized source of expertise regarding appropriate usage of therapeutic and preventative medications and other interventions for persons with Alzheimer's and related dementias, and the multiple morbidities which usually accompany these disorders.

The Maier Institute is identifying knowledge gaps regarding therapeutic approaches for persons with dementia and initiating research projects to address these gaps.

Projects initially undertaken will include:

- meta-analyses of existing literature with production of clinical recommendations from such analyses,
- clinical therapeutics primary/original research, and
- projects designed to improve information delivery regarding ideal prescribing to practicing physicians.

#### **6 - BrickStreet Endowment for Safety Engineering Research- nothing to report**

## 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. In summer 2016 the funds supported 3.5 summer research fellows.

## 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.

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 **published in the prestigious journal 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.

The oxidative stress activities have continued at MIIR and SOM laboratories, with the initiation of six related projects based on the initial results reported last year:

**1. pNaKtide attenuates NASH and atherosclerosis in mouse models of metabolic syndrome:** We have previously reported that the  $\alpha 1$  subunit of sodium potassium adenosine triphosphatase (Na/K-ATPase), acts as an amplifier of oxidative stress, specifically, reactive oxygen species (ROS). On this background, we speculated that blockade of this amplification with a specific peptide, pNaKtide, might attenuate the development of nonalcoholic steatohepatitis and atherosclerosis. pNaKtide reduced obesity and improved steatohepatitis, dyslipidemia, insulin sensitivity, and aortic streaking in C57Bl6 mouse fed a "western" diet. Similar studies were performed on ApoE knockout mice to elucidate the effects of pNaKtide on atherosclerosis. In these mice, also fed a "western" diet, pNaKtide not only improved steatohepatitis, dyslipidemia, and insulin sensitivity, but also ameliorated significant aortic atherosclerosis. This study demonstrates for the first time that the Na/K-ATPase/ROS amplification loop contributes significantly to the development and progression of steatohepatitis and atherosclerosis and pNaKtide is a potential novel treatment for the metabolic syndrome phenotype.

**2. pNaKtide alleviates genetic and phenotypic attributes of aging:** This study addresses the effect of novel drug, pNaKtide, a peptide derived from  $\alpha 1$  Na/K-ATPase, has on senescence-associated features in human dermal fibroblasts (HDF) induced by exposure to oxidative stress caused by hydrogen peroxide (H<sub>2</sub>O<sub>2</sub>). Two groups of adult HDF cells were exposed to a sub lethal dose of H<sub>2</sub>O<sub>2</sub> for 2 hours to induce cellular senescence. One group was then treated

with different concentrations of pNaKtide for 48 hours. Progression to senescence was evaluated in treated and untreated cells by: studying morphology changes, RT-PCR, T-BARs assay to assess lipid peroxidation, superoxide assay to measure the level of ROS, and senescence associated  $\beta$  galactosidase assay. H<sub>2</sub>O<sub>2</sub> exposed senescent cells showed significantly elevated levels of mRNAs (p21, apolipoprotein J, Collagenase 1, fibronectin) that are indicators of DNA damage confirming senescence through alterations in gene expression. Morphological symptoms such as loss of cell replication, increased size of nucleus was evident through Dapi staining in aged cells. Additionally, activation of senescence associated  $\beta$ -galactosidase and increase in ROS level were also significant in these cells as expected. On the contrary, cells exposed to H<sub>2</sub>O<sub>2</sub> and treated with pNaKtide showed similar morphology and gene expression profile comparable to pre-senescent control cells that were not exposed to H<sub>2</sub>O<sub>2</sub>. Taken together, our study demonstrates for the first time that Na/K-ATPase mimetic, pNaKtide, significantly alleviates the genetic and phenotypic attributes of aging. pNaKtide is a novel drug for treating cellular damage responses that may contribute to manifestations of aging.

