

## ***Letter of Interest***

Professor D. Marshall Porterfield, PhD.  
Purdue University

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**March 28, 2017**

I am writing to apply for the position of Vice President for Research and Economic Development (VPRED) at the University of Wyoming. I recently returned to my academic position, as Professor of Biological Engineering at Purdue University, after five years of official leave during which I served as Division Director at NASA in the Human Exploration and Operations Mission Directorate [NASA's Space Life and Physical Sciences (SLPS) Division]. I am looking for a new opportunity to apply my academic, administrative, and executive experiences within the university setting, where I believe I can serve as an agent of creative innovation within the academic research enterprise. I believe my experience has prepared me to mentor junior faculty development, promote research innovation, forge productive interdisciplinary research collaborations, and support a complicated infrastructure serving a diverse stakeholder community, all requirements of the VPRED.

### **Perspectives and Objectives**

The challenges that face the public university are unprecedented in the history of American higher education. The breadth of discovery and the pace of advancement of new knowledge are staggering in scale and speed, yet universities are facing pressures to limit the number of degree required credits at both the graduate and undergraduate levels. The importance of research for addressing our societal problems has increased; at the same time funding to support research has been cut substantially. From my perspective, the key to working within this environment is to embrace multidisciplinary approaches, train graduate and undergraduate students to be interdisciplinary, and to enable faculty entrepreneurship in pursuing both research innovation, and large team multidisciplinary efforts. I perceive that UW has an environment that is open and ready for this model in the transformation of the modern university and is well positioned to take the first steps along this path.

### **Scholarly Credentials and Leadership**

As a faculty member at Purdue, I developed new funding opportunities and potential collaborations with both government and nongovernmental agencies, industry, and other universities, based on an internationally recognized program that unites life sciences and engineering, for research applications in biology, agriculture, the environment, and medicine called the Physiological Sensing Facility. The Physiological Sensing Facility was developed to bridge disciplines and it promotes collaboration among faculty working in the nanotechnology and life sciences centers with other researchers at the regional, national, and international levels. My program at Purdue has been supported by grants from the DoD, EPA, NSF, NASA, NIH, USDA, and private industry. Creation of the Physiological Sensing Facility is an excellent example of my aforementioned perspectives of the transformation needed in the modern university, and the type of interdisciplinary approach required to effectively serve the academic enterprise at UW. I envision reaching out within the university, across the state and nation, and globally to forge new multidisciplinary opportunities for faculty at the broader university level to advance the academic research enterprise. With respect to service to the academic community, I have always embraced that responsibility. I have trained graduate students who are now faculty at some of the best institutions both nationally and internationally, and served the faculty as a member of numerous committees including the Purdue Faculty Senate as a member of the steering committee. My roots and passions are within academia and I am committed to higher education, but my broader experiences allow me to see beyond the horizon to new opportunities for future advances in the American academic research enterprise.

The University of Wyoming requires a respected VPRED who can represent the university with distinction. Throughout my academic career, my peers have recognized my research and leadership. My education and training are as a scientist but I hold academic appointments and credentials as an engineering professor at Purdue. I received the Halstead Award from the American Society for Gravitational and Space Research, the Purdue University Faculty Scholar Award, and the Distinguished Alumni Award from the University of South Alabama. Also, my accomplishments in the field of biological engineering were recently recognized by my election to the College of Fellows for the American Institute for Medical and Biological Engineering, an honor reserved for the top 2% of medical and biological engineers in the United States. My work was described as "bridging the interface between engineering and physiology through outstanding contributions to biosensor technology and fundamental cell biology." I have served as a leader at the national level as President of the American Society for Gravitational and Space Research. A key accomplishment as President was to expand the society to include the physical sciences community, thereby doubling society membership. I also served as the President for the Institute for Biological Engineering.

