

**GEORGE MASON UNIVERSITY
BOARD OF VISITORS**

**Research Committee Meeting
February 11, 2016
Merten Hall, Fairfax Campus**

AGENDA

- I. Call to Order
- II. Approval of Minutes (**ACTION ITEM**)
 - A. Meeting minutes for December 8, 2015.....F-3
- III. Updates by Provost Wu
 - A. Progress report on VP Research and Associate VP for Entrepreneurship and Innovation searches
 - B. Budget request for Research
- IV. Overview of research by Dr. Giorgio Ascoli
- V. Adjournment

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GEORGE MASON UNIVERSITY
BOARD OF VISITORS
RESEARCH COMMITTEE MEETING

December 8, 2015

PRESENT: Rector Tom Davis, Chairman Anne Gruner, Provost S. David Wu; Visitors Mahfuz Ahmed, Karen Alcalde, Claire Dwoskin; Faculty representative, June Tangney; Guest presenter Dean Kenneth Ball, Volgenau School of Engineering

ABSENT: President Angel Cabrera, Visitors Karen Alcalde, Claire Dwoskin, Faculty Senate Chair Charlene Douglas; student representatives Khushboo Bhatia and Justin Van Buren

I. Chairman Gruner called the committee meeting to order at 4:08pm.

II. Approval of Minutes from 9/24/15 and 10/27/15 meetings (Action Item)

A request for amendment to minutes made by Chairman Gruner to correct error under agenda Item IV subcategory E, citing Mason as in “Very High” Carnegie category, delete “very” from the September 24, 2015 minutes and update minutes from October 27, 2015 meeting. Visitor John Jacquemin not recognized as absent at September 24 meeting, update to attendance list is needed. The **MOTION CARRIED UNANIMOUSLY** by Chairman Gruner.

III. Update by Provost Wu on VP of Research and AVP of Innovation and Entrepreneurship searches.

- A. The firm of Russell Reynolds and Associates has engaged the searches, locating 70 applicants, initially reviewing 17 candidates and conducting interviews on December 1 and 2. Four finalist candidates invited to in-person interviews during the week of December 14-18, 2015. Provost Wu deferred on whether there had been any internal candidates. The committee is excited about the high caliber of selected candidates.
- B. The search for the AVP of Innovation and Entrepreneurship, as a result of separation of organizational structure within the Office of Research is proceeding. At present, there have been 150 applications; the search committee has identified 7 candidates for first round of interviews in December, with 3 to 4 to be invited for campus interviews in January 2016.
- C. Chairman Gruner presented on interviewing the 17 candidates, who responded to how Mason can achieve “Very High” Carnegie status. Only 108 schools have this classification. Increased PhD enrollment and graduates is needed as well as faculty/non-faculty research staff. It has been identified, but unconfirmed, that Arizona State University, which was in a similar position as Mason was able to attain the goal in a very short time.

An undisclosed university conducted a study on what it would take to reach such classification, estimating a 50-70 million a year of investment over a 5 year span, with a total of \$350 million, to achieve this level of recognition. Why push Mason forward toward this goal? The institution's degree

will be more valuable, venture capitalists and philanthropists will take notice, and the rejuvenation of the Northern Virginia economy requires a major research university. To succeed, the Office of Research infrastructure must work like clockwork to allow and facilitate faculty drafting strong proposals. A candidate formerly of NSF pointed out that over 50% of proposals submitted to NSF is non-competitive because they are not well-written, need for more well-written proposals. Collaboration with industry in offering labs and researchers to companies is a way to develop partnerships. At USC researchers were simply brought in from elsewhere to achieve the change in culture necessary to become a research institution. Intellectual signatures need to be marketed aggressively and consistently and consistently with Mason singled out for 2-3 things that it is known for and so marketed. The Sci-Tech campus has great promise to become a destination venue for research. Many candidates suggested that Mason had too many centers and that could be a weakness rather than as a strength. A smaller number of consolidated centers could permit greater integration and focus.