### **3. Creating a Novel Panel of Biomarkers for the diagnosis and management of Metabolic Syndrome in women in West Virginia:**

Metabolic syndrome represents a cluster of related metabolic abnormalities, including central obesity, hypertension, dyslipidemia, hyperglycemia, and insulin resistance, with central obesity and insulin resistance in particular recognized as causative factors. These metabolic derangements present significant risk factors for cardiovascular disease, which is commonly recognized as the primary clinical outcome, although other outcomes are possible. Metabolic syndrome is a progressive condition that encompasses a wide array of disorders with specific metabolic abnormalities presenting at different times. These abnormalities can be detected and monitored via serum biomarkers and using multiple biomarkers for diagnosis and early detection, and subsequent customization of treatment and risk management, is a blossoming field with much room for research. Despite there being many studies on individual biomarkers, there is a void in research on the implications of multiple biomarkers being abnormal. Creating such a panel could provide a relatively easy and minimally-invasive way to detect metabolic syndrome and possibly indicate the severity, depending on the combination of aberrations. Such a panel would be highly useful in areas where metabolic syndrome poses a significant burden, such as West Virginia. In coordination with the Department of Family Medicine, we have been collecting serum from female patients who have normal BMIs (control), who are obese (BMI>30), and those who have a diagnosis of metabolic syndrome according to the International Diabetes Federation over the last 4 years. The serum is currently being tested for a variety of biomarkers, including microRNAs which is a unique addition to a biomarker panel as microRNA has only recently been recognized for its utility as a biomarker. This panel will represent the first of its kind, especially within the state of West Virginia, to have potential clinical utility for diagnosis, management, and risk stratification of metabolic syndrome patients.

### **4. Effect of hepatocyte specific pNaKtide expression on NASH and liver fibrosis using lentiviral constructs:**

Mice with hepatocyte-specific targeting of pNaKtide provides a unique opportunity to advance our understanding of the pathophysiology of NAFLD and associated metabolic dysfunction. We have the lenti-Alb-eGFP-pNaKtide vector and its control Lenti-Alb-eGFP for in vivo studies which has been constructed (Cyagen Biosciences, CA, US) to achieve pNaKtide expression specifically in the liver. This mode of intervention is utilized to obtain pNaKtide expression for an extended period of time. Lentivirus (100  $\mu$ l, 2x10<sup>9</sup> TU/ml in saline) with pNaKtide and its counterpart Lenti-eGFP, driven by an albumin promoter, will be injected into mice by a tail vein injection under anesthesia with sodium pentobarbital at the age of 4 weeks. Two weeks later, another injection (75  $\mu$ l 1x10<sup>9</sup> TU/ml in tail vein) will be given. We expect Na/K-ATPase-Src signaling cascade will be activated in mice fed a western diet, which will precipitate a pro-inflammatory setting, increase TGs and FFA levels and will induce insulin resistance. This will be accompanied by fatty liver infiltration and a decline in liver function. However, with lentiviral injections, we expect that pNaKtide targeted specifically to hepatocytes will suppress Na/K-ATPase-Src/ROS amplification loop and will attenuate ROS, IR, hepatic steatosis and fibrosis.

**5. Role of pNaKtide in ameliorating renal failure:** pNaKtide was also tested in mouse models with renal failure (C57Bl/6 mice fed standard chow vs western diet and ApoE KO mice fed standard chow vs western diet) to see if pNaKtide could ameliorate glomerulosclerosis and interstitial fibrosis and improve urine production, GFR/cystatin-C. ApoE KO mice on western diet showed increased interstitial fibrosis, decreased urine production and decreased GFR which was improved with pNaKtide. These results have been submitted to Nature.

**6. Altered modification and signaling of the Na/K-ATPase in human adipocytes:** Recent studies of the Na/K-ATPase in obese mice have demonstrated that it can be targeted to decrease obesity and doing so alters the expression of oxidative and adipogenic markers. Given the importance of the adipocyte redox state in the development and maintenance of obesity, we are interested in elucidating the full role of this Na/K-ATPase pump in adipocytes and the pathogenesis of obesity, as this has never been studied in humans. Given the close relationship between the Na/K-ATPase and ROS, and the close relationship between ROS and obesity, it is our hope that determining all components of the signaling pathway may highlight novel molecular mechanisms to combat obesity and its related comorbidities. Goals of this project are to (a) understand the role of the Na/K-ATPase in the pathogenesis of obesity in humans, (b) isolate, quantify, and characterize modifications to the Na/K-ATPase in human adipocytes in obese vs control patients, (c) study inflammatory markers, oxidative stress markers, and adipogenic markers associated with the Na/K-ATPase in obese vs control patients, (d) identify signaling cascades and their changes, that stem from the Na/K-ATPase modifications in obese vs control patients. IRB has been submitted for this project, which is a collaboration with the Department of Surgery (who will be collecting visceral Fat samples from obese and control patients). This is the next step in bridging the gap in our extensive animal model studies to human studies.