### **Administrative Experience and Philosophy**

In my executive administrative role as Director of NASA's SLPS Division, I was responsible for staff appointments and recommendations on promotion and awards, all duties of a university administrator. I was also responsible for development and implementation of all strategic planning, policies and budgets associated with this large division at NASA that oversaw approximately \$500M in university research grants. This division includes personnel, engineering programs, and research assets at six NASA centers throughout the United States and three research programs: 1) the Human Research Program (applied biomedical); 2) the Space Biology Program (fundamental); and 3) the Physical Sciences Program (fundamental and applied).

Based on my experience building collaborations, and working across disciplines as a university faculty member, I continued to build partnerships and teams that were successful and productive as a research administrator. I bartered a key memorandum of understanding between programs in NASA, which allowed my division to expand research directed funding by approximately 30% without any increase in budget appropriations. Furthermore I worked with my staff and developed other initiatives that were heavily leveraging the resources of other agencies based on collaborative interdisciplinary initiatives. For example, the new NASA materialsLAB campaign was partnered by a memorandum of understanding with NIST as part of the OSTP Materials Genome Initiative, and the NASA geneLAB campaign partnered with NIH, DoE and various industry partners. My policies and strategic planning lead directly to numerous high profile research missions aboard the International Space Station, including the One-Year Mission (negotiated directly with the Russian Space Agency) and the Twin's Study (a geneLAB based project).

### **Executive Experience and Governmental Affairs**

I also served as a member of NASA's Senior Executive Team for Human Exploration and Operations, and I worked closely with leadership in the International Space Station Program Office. Additionally, I represented NASA and reported directly to the NASA Advisory Council and the National Academies Space Studies Board, describing the SLPS strategic plan and providing updates regarding our progress towards meeting the Board's objectives. I also regularly reported to the House Committee for Science, Space and Technology and the Senate Committee Commerce, Science, and Technology. At the executive level, I reported to the White House Office of Management and Budget to describe SLPS budgetary policy alignment with congressional authorization and appropriations, and I reported to the White House Office of Science and Technology Policy. I also represented NASA as a member of the President's Science and Technology Council Subcommittee on Life Sciences.

### **International Representation and Stakeholder Outreach**

I gained significant experience building collaborative research at the international level. I served as the NASA representative and permanent co-chair of the International Space Life Sciences Working Group, which

coordinates research activities with Canada, the European Space Agency, Japan, Italy, France, and Germany. Moreover, diplomatic collaboration with the Russian Federation is based on international treaty, and I was responsible for representing NASA at annual US-Russian Joint Working Group meetings, where I serve as co-chair with my Russian counterpart.

### **Closing Perspective and Affirmation**

As VPRED I would be prepared to support the research enterprise at the University of Wyoming to my fullest capacity, and to leverage my national and international experience to promote UW's interests. I can effectively work with the President, Provost, executive team, and Deans and Directors across campus to advance the University's research and economic development agenda. I would also work closely and openly with the staff and supporting personnel within the Office of Research and Economic Development. For the faculty I would be working for/with, my career has taught me how to discover, translate knowledge into tools, and to work and teach across diverse disciplines. I have a strong record of strategic leadership promoting faculty development and research at Purdue as a faculty member, and now I have built upon this foundation of experience during my administrative role at NASA. Please accept this letter as my formal application for this position.

With regards,



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# **CURRICULUM VITAE**

Professor D. Marshall Porterfield, PhD  
Purdue University

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## **ADMINISTRATIVE EXPERIENCE:**

- 2012- Present    Director  
Space Life and Physical Sciences Division  
Human Exploration Mission Directorate  
NASA Headquarters Washington, DC  
Programmatic lead for the Fundamental Space Biology, Physical Sciences, and Human Research Programs. Responsibilities include oversight of NASA center research assets for division science and engineering (Ames Research Center, Kennedy Space Center, Johnson Space Center, Glenn Spaceflight, Marshall Space Center, and the Jet Propulsion Lab). Manage the NASA extramural research programs, and support flight operations for spaceflight experimentation. Spaceflight research activities include all international collaborations in the utilization of the International Space Station. The position also manages the funding and performance of the International Space Station National Laboratory, and holds responsibility for programmatic representation for executive and legislative affairs both domestically and diplomatically with international partners.
- 2005  
to 2012            Founding Director  
Physiological Sensing Facility  
Purdue University West Lafayette, IN  
The Physiological Sensing Facility serves as an interdisciplinary resource and engages scientists and engineers from across Purdue University in the development and application of advanced biosensing technologies as new tools for discovery. Here, ideas, needs, and capabilities are incubated, adapted and applied to advance existing technologies and develop new biological sensing capabilities that have significant impact in many research areas. The PSF is a trans-center facility bridging the Birk Nanotechnology Center and the Bindley Bioscience Center.