IV. Metrics and Collaborative Partnerships by Provost Wu

- A. Metrics for achieving Very High Carnegie category:
1. Amount of research expenditures
 2. Number of Doctoral degrees conferred
 3. Number of research faculty/staff

Continued discussion still needed on this topic and additional analysis to be conducted, the Carnegie classification evaluation is being revamped and under restructure. The operation is being moved to Indiana University and close analysis of criteria is underway.

B. Mason/INOVA Partnership in Personalized Medicine

With a multi-billion initiative, as a primary university partner, Mason is to occupy space in the former Exxon Mobil campus across from Fairfax Hospital. A joint steering board will be developed to refine partnership over time. The Joint Fellowship Program will be set in place for Mason to recruit faculty and INOVA to recruit physicians. The development of Joint Research Innovation Centers, educational programs, such as a certificate program in Personalized Management to be developed. It will include the sharing of facilities within the Sci-Tech campus, such as the Biomedical Research Laboratory (BRL) animal facility, and other INOVA facilities. Other programs of interest in development are in personalized medicine public policy and ethics, heart disease, metabolic diseases, and breast cancer research.

The clinical partnership is critically important for the Institute of Biomedical Innovation (IBI) to be successful. The upcoming academic year will focus on Mason's intellectual signature of international security, particularly in cyber security and bioterrorism threats faced by the U.S.

V. Indirect Repayments by Provost Wu

- A. Senior VP of Finance and Administration J.J. Davis and Provost Wu have taken a fresh look and will appoint a working group to implement the new budget model. How research is handled at other universities, identified by Michael Laskofski of the Office of Sponsored Program will assist Mason with its own review of the matter. Comparable operations are taking place at Boston University, Connecticut, Emory, Georgia Tech, Virginia Tech, and University of Virginia. The important point to take away is that Mason is serious about achieving "Very High" Carnegie research status.
- B. Faculty representative Dr. June Tangney commented on the problem regarding the distribution of indirect repayments that currently make it difficult to work efficiently, as researchers, are under incentivized and operating under a zero-minus balance. Provost Wu recognizes that the current system is broken and needs to be studied as to how to make necessary changes. Research indirects are being assessed and policy re-addressed.

VI. Overview of Cybersecurity Programs and Research at George Mason University presented by Dean Kenneth Ball, Volgenau School of Engineering (**Attachment 1: F-9, F10, F-11**)

- A. Mason is ranked 8th, out of 400 universities, among Best Schools for cyber security:
 - 1. Academic Excellence
 - 2. Practical Relevance
 - 3. Faculty Expertise

Tied in with the military, Mason's program is competitive relative to other universities such as University of Colorado at Colorado Springs and University of Texas at San Antonio (A list of top programs will be provided for those interested). Rector Tom Davis inquired how these programs impact on general interest compete with the interest in enrollment and was informed there is great interest in this area by prospective students, perhaps more than the school can handle. There is extreme interest in growing these academic programs to meet the needs of industry and government in the metropolitan area. Former military populations within the DC region are natural entrants to the cyber security programs.

- B. Governor McAuliffe's focus on importance of cybersecurity activities and strong support of Mason's inaugural Bachelor of Science degree in Cyber Security Engineering, first class began in the fall of 2015, along with other current cyber security MS programs.

Dean Ball emphasized there should not be a divide between research and education, there needs to be a recognized focus on both as they are interdependent.

- C. State Funded Initiatives

1. Virginia Cyber security Pathway Program-over 300 students enrolled through veteran program with NVCC AAS in cyber security program.
2. Virginia Cyber Range Initiative-provide high school/college students with a virtual platform.

Rector Tom Davis inquired on the projection of available employment post graduation, it is anticipated that there will be a job for every graduate with projected starting salaries of \$88,000. Steps to make achieving or re-instating clearances more efficient for those of former military are in place.