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

The endowment is to be used 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.

In addition to the work described above, the following projects have been initiated:

#### **Study of Ergonomic Factors Contributing to Carpal Tunnel Syndrome:**

This study involves a manufacturer of implantable lenses that employs 850 individuals in the Huntington area. There are specific components of the manufacturing process that significantly increase the risk of carpal tunnel syndrome for some individuals. We have evaluated the manufacturing process and have identified ergonomic factors contributing to carpal tunnel syndrome. We have proposed a series of modifications that have been incorporated in a comprehensive plan to address the problem. These include work duty rotation, ergonomic modification of some tools, exercise and wellness activities. Our Occupational Division provides support for the wellness activities of this employer and we plan to publish this quality improvement effort in the occupational medicine literature.

#### **Study of Consequences of Exposure to Heavy Metals**

This study follows approximately 250 individuals at a metallurgical manufacturer. The company produces ferrosilicate alloys for steel production. Each year, individuals are provided a health screening and are evaluated for hearing, vision, spirometry, lead and manganese levels and complete a health survey that includes specific questions related to symptoms of heavy metal exposure and toxicity. A database has been created. The goal is to track these individuals over a sufficient period of time to determine which job duties pose the greatest risk of exposure. In addition, the laboratory values and surveys will be used to identify early physical changes that may coincide with consequences of chronic heavy metal exposure.

#### **Collaborative Project with WV regarding Work-related Disability and All-cause Mortality**

We are currently working in cooperation with WVU Occupational Medicine and National Institute for Occupational Safety and Health (NIOSH) on a retrospective review of impairment rating data from the historic workers' compensation database matched to WV Vital Statistics data to evaluate the potential relationship between injury severity and life expectancy/all-cause mortality.



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

It has been decided to focus this appointment on research in Geriatrics, and more specifically, research related to dementia. The department of internal medicine is recruiting a clinician researcher with an established portfolio of research projects in this area. The hire is expected to be completed in FY 17.

### 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 the investment of these settlement funds monies for the benefit of those presently afflicted with diabetes and advance the research related to diabetes and its related metabolic disorders, the Rezulin Endocrinology Research Fund was created.

The Department of Internal Medicine is recruiting a clinician- researcher in the specialty of Endocrinology with an established portfolio of research projects. This individual will be supported partially with the proceeds from the endowment. The hire is expected to be completed in FY 17.

**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.

The Eiselstein Scholarship funds supported two students in FY 16. Those students plan to pursue Ph.D.s in chemistry and biochemistry.

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

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

### B - Current Fund Balances

The current fund balances for the Marshall University Research Trust Fund Endowments is shown in Table One, below. Expenditures in FY 2016 amounted to \$450,000.

**Table One-** Fund Balances for Marshall University’s Research Trust Fund Endowments at the End of FY16 (Reflecting MURC holdings as of June 2016 and MUF holdings as of 12/31/15)

#	Fund	Corpus	Earnings
1	MIIR	6,614,731	948,261
2	RTI	387,411	61,691
3	Maier Dementia Research	2,000,150	280,649
4	Fletcher Engineering	1,693,855	181,607
56	Pew River Research	530,200	72,538
7	Brickstreet Safety Research	441,600	67,133

#	Fund	Corpus	Earnings
8	Chemistry SURF	241,670	26,621
9	Zacharias OB/GYN	796,714	107,871
10	Translational Sports Medicine Research	10,119,650	968,806
11	Eiselstein Scholarship	84,600	3,416
12	Tarter Scholarship	43,720	2,395
13	Beckelhimer Scholarship	100,000	5,523
14	Hanshaw Geriatric Research	1,000,000	45,372
15	Rezulin Endocrinology Research	1,782,021	136,039
16	Brickstreet Wellness Research	5,000,000	207,751
	<b>Total</b>	<b>30,836,322</b>	<b>3,115,671</b>

## 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 ntegral 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.

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- 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”<sup>2</sup>.

“Biological Engineering can be differentiated from its roots of pure biology or classical engineering in the following way.

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<sup>2</sup> 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).

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”.<sup>3</sup>“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”.<sup>4</sup>

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.

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<sup>4</sup> Endy D, “Foundations for Engineering Biology”, *Nature*, 438, 449-4 (2005).

**WV Research Trust Fund**

**Annual Report**

**from**

**WEST VIRGINIA UNIVERSITY<sup>5</sup>**

August 15, 2016

## INTRODUCTION

This eighth 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 2017.