## **ACADEMIC EXPERIENCE:**

- 2010-Present    Professor  
2005-2010        Associate Professor  
Department of Agricultural and Biological Engineering (75%)  
Department of Horticulture and Landscape Architecture (25%)  
Weldon School of Biomedical Engineering (Courtesy appointment)  
Purdue University West Lafayette, IN  
  - Research is focused on multidisciplinary approaches for the development of advanced sensor technologies, and the applications of these technologies towards important questions in agriculture, biology, environmental science, medicine and space biology.

2001  
to 2005            Assistant Professor of Computer and Electrical Engineering  
University of Missouri-Rolla Rolla, MO  
  - Joint appointment between the Department of Biological Sciences and the Department of Computer and Electrical Engineering.

- 2000  
to 2005      Adjunct Professor  
Department of Molecular and Cellular Physiology  
LSU Medical Center      Shreveport, LA
- Managed a research and training laboratory facility for biomedical research applications microsensor technologies. Work here focused on the electroanalytical detection of NO and ascorbate.
- 1999  
to 2005      Assistant Professor of Biological Sciences  
University of Missouri-Rolla      Rolla, MO
- Continued development of self-referencing microelectrode instrumentation and application of this system to important problems in plant biology.
- 1998  
to 1999      Staff Scientist I  
Marine Biological Laboratory      Woods Hole, MA
- Research and development of self-referencing electrochemical microsensors for single-cell application. NIH National Center for Research Resources Center.
- 1997  
to 1998      Post-Doctoral Researcher  
Marine Biological Laboratory      Woods Hole, MA
- Research and development of self-referencing microelectrode system for measuring trans-membrane flux of ions and gases involved in signaling and metabolism at the cellular level. NIH National Center for Research Resources Center.
- 1993  
to 1996      Graduate Student Research Fellow  
Louisiana State University      Baton Rouge, LA
- Dissertation research included five spaceflight experiments, with three experimental teams. Emphasis was in root system physiology. Supported by fellowship from NASA Graduate Student Researcher Program.

#### **RESEARCH AND MISCELANEOUS EXPERIENCE:**

- 2005-Present      Discovery Park Faculty  
Bindley Bioscience Center and Birck Nanotechnology Center  
Purdue University      West Lafayette, IN
- 2003  
to 2005      Research Investigator  
Environmental Research Center  
University of Missouri-Rolla      Rolla, MO
- 2001  
to 2005      Research Investigator  
Intelligent Systems Center  
University of Missouri-Rolla      Rolla, MO
- 2000  
to 2005      Associate Member  
Center for Sensor Technology  
University of Kentucky      Lexington, KY
- May 1998  
2000 and 2002      Course Instructor  
Rapid Electrochemical Measurements in Biological Systems.  
Marine Biological Laboratory      Woods Hole, MA
- Summer  
1995      Course Instructor  
Space Life Sciences Training Program  
NASA      Kennedy Space Center, FL
- 1990  
to 1993      Undergraduate Student Laboratory Technician  
University of South Alabama      Mobile, AL

## EDUCATION:

1996

Ph.D.

Louisiana State University

Baton Rouge, LA

- Dissertation: Characterization of physiological changes in roots grown in spaceflight conditions: a comparison of nutrient delivery technologies. Field of study: Physiology and space biology (emphasis in stress physiology). Recipient of NASA Graduate Student Researcher Fellowship. Degree received December 20, 1996.

1993

B.S.

University of South Alabama

Mobile, AL

- Area of concentration: Cell Biology. Recipient of George Barber Fellowship in Marine Sciences to support undergraduate research.