Dean Ball pointed out current Volgenau centers, cooperatively focused on aspects of cyber security, Center for Air Transportation Systems Research with FAA and regional partnership with UVA and New Jersey, focused on drones and Center for Configuration Automation and Analytics. There are very few NSF partnered centers on campus; however are members of a cooperative research center. We have laboratories, multi-faculty conducting lots of research multiple projects.

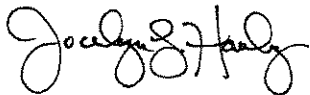
- D. Focus on driver-less cars, shared examples such as Christmas shipments delivered by drones, a recent report on a wifi-enabled hacked Barbie doll, shows how the level of controlling this technology needs to rise.
- E. Due to current status of VP of Research and the need to not miss opportunities with outside industry, Dean Ball has developed working groups open to all Mason faculty, not just within Volgenau: Cyber Security and Robotics and automation assistance.
- F. The upcoming multi-disciplinary symposium with focus on cyber security as major topic to take place on campus on February 12 will give faculty the opportunity to begin such collaboration efforts.
- G. Highlights on the diversity of current cyber security research, such as automated cars, train, air transportation systems and improvements to the I-66 corridor were presented.

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V. Adjournment

With no further discussion, Chairperson Gruner motioned approval of amended minutes, seconded by Visitor Mahfuz Ahmed, and adjourned the Research Committee meeting at 5:05pm.

Respectfully submitted,

A handwritten signature in black ink, appearing to read "Jocelyn L. Hanly". The signature is written in a cursive, flowing style with some loops and flourishes.

Jocelyn L. Hanly
Secretary Pro Tem

Attachment 1: Overview of Cybersecurity Programs and Research at George Mason University
Presentation by Dean Kenneth Ball, Volgenau School of Engineering (3 pages)

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Overview of Cybersecurity Programs and Research
at
George Mason University

Kenneth S. Ball, Ph.D., P.E.
Dean, Volgenau School of Engineering

December 2015

Mason's Reputation in Cybersecurity

Hewlett-Packard / Ponemon Institute Report (2014):
Ranked **8th** among "Best Schools for Cybersecurity"

Ranking based on a large, national sample of experienced practitioners with bona fide credentials in IT and information security considering more than 400 institutions of higher learning in the U.S.

Mason's Reputation in Cybersecurity

Ranking criteria:

1. Academic excellence;
2. Practical relevance;
3. Experience and expertise of program faculty;
4. Experience and background of students and alumni;
5. Professional reputation in the cyber security community

BY-THE-NUMBERS...

- ▶ Overall VSE Student Enrollment: 6,222
 - ▶ 4,504 Undergraduates
 - ▶ 1,718 Graduate Students
- ▶ Cybersecurity Program Enrollment: ~950
 - ▶ ~700 BS students
 - ▶ ~210 MS students
 - ▶ 40+ Ph.D. students (including 10 IT in ISA concentration)
- ▶ Degree Programs: 33
 - ▶ BS: 5
 - ▶ MS: 6
 - ▶ Ph.D.: 1 cybersecurity-specific plus multiple other disciplines
 - ▶ Graduate Certificate Programs: 4

New Mason State-Funded Initiatives

Virginia Cybersecurity Pathway Program

Innovative degree-completion program designed for military veterans enrolled in NOVA's AAS in Cybersecurity to complete the Bachelor of Applied Science degree at Mason in the Cybersecurity Concentration.

Annual appropriation of \$153,00 starting in FY2016.

New Mason State-Funded Initiatives

Virginia Commonwealth Cyber Range Initiative

Governor McAuliffe's Press Release (2 DEC 2015):
An innovative cyber range... will provide high school and college students a virtual, secure platform to enhance their cyber skills. The range will enable the Commonwealth to provide training on cyberattack detection and defense, to develop cyber certifications, to encourage collaboration within the industry, to conduct research, and to offer training for active duty military and veterans.