### 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](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.

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<sup>5</sup> 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](mailto:joyce.mcconnell@mail.wvu.edu)) or Vice President for Research, Dr. Fred King, West Virginia University ([fred.king@mail.wvu.edu](mailto:fred.king@mail.wvu.edu)).

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 sixth 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 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 APPENIDX A summarize much of the information requested by the Legislative Rule.

Through June 30, 2016 the following results have been achieved:

- **FY16 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, 2016 is \$39,146,786.

- **FY17 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 FY17 are \$1,679,448.

- **FY16 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, 2016 is \$37,321,280.

- **FY17 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 FY17 is \$1,438,455.

- **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.

- **FY16 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 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, 2015 and 2014 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**

Vice President for Research Fred King remarked previously 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.”

To place Vice President King’s remarks in a more specific context, WVU learned on February 1, 2016, that it was classified as an R1 or highest research activity, university by the Carnegie Classification of Institutions of Higher Learning, a ranking is shared by only 114 other universities in the United States. This ranking authenticates the quality of WVU’s research on the global stage.

On March 1st, at a special state of the university address, President Gordon Gee encouraged the WVU community to ride this wave of momentum into strengthening three critical pillars of the University and the state: education, health care and broad-based prosperity. “As our recent achievements show, West Virginia University is on an upward trajectory,” Gee said. “Our momentum gives us the power to lift our entire state. Our land-grant heritage deeds us the moral obligation to do so.”

In keeping with the themes of the Strategic Research Plan that undergird the Research Trust Fund, WVU is dedicated to revamping health in West Virginia and supporting the development of the state's energy resources.

Over the years, West Virginia has consistently ranked as one of the unhealthiest states in the country. President Gee noted, "West Virginia deserves better, every one of us deserves better, and we are capable of doing better."

WVU Medicine is devoting research, clinical care and outreach leadership to improving the state's overall health and quality of life but this effort will take more than just WVU's efforts. That's why WVU has partnered with Marshall University to jumpstart health care research and delivery with \$1.5 million in projects across the state.

"By reinventing healthcare, we can ensure that West Virginians thrive – not merely survive," Gee said. The income from RTF accounts dedicated to healthcare will aid in our efforts to improve the lives of the citizens of our state.

To enhance our state's prosperity, WVU has mobilized its energy resources to address global energy needs. Vice President King noted that "the ever-increasing demand for energy can no longer be met by a handful of sources, but will require a stable of technologies for cleaner and more sustainable technologies, better storage, more modern infrastructure and cheaper, more efficient methods that will increase production."

To meet those complex challenges, West Virginia University has joined with three distinguished research universities – Case Western Reserve University, Carnegie Mellon University and the University of Pittsburgh – to form the Tri-State University Energy Alliance, a collaboration dedicated to research that will accelerate energy innovation.

Vice President King noted that "each of these partners brings unique skills and expertise to bear on leading the way for 21st century solutions for our nation's need for affordable, abundant and clean energy."

"Building upon years of collaboration across these leading regional universities allows us to develop strong teams of researchers to solve modern energy challenges," said Brian Anderson, director of the WVU Energy Institute. "These universities brings unique strengths that together, provide one of the strongest regional research portfolios on the globe."

Affordable and reliable energy solutions have the potential to unlock new opportunities for growth and mitigate ongoing environmental impact. However, meeting the nation's increased energy needs requires acceleration of innovation in the energy sector.

WVU has more than 100 years of applied and fundamental research experience in energy and more than 120 faculty researchers doing work in four areas of emphasis in collaboration with the WVU Energy Institute: fossil energy, sustainable energy, environmental stewardship and energy policy.

WVU's record of collaboration is strong, with many federal-academic-industrial partnerships across the University's energy research portfolio progressing state-of-the-art in energy technologies.

The Marcellus Shale Energy and Environment Laboratory is the first ever long-term, comprehensive field study of shale gas resources in which scientists will study the process from beginning to end. The project will evaluate new technologies for increasing the efficiency of the process as well as the impact of drilling and production on the land, water, air and the local economy.

WVU is committed to using its RTF resources to help shape the state's future in healthcare delivery, energy, and economic prosperity.