## PROFESSIONAL ADMINISTRATIVE DEVELOPMENT:

- 2014 NASA Senior Executive Service: Media Training
- 2013 Federal Executive Service Development Summit
- 2012 NASA Senior Executive Service Course: Personnel Development and Evaluation Procedures
- 2012 NASA Senior Executive Service Course: Programmatic Risk Management and Mitigation
- 2012 NASA Senior Executive Service Course: Encouraging Intra-office Communication and Innovation
- 2007 Purdue Entrepreneurial Leadership Academy Fellow. (Program emphasizes academic entrepreneurship and developing future administrative leaders).

## AWARDS AND HONORS:

- 2014 Distinguished Alumni Award, University of South Alabama
- 2013 Elected President for the Institute for Biological Engineering
- 2012 Appointed to the National Science and Technology Council as the NASA representative on the Life Sciences Subcommittee. Executive Office of the President, Office of Science and Technology Policy.
- 2012 Named to the National Science and Technology Council Interagency Working Group for Neuroscience. Executive Office of the President, Office of Science and Technology Policy.
- 2012 Elected to the College of Fellows for the American Institute for Medical and Biological Engineering for "bridging the interface between engineering and physiology through outstanding contributions to biosensor technology and fundamental cell biology." (Top 2% of medical and biological engineers in US)
- 2010 Panel Member and Moderator, House Committee for Science and Technology Panel, The Role of NASA in the Emergence of the Biological Economy
- 2010-2011 President, American Society for Gravitational and Space Biology
- 2009 University Faculty Scholar, Purdue University. (Top award for mid-career faculty at Purdue University).
- 2006 Halstead Young Investigator Award, American Society for Gravitational and Space Biology
- 2006-2009 Governing Board, American Society for Gravitational and Space Biology
- 2002 Best Paper, Microfabricated Chemical and Biological Sensors, IEEE Sensors Conference, Orlando, FL, 2002
- 1996 LSU College of Agriculture Distinguished Dissertation Award
- 1996 First Place Student Poster, Annual Meeting of the American Society for Gravitational and Space Biology
- 1995 C. W. Edgerton Outstanding Graduate Student Award, LSU Department of Plant Pathology and Crop Physiology
- 1994 LSU Graduate Student Travel Award
- 1993-1995 NASA Graduate Student Researcher Fellowship, awarded through Kennedy Space Center
- 1991 George Barber Fellowship in Marine Sciences

## PROFESSIONAL AFFILIATIONS:

- American Association for the Advancement of Science
- American Association of Agricultural and Biological Engineering
- American Institute for Aeronautics and Astronautics
- American Society for Gravitational and Space Biology
- American Society of Plant Biologists
- Institute of Biological Engineering
- International Council of Scientific Unions, Committee on Space Research
- IEEE Sensors
- Japanese Society of Plant Physiologist
- Sigma Xi
- Society for Photo-Optical Instrumentation Engineers

