Dr. Patrick J. Martin ’02: Providing New Engineering Research Opportunities at Hampden-Sydney

by Shaquann S. Seadrow '16

Dr. Patrick J. Martin graduated from Hampden-Sydney in 2002 with a double major in Physics and Applied Mathematics. He went on to do graduate study at the University of Maryland, where he followed his interests in control theory, one of the fundamental concepts behind robotics. As a grad student, Patrick spent his summers working at the Army Research Lab, where he programmed data acquisition platforms for their *Sensor and Electronic Devises Directorate*. After completing his M.S. at Maryland, he joined Intelligent Automation, Inc. and performed multi-agent robotics research. With a little push from his coworkers, Martin attended Georgia Institute of Technology, where he earned his a Ph.D. in Electrical and Computer Engineering with a concentration in multi-agents robotics and controls in 2010. After graduating from Georgia Tech, he served as a professor at York College in Pennsylvania until 2015. Finally, he has returned to H-SC as the newest addition to the Department of Mathematics & Computer Science.

Even through Dr. Martin is visiting professor, he serves a slightly different purpose than the rest of the faculty. No one is going to find him in the TigerWeb course registry or in any catalogue. Dr. Martin is also a Principal Research Engineer at BAE Systems in Arlington, Virginia. Nevertheless, he is using his position contribute to the diverse array of scientific research at Hampden-Sydney. Dr. Martin’s research is being funded by the National Science Foundation. The HyPower Project is a Georgia Tech collaboration that studies optimal control strategies. They are interested in effectively coupling performance features with power consumption by using physical data from an environment. Unfortunately, everything about the natural world is dynamic, and that increases the complications with making data-based predictions. PhysiCloud is a cloud computing interface for controls that uses a novel combination of abstractions—techniques and systems that are designed to handle computational complexity—that hide the implementation details of the underlying cyber-physical system. If a device is being operated though PhysiCloud, the software would collect data on the environment surrounding it. Once given a script of control codes, PhysiCloud uses the abstractions from the data to implement the commands onto that device. The HyPower vision is to enable the control algorithms developed by Georgia Tech with PhysiCloud as the unifying software framework among cyber-physical systems.

HyPower and PhysiCloud are highly interdisciplinary, and that is why Dr. Martin has enlisted the talents of H-SC students from physics, mathematics, and computer science. **Linh Nguyen ’16**(Physics and Applied Mathematics) and **Samuel Sheffield ’17** (Computer Science) have been working for Dr. Martin since beginning of the 2015-16 academic year. In the Fall of 2015, Linh and Sam were working on a phidget sensor node, which measures external quantities, such as light and temperature. They wrote software that directs the sensor node’s data from an interface and into a server for post-processing. For the Spring Semester,

Linh has been developing a high level programing language for a deployed PhysiCloud system. Sam has been renovating the current PhysiCloud software by exploring technologies that enhance the clustering of cyber-physical systems. Computer Science majors, **Keith Kangas ’18** and **Benjamin Hackley ‘18**, will spend this summer trying to implement Linh and Sam’s designs for PhysiCloud 2.0. The end goal is to have this software completed and tested on the Energy Research Laboratory.

Science is becoming highly interdisciplinary, and with this change comes a demand for sophisticated technology, thorough computation, and pure intellect. Dr. Martin, like other professors, is trying increase Hampden-Sydney’s productivity in this type of work. As a result of his work, the Energy Research Laboratory (ERL) could possibly leverage advances in machine learning. A lab operating on cyber-physical programming could, for example, maintain its own temperature by predicting weather from collected statistics. The college will be left with tools to advance its studies with the ERL. As an added bonus, a new public cyber-physical programming language would be a product of H-SC students. Dr. Martin is proof of what engineers can do with a liberal arts education, and that’s why he’s using his time here to help shape what it means to be a Hampden-Sydney Engineer.