## 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 FY17.

In FY16, \$4,247,127 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 FY17, \$10,752,771 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, \$3,117,903 will come from interest earned on both the private endowments and that from the matching state endowments established from the Research Trust Fund; \$7,634,868 will come from unspent funds from the previous year. The significant amount of interest dollars reflects the positive impact of the stock market and the fact that all endowments are fully funded. All 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 state's and the nation's most important issues in energy, health care and security.

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APPENDIX A. Endowments established in the West Virginia University Foundation under the Research Trust Fund program and their anticipated use in Fiscal Year 2017. Amounts available include proceeds from endowments plus unspent funds from previous years.

Fund Name	Brief Description	FY 2017 Spend Total	Anticipated Use
Frederick P. Jr. & Joan C. Stamp Cancer Research	Broad-based Research Support	\$13,237	Operational support for ongoing research
Norma Mae Huggins Cancer Research Endowment	Basic and Clinical Colon Cancer Research	\$48,251	Operational support for colon cancer research
Walter H. Moran Jr. General Surgery Resident Research	Research Opportunity for Surgery Resident	\$116,812	Stipend for resident to engage in research
Schoepp Neurosciences Research Student Support	Graduate Fellowships and Support for Research	\$23,191	Support for student research activities
Verizon WV for Biometrics	Broad-based Biometrics Research	\$53,220	Operational support for ongoing
Raymond Brooks Vanscoy Cancer Research Endowment	Broad-based Cancer Research	\$13,360	Operational support for ongoing research
Allen S. Pack Endowment for Mining Engineering	Energy Research in Mining Engineering	\$23,121	Operational support for ongoing research
L. Zane Shuck Laboratory Endowment in Nanobiotechnology	Facilities Support in Nano-biotechnology	\$36,323	Supplies and equipment for a shared
Alpha Natural Resources Endowment for Energy Research	Energy and Environmental Research	\$95,292	Supplies and equipment for two new faculty
Alan Susman Cortico-basal Ganglionic Degeneration Research	Degenerative Neurological Research	\$57,571	Projects that lead to extramural funding
Blaine S. West Endowment for Civil and Environmental Engineering	Broad-based Research Support	\$47,274	Part of start-up packages for two new faculty
William J. Maier, Jr. Chair of Research	Create a Chair in Biomedical Research (Charleston Division)	\$399,043	Hold until Chair is appointed
Branson-Maddrell Endowed Professorship in Orthodontics	Create a Professorship in Dentistry	\$139,599	Salary enhancement for recipient of the professorship
George B. Bennett Dean's Research Opportunity Endowment	Broad-based Research Support	\$290,867	Develop new research opportunities
E. Elizabeth Morgan Cancer Research	Broad-based Research Support	\$2,326	Operational support for ongoing research
Badzek Family Endowment for Nursing Research	Nursing Research to Support Quality of Life	\$10,940	Nursing research supporting the Institute
Ruth and Robert Kuhn Nursing Faculty Research	Broad-based Research Support	\$10,221	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	\$7,596	Operational support for ongoing research

Fund Name	Brief Description	FY 2017 Spend Total	Anticipated Use
Fithian Family Foundation #2/ Behavioral Medicine-Psychiatry	Research Support in Behavioral Medicine	\$41,710	Operational support for ongoing research
WVUH Evidence Based Practice Research Professorship/Nursing	Create a Professorship	\$156,571	Hold until Professorship is created
Grace C. Clements Speech Pathology and Audiology Research	Broad-based Research Support	\$15,147	Operational support for ongoing research
Virginia Oil and Gas Research Endowment for PNGE	Research Activities in Appalachian Shales	\$26,027	Operational support for ongoing research
Michael Baker Corporation Endowment/ CEE	Broad-based Research Support	\$29,045	Operational support for ongoing research
Darrell & Diane Williams Research for PNGE	Research Activites in Appalachian Shales	\$17,707	Operational support for ongoing research
Preservati Cancer Research	Broad-based Research Support	\$13,722	Operational support for ongoing research
Martha Gaines & Russell Wehrle Pediatric Research Endowment	Broad-based Research Support	\$19,685	Operational support for ongoing research
E. Jane Martin Research Doctoral Fund	Research Support for Doctoral Students in Nursing	\$9,727	Support research of doctoral students
John T.& June R. Chambers Chair of Oncology Research	Create a Cancer Research Chair	\$283,637	Hold until chair is created
Christopher Cline Chair in Orthopedic Surgery	Create a Chair in Orthopedic Surgery	\$396,924	Hold until chair is created
Mabel C. Phares Leukemia Research Endowment	Broad-based Research Support	\$58,251	Support for leukemia research
Gary and Lisa Christopher Graduate Fellowship	Create a Graduate Fellowship in CEMR	\$38,929	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	\$16,190	Annual support for ongoing research
Mike Ross Family Pediatric Diabetes Research Endowment	Broad-based Research Support	\$156,432	Support for faculty engaged in research in pediatric research
Van Wyk Cancer Research Endowment	Broad-based Research Support	\$2,154	Operational support for ongoing research
Robert T. Bruhn Physics Research Endowment	Broad-based Research Support	\$24,805	Operational support for ongoing research
Women in Science and Engineering Giving Circle Endowment	Support for the Women's Giving Circle	\$9,531	Research support for women faculty and students in RTF areas