## RESEARCH

### PUBLICATIONS:

#### Peer Reviewed Manuscripts (94 total)

- Park, J., Salim, M.L.S., Wan, W.W.W., Rademacher, A., Wickizer, B., Schooley, A., Benton, J., Cantero, Araceli, A., Argote, P.F., Ren, M., Zhang, M., Porterfield, D.M., Ricco, A.J., Roux, S.J., Rickus, J.L., 2017. An autonomous lab on a chip for space flight calibration of gravity-induced transcellular calcium polarization in single-cell fern spores. *Lab on a Chip*. In Press (DOI: 10.1039/C6LC01370H)
- Stulberg, E., Fravel, D., Proctor, L., Murray, D., LoTempio, J., Chrisey, L., Garland, J., Goodwin, K., Graber, J., Harris, M., Jackson, S., Mishkind, M., Porterfield, D.M., Records, A. 2016. From Skin to Soil: An Assessment of US Microbiome Research, *Nature Microbiology* (#NMICROBIOL-15090353A)
- Xu, W., Hong, S.J., Zhong, A., Xie, P., Jia, S., Xie, Z., Zeitchek, M., Niknam-Bienia, S., Zhao, J., Porterfield, D.M., Surmeier, D.J., Leung, K.P., Galiano, R.D., Mustoe, T.A. 2015. Sodium channel Nax is a regulator in epithelial sodium homeostasis. *Science Translational Medicine*. 7: 312ra177. DOI: 10.1126/scitranslmed.aad0286
- Zheng, W., Tayyari, F., Gowda, G.A.N., Raftery, D., McLamore, E.S., Porterfield, D.M., Donkin, S.S., Bequette, B., Teegarden, D. 2015. Altered glucose metabolism in Harvey-ras transformed MCF10A cells. *Molecular Carcinogenesis*. DOI: 10.1002/mc.22079.
- Stensberg, M.C., Madangopal, R., Yale, G., Wei, Q., Ochoa-Acuna, H., Wei, A., McLamore, E.S., Rickus, J.L., Porterfield, D.M., Sepulveda, M. 2014. Silver nanoparticle-specific mitotoxicity in *Daphnia magna*. *Nanotoxicity*. 8: 833-842.
- Zhang, W., McLamore, E.S., Wu, R., Stensberg, M.C., Porterfield, D.M., Banks, M.K. 2014. Glutathione-Gated Potassium Efflux as a Mechanism of Active Biofilm Detachment. *Water Environment Research*. 86: 462-469
- Stensberg, M.C., Zeitchek, M.A., Inn, K., McLamore, E.S., Porterfield, D.M., Sepúlveda, M.S. 2014. Comparative study of non-invasive methods for assessing *Daphnia magna* embryo toxicity. *Environmental Science and Pollution Research International*. 18: 10803-10814
- Liu, G., Porterfield, D.M., 2014. Oxygen enrichment with magnesium peroxide for minimizing hypoxic stress of flooded corn. *Journal of Plant Nutrition and Soil Science*. DOI: 10.1002/jpln.201300424
- Kang, Z., Yan, X., Zhang, Y., Pan, J., Shi, J., Zhang, X., Liu, Y., Choi, J.H., Porterfield, D.M., 2014. Single-Stranded DNA Functionalized Single-Walled Carbon Nanotubes for Microbiosensors via Layer-by-Layer Electrostatic Self-Assembly. *ACS Applied Materials & Interfaces* 6: 3784-3789.
- Jaroch, D., Lu, J., Madangopal, R., Stull, N., Stensberg, M., Shi, J., Kahn, J., Herrera-Perez, R., Zeitchek, M., Sturgis, J., Robinson, J.P., Yoder, M., Porterfield, D.M., Mirmira, R., Rickus, J.L. 2013. Mouse and Human Islets Survive and Function After Coating by Biosilicification. *American Journal of Physiology: Endocrinology and Metabolism*. 305: E1230-E1240
- Wan Salim, W.W., Zeitchek, M.A., Hermann, A.C., Ricco, A.J., Tan, M., Selch, F., Fleming, E., Bebout, B.M., Bader, M.M., Ul Haque, A., Porterfield, D.M. Multi-analyte biochip (MAB) based on all-solid-state ion-selective electrodes (ASSISE) for physiological research. *Journal of Visual Experimentation*. 74: e50020.
- Zheng, W., Tayyari, F., Nagana Gowda, G.A., Raftery, D., McLamore, E.S., Shi, J., Porterfield, D.M., Donkin, S.S., Bequette, B., Teegarden, D. 2013. 1,25-Dihydroxyvitamin D regulation of glucose metabolism in Harvey-ras transformed MCF10A human breast epithelial cells. *The Journal of Steroid Biochemistry and Molecular Biology*. 138: 81–89