VSE RESEARCH CENTERS

- ▶ Center for Air Transportation Systems Research
- ▶ Center for Assurance Research and Engineering
- ▶ Center for Configuration Analytics and Automation (NSF I/UCRC)
- ▶ Center of Excellence in Command, Control, Communications, Computing and Intelligence
- ▶ Center for Secure Information Systems (NSA Center of Academic Excellence for over 25 years)
- ▶ Learning Agents Center

VSE RESEARCH LABORATORIES

- ▶ Communications and Network Laboratory
- ▶ Computer Vision and Neural Networks Laboratory
- ▶ Cryptographic Engineering Research Group
- ▶ Laboratory for IT Entrepreneurship
- ▶ Networking and Simulation Laboratory
- ▶ Radio and RADAR Engineering (REAR) Lab
- ▶ Sensor Fusion Lab
- ▶ System Architectures Laboratory

RELEVANT AREAS OF EXPERTISE

- ▶ Autonomous Systems and Controls
- ▶ Robotics and Unmanned Vehicles
- ▶ Sensors and Multi-Sensor Fusion
- ▶ Trusted Communications and Connected Vehicles
- ▶ Cybersecurity and Cyber-Physical Systems
- ▶ Safety and Reliability; Resilient Systems
- ▶ Signal and Array Processing; Data Analytics
- ▶ Artificial Intelligence
- ▶ Testing and Evaluation
- ▶ Logistics

Coordination of Research Programs

- VSE forming "Working Groups" to coordinate research activities and to facilitate growth of external funding
- Working Groups open to all Mason faculty by "self-identification"
- Working Groups formed for Cybersecurity and for Robotics and Autonomous Systems

Cybersecurity of Connected and Automated Cars

Kai Zeng, Ph.D.

Professor of Electrical and Computer Engineering and Cybersecurity Engineering

Amir Allipour-Fanid

Ph.D. Student

Duminda Wijesekera, Ph.D. Professor of Computer Science

- Trusted Cognitive Radios for Smart Cars
- Trusted Broadcasts for Smart Vehicles
- Secure V2V Communications
- Data dissemination in V2I infrastructures
- Emergency Handling in Smart Highways
- Commercial Mobile Alert System (CMAS)

Evolutionary Computation and Evolving Agents
Kenneth De Jong, Ph.D.
Computer Science Department

Collision Avoidance and Navigation

Goal:
Get single agent to reliably perform complex navigation tasks. Extend to multiple cooperating agents.

Approach:
Evolve behaviors offline via simulation
Download & test on real robot

RAJESH GANESAN, PH.D.
PROFESSOR, SEOR

- ▶ Analytical Modeling and Computational Research for Next Gen Automobiles
 - ▶ Big Data Analytics (Data-information-Knowledge)
- ▶ Dynamic optimization using artificial intelligence of vehicle operational parameters for
 - ▶ Effective cruise control
 - ▶ Minimized emissions
 - ▶ Maximized fuel/battery/fuel-cell economy
- ▶ Simulation and Optimization of system, process, and product design parameters
 - ▶ Multi-objective optimization
 - ▶ Trade-off analysis of conflicting parameters
- ▶ Engineering process control and statistical real-time monitoring of advanced manufacturing processes
- ▶ Algorithm development for vehicle computers

Automatic Steering and Lane Tracking

Monson Hayes, Ph.D.
Chair and Professor
Department of Electrical and Computer Engineering (ECE)

Gerald Cook, Ph.D.
Earle C. Williams Professor of ECE

John Shortle, Ph.D.
Professor, Systems Engineering & Operations Research

Related Expertise

- Aviation safety
- Automated separation
- Reliability
- Rare-event simulation

Connected Vehicle Testbed in Northern Virginia
Shanjiang Zhu, Ph.D. Asst. Prof. CEIE

ExpressLanes

GEORGE MASON UNIVERSITY

Connected Vehicle Testbed in Northern Virginia

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THANK YOU !

Questions?