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Fund Name	Brief Description	FY 2017 Spend Total	Anticipated Use
Jarrett Family Research Endowment for Dentistry	Research Support in Orthodontics	\$35,020	Support for faculty guided research projects for pre/post doctoral students
Donald R. & Linda E. Holcomb Research Endowment Dentistry	Braod-based Research Support	\$32,083	Support for pilot research and bridge funds
Arch Coal Inc. Endowment for Mine Health & Safety Research	Mine Health and Safety Research safety and the health of mine workers	\$88,994	Support for the continual study of mine
Shaw Pathology Research	Broad-based Research Support	\$21,878	Support for ongoing faculty research
Dr. Mohindar S. Seehra Research Award	Phycsis Doctoral Student Awards	\$11,935	Awards for meritorious doctoral students
Oleg D. & Valentina P. Jefimenko Library Resources #2	Library Resources Endowment	\$28,419	Acquire library resources for physics
Frank and Susan Klatshin Cerminara Endowment	Research Support for Industrial & Safety Management Engineering	\$4,548	Support for ongoing faculty research
Nesselroad Family Glaucoma Research	Glaucoma Research in WVU Eye Institute	\$19,877	Support for research directed to glaucoma
Salvatore and Josephine Cilento Research Endowment	Broad-based Research Support in CEMR, Preference to Chemical Engineering	\$2,497	Support for faculty research
Statler Research Endowment Graduate Fellows Program in CEMR	Support for 3 Statler Chairs and a	\$2,798,003	Support for fossil-energy research
WVU School of Medicine Research Endowment	Broad-based Research Support	\$149,363	Research support funds
Quad/Graphics Chair in Internal Medicine, Eastern Division	Create a Research Chair	\$431,644	Hold until Chair is appointed
James H. Walker Chair of Pediatric Cardiology	Create a Research Chair	\$209,160	Support for the Walker Chair, Dr. William Neal
James A. Kent Endowment for Biomedical Engineering	Broad-based Research Support	\$19,037	Supplies and equipment for recently hired faculty
Osborn Professorship in Hematological Malignancies Research	Create a Research Professorship	\$65,792	Support for the Osborn Professorship, Dr. Laura Gibson
BrickStreet Neurology Fellowship	Create a Graduate Student Fellowship	\$48,136	Create a student fellowship
Robert E. Murray Chairmanship Mining Engineering Department	Create a Named Department Chairmanship	\$283,854	Support for the Chair of Mining Engineering
Rita Radcliff-Deppe & Brian Deppe Fellowship Award	Create a Graduate Student Fellowship	\$18,824	Create a graudate student fellowship
Oleg D. and Valentina P. Jefimenko Library Resources	Library Resources Endowment	\$23,218	Acquire library resources to support research