- Subraya, K.K, Diggs, A., Porterfield, D.M. 2013. Amperometric Biosensor Approaches for Quantification of Indole 3-Acetic Acid in Plant Stress Responses. *Communications in Soil Science and Plant analysis*. 44: 1749-1763
- Shi, J., McLamore, E.S., Porterfield, D.M. 2013. Nanomaterial Based Self-referencing Microbiosensors for Cell and Tissue Physiology Research, *Biosensors and Bioelectronics*, 15: 127-134.
- Bushart, T.J., Cannon, A.E., ul Haque, A., San Miguel, P., Mostajeran, K., Clark, G.B., Porterfield, D.M., Roux, S.J. 2013. RNA-seq analysis identifies potential modulators of gravity response in spores of *Ceratopteris* (Parkeriaceae): Evidence for modulation by calcium pumps and apyrase activity. *American Journal of Botany*. 100: 161-174
- Shi, J., Zhang, H., Snyder, A., Wang, M., Xie, J., Porterfield, D.M. Stanciu, L.A. 2012. An aqueous media based approach for the preparation of a biosensor platform composed of graphene oxide and Pt-black. *Biosensors and Bioelectronics*. 38: 314–320
- Claussen, J.C., Kumar, A., Jaroch, D.B., Khawaja, M.H., Hibbard, A.B., Porterfield, D.M., Fisher, T.S. 2012. Biosensors: Nanostructuring Platinum Nanoparticles on Multilayered Graphene Petal Nanosheets for Electrochemical Biosensing. *Advanced Functional Materials* 22: 3399-3405.
- Guodong, L., Porterfield, D.M., Li, Y., Klassen, W. 2012. Increased Oxygen Bioavailability Improved Vigor and Germination of Aged Vegetable Seeds. *HortScience*. 47: 1714-1721.
- Li, F, Porterfield, D.M., Zheng, X., Wang, W., Xu, Y., Zhang, Z. 2012. Abnormal mitochondrial function impairs calcium influx in diabetic mouse pancreatic beta cells. *Chinese Medical Journal* 125: 502-510.
- Liu, G., Li, Y., Alva, A.K., Porterfield, D.M., Dunlop, J. 2012. Enhancing nitrogen use efficiency of potato and cereal crops by optimizing temperature, moisture, balanced nutrition and oxygen bioavailability. *Journal of Plant Nutrition*. 33: 428-441.
- Sun, X., McLamore, E.S., Kishorec, V., Fitesa, K., Slipchenkoa, M., Porterfield, D.M., Akkus, O. 2012. Mechanical Stretch Induced Calcium Efflux from Bone Matrix Stimulates Osteoblasts. *Bone* 50: 581-591
- Claussen, J.C., Hengenius, J.B, Wickner, M.W., Fisher, T.S., Umulis, D.M., Porterfield, D.M. 2011. Effects of carbon nanotube-tethered nanosphere density on amperometric biosensing: simulation and experiment. *Journal of Physical Chemistry C*. 115: 20896-20904
- Shi, J., Claussen, J.C., McLamore, E.S., ul Haque, A., Jaroch, D., Diggs, A.R., Calvo-Marzal, P., Rickus, J.L., Porterfield, D.M. 2011. A comparative study of enzyme immobilization strategies for multi-walled carbon nanotube glucose biosensors. *Nanotechnology*. 22: 355502
- Shi, J., Cha, T.G., Claussen, J.C., Diggs, A.R., Choi, J.H., Porterfield, D.M. 2011. microbiosensors based on DNA modified single-walled carbon nanotube and Pt black nanocomposites. *Analyst*. 136: 4916-4924
- McLamore, E.S., Porterfield, D.M. 2011. Non-invasive tools for measuring metabolism and biophysical analyte transport: Self-referencing physiological sensing. *Chemical Society Reviews*. 40: 5308-5320
- Claussen, J.C., Artiles, M.S., McLamore, E.S., Mohanty, S., Shi, J., Rickus, J.L., Fisher, T.S., Porterfield, D.M. 2011. Electrochemical glutamate biosensing with nanocube and nanosphere augmented single-walled carbon nanotube networks: a comparative study. *J. Mater. Chem*. 21: 11224-11231
- Stensberg, M.C., McLamore, E.S., Sepúlveda, M.S., Porterfield, D.M., Wei, A. 2011. Toxicological Studies on Silver Nanoparticles: Challenges and opportunities in assessment, monitoring and imaging. *Nanomedicine*. 6: 879-98.
- Jaroch, D., McLamore, E.S., Zhang, W., Shi, J., Garland, J., Banks, M.K., Porterfield, D.M., Rickus, J.L. 2011. Cell-Mediated Deposition of Porous Silica on Bacterial Biofilms. *Biotechnology and Bioengineering*. 108: 2249–2260.
- Cha, T.G., Baker, B.A., Sauffer, M.D., Salgado, J., Jaroch, D., Rickus, J.L., Porterfield, D.M., Choi, J.H. 2011. Optical Nanosensor Architecture for Cell Signaling Molecules Using DNA Aptamer-Coated Carbon Nanotubes. *ACS Nano*. 5: 4236-4344
- Claussen, J.C., Wickner, M.M., Fisher, T.S., Porterfield, D.M. 2011. Transforming the Fabrication and Biofunctionalization of Gold Nanoelectrode Arrays into Versatile Electrochemical Glucose Biosensors. *ACS Appl Mater Interfaces*. 3: 1765-1770.
- Salmi, M., ul Haque, A., Bushart, T.J., Stout, S.C., Roux, S.J., Porterfield, D.M. 2011. Changes in gravity rapidly alter the magnitude and direction of a cellular calcium current. *Planta*. 233: 911-920.
- Shi, J., McLamore, E.S., Jaroch, D., Claussen, J.C., Rickus, J.L., Porterfield, D.M. 2011. Oscillatory glucose flux in INS 1 pancreatic  $\beta$  cells: A self-referencing microbiosensor study. *Analytical Biochemistry*. 411:185-193
- McLamore, E.S., Stensberg, M.C., Sepúlveda, M.S., Zhang, W., Banks, M.K., Porterfield, D.M. 2011. A self-referencing microelectrode for real time measurements of silver flux. *Sensors and Actuators B*. 153: 445-452.



- McLamore, E.S., Shi, J., Jaroch, D., Claussen, J.C., Uchida, A., Jiang, Y., Zhang, W., Donkin, S., Banks, K., Buhman, K.K., Teegarden, D., Rickus, J.L., Porterfield, D.M. 2011. A self referencing platinum nanoparticle decorated enzyme-based microbiosensor for real time measurement of physiological glucose transport. *Biosensors and Bioelectronics*. 26: 2237-2245.
- Prather, K.J., McLamore, E.S., Porterfield, D.M. 2010. Synthetic Biology and the Rational Design of Microbial Chemical Factories. *Gravit. and Space Biol. Bull.* 23: 49-54
- McLamore, E.S., Zhang, W., Porterfield, D.M., Banks, K. 2010. Membrane-Aerated Biofilm Proton and Oxygen Flux During Chemical Toxin Exposure. *Environmental Science Technology*. 44: 7050–7057.
- McLamore, E.S., Diggs, A., Marzal, P.C., Shi, J., Blakeslee, J.J., Peer, W.A., Murphy, A.S. Porterfield, D.M. 2010. Non-Invasive Quantification of Endogenous Root Auxin Transport Using an Integrated Flux Microsensor Technique. *The Plant Journal*. 63: 1004-1016.
- McLamore, E.S., Jaroch, D., Chatni, R., Porterfield, D.M. 2010. Self-referencing optrodes for measuring spatially resolved, real-time metabolic oxygen flux in plant systems. *Planta*. 211: 384–389.
- McLamore, E.S., Mohanty, S., Shi, J., Haque, A., Rickus, J., Porterfield, D.M. 2010. A self-referencing glutamate biosensor for measuring real time neuronal glutamate flux. *Journal of Neuroscience Methods*. 189:14-22.
- Claussen, J.C., Kim, S.S., ul Haque, A., Artilles, M.S., Porterfield, D.M., Fisher, T.S. 2010 Electrochemical Glucose Biosensor of Platinum Nanospheres Connected by Carbon Nanotubes. *J Diabetes Sci Technol*. 4: 312-319.
- Chatni, M.R., Li, G., Porterfield, D.M. 2009. Frequency Domain Fluorescence Lifetime Optrode System Design and Instrumentation Without a Concurrent Reference LED. *Applied Optics*. 48: 5528-5536
- Chatni, R., Porterfield, D.M. 2009. Development and Application of Self-Referencing Optrode Sensing Technology for Measuring Biophysical Flux. *The Analyst*. 134: 2224-2232
- ul Haque, A., Diaz, R.E., Porterfield, D.M. 2009. Electrical characterization of a single cell electroporation biochip with the 2-D scanning vibrating probe. *Biomedical Microdevices*. 11: 1239-1250 (Distinguished by MedWorm as Biomedical Engineering Top 20)
- Chatni, R., Maier, D.E., Porterfield, D.M. 2009. Optimization of Oxygen Sensitive Optical Dye Membrane Polymers for Fluorescent Lifetime based Physiological Biosensing. *Sensors and Actuators B*. 141: 471-477.
- Liu, G., Li, Y., Porterfield, D.M. 2009. Genotypic Differences in Potassium Nutrition in Lowland Rice Hybrids. *Communications in Soil Science and Plant Analysis*, 40: 1803–1821.
- Porterfield, D.M., McLamore, E.R., Banks, M.K. 2009. Microsensor Technology for Measuring H<sup>+</sup> Flux in Buffered Media. *Sensors and Actuators B*. 136: 383-387
- Claussen, J., Franklin, A., ul Haque, A., Porterfield, D.M., Fisher, T. 2009. Electrochemical Biosensor of Nanocube-Augmented Carbon Nanotube Networks. *ACS Nano*. 3: 37–44 (Issue Cover Article)
- McLamore, E.R., Porterfield, D.M., Banks, M.K. 2009. Non-invasive self-referencing electrochemical sensors for quantifying real time biophysical flux in biofilms. *Biotechnology and Bioengineering*. 102:791-799. (Issue Spotlight Manuscript)
- Zuberi, M., Liu, P., ul Haque, A. Porterfield, D.M., Borgens, R.B., 2008. Large Naturally-Produced Electric Currents and Voltages Traverse Damaged Mammalian Spinal Cord. *J. Biol. Eng.* 2: 17
- Koehler, J.J., Zhao, J., Jedlicka, S.S., Porterfield, D.M., Rickus, J.L. 2008. A Compartmentalized Nanocomposite for Dynamic Nitric Oxide Release. *Journal of Physical Chemistry*. 112: 15086-15093.
- Sanchez, B.C., Ochoa-Acuña, H, Porterfield, D.M. Sepúlveda, M.S. 2008. Oxygen Flux as an Indicator of Physiological Stress in Fathead Minnow Embryos: A Real-Time Biomonitor Of Water Quality. *Environmental Science and Technology*. 42: 7010-7017.
- Porterfield, D.M., French, S.S., DeCarlo, A.R. 2008. The Development of a Biomimetic Root Oxygen Bioavailability Sensor. *Journal of Biological Engineering*. 1(2): 219-227.
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## Books and Text (2 in progress)

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- De Carlo, A.R., Porterfield, D.M. 2005. Cobalt (II) phthalocyanine as an ionophore for the detection of potassium. PittCon 2005, Orlando, FL.
- Morris, K.E., Porterfield, D.M. 2004. Nitric Oxide and cGMP Signaling and Gravity Dependent Cell Polarity in *Ceratopteris richardii*. Annual Meeting of the American Society for Gravitational and Space Biology. Abstract 31.
- Liu, G., Dunlop, J., Phung, T., Porterfield, D.M. 2003. Mobilization of Sparsely Soluble Phosphates - The Effects of Imbalance Between Anion and Cation Absorption, 2nd International Symposium on Phosphorus Dynamics in the Soil-Plant Continuum, Perth, Western Australia.
- Kim, S.S., Saythan, S., Porterfield, D.M., Nagle, H.T. 2003. Microsensors on a Flexible Plastic Substrate for Dissolved Oxygen Monitoring