Fund Name	Brief Description	FY 2017 Spend Total	Anticipated Use
Oleg D. and Valentina P. Jefimenko Physics Fellowship	Create a Graduate Student Fellowship	\$15,974	Create a graduate student fellowship
WVU Hardwood Research Trust	Create a Graduate Student Fellowship	\$88,275	Create a student fellowship
James P. Boland, M.D. Department of Surgery Endowed Research	Broad-based Research Support	\$122,544	Operational support for ongoing research
WVU Ruby Scholars Graduate Research Fellowships	Create Merit-based Graduate Fellowships for Exceptionally Talented Students	\$1,777,350	Create fellowships for highly meritorious students
Robert E. Pyle Chemical Engineering Graduate Fellowship	Create a Graduate Student Fellowship	\$13,542	Support for a graduate student
James & Ruby Romano Civil & Environmental Engineering Endowment	Energy and Environmental Research Support	\$129,855	Operational support for ongoing research
Robert & Stephany Ruffolo Pharmacy Graduate Fellowship	Create a Graduate Student Fellowship	\$14,435	Research support for a graduate student in pharmacy
James and Betty Hall Fellowship	Create a Graduate Fellowship in CEMR	\$26,577	Research support for a meritorious student
Stuart M. & Joyce N. Robbins Distinguished Prof/Epidemiology	Create a Distinguished Professorship	\$349,016	Support for a professorship in School of Public Health
Academy of Chemical Engineers Graduate Fellowship	Create a Graduate Fellowship in Bioengineering in Chemical Engineering	\$40,929	Support the research of a meritorious graduate student
J. F. Brick Chair in Neurology	Create a Named Chair in Neurology	\$496,806	Ongoing support for the Brick Chair
Jack and Marietta Mullenger Fellowship	Create a Graduate Research Fellowship in CEMR	\$8,632	Support for graduate student research in any RTF area
Wells Fargo Energy Group Scholarship	Create a Student Scholarship	\$27,932	1 undergraduate student scholarship
Benjamin James Galford Research Scholarship	Create an Undergraduate Research Scholarship in Physics	\$13,850	Support research activities of undergraduates
Carl Del Signore Foundation Graduate Fellowship	Create a Graduate Student Fellowship	\$15,755	Support for a graduate student
George M. & Mary Freda Vance Medical Scholarship-Fellowship	Create a Student Scholarship/ Graduate Student Fellowship	\$43,988	Create 1 prestigious post doctoral fellowship
William S. Clapper Mechanical & Aerospace Engineering Scholarship	Create Undergraduate Student Scholarships	\$2,053	5 undergraduate student scholarships
Everette C. Dubbe Research Scholarship	Create a Undergraduate Student Scholarship	\$12,978	3 undergraduate student scholarships

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Fund Name	Brief Description	FY 2017 Spend Total	Anticipated Use
Oleg D. and Valentina P. Jefimenko Physics Scholarship	Create an Undergraduate Scholarship	\$4,321	1 undergraduate student scholarship
James Bergen and Randy Monteith Anderson Scholarship in MAE	Create Undergraduate/Graduate Scholarships in Energy Research	\$2,199	Support research by undergraduate
Morton Scholarship CEMR	Create Scholarships for Students in energy	\$10,908	Support undergraduate student research
David VanDorn Sutton Scholarship Scholarships	Create Undergraduate or Graduate	\$162,190	Support students in any of the RTF areas
Morrissey-Ropp Scholarship Sciences in any RTF area	Create Scholarships in Arts and	\$4,364	Support for undergraduate student research
Martha Hopkins Hashinger Scholarship	Create a Scholarship in CEMR in Chemical Engineering	\$2,426	Support for undergraduate student research
J. Leland & Clara Virginia (Grosscurth) Taylor Scholarship	Create a Scholarship in CEMR, Preference to Petroleum and Natural Gas	\$6,996	Support for undergraduate student research
Mitchell-Morey Scholars Program	Create a Scholarship in Any RTF Area	\$6,596	Support for undergraduate student research
Statler Research Scholars Program Program in CEMR	Create Undergraduate Scholarship research	\$136,908	Support for undergraduate students doing
Bettie D. Gallaher Research Fellowship	Create a Graduate Fellowship in Any RTF Area	\$175,051	Fellowship to be awarded to meritorious students
Research Trust Fund Jefimenko Professorship in Physics	Create a Professorship in Physics	\$46,944	Hold until professorship is awarded
William E & Bonniegail Kucan Coleman Research Scholarship	Create Research Scholarship in any RTF Area	-\$1,929	Support for undergraduate student research
<b>TOTAL</b>		<b>\$10,752,771</b>	



The background is a complex, abstract composition. On the right side, there is a large, semi-transparent profile of a human head facing right. Inside the head, a glowing lightbulb is depicted, with several glass test tubes or pipettes extending from it, suggesting a connection between ideas and scientific research. Scattered throughout the upper left and center are several dollar signs (\$) in various colors (orange, green, yellow). The overall color palette is dominated by light blues, greens, and yellows, with a soft, ethereal glow. In the lower-left quadrant, there are faint, semi-transparent outlines of a clock face and a bar chart, along with some illegible text fragments.

Senate Bill No. 287

West Virginia Higher Education Policy Commission  
Science and Research Division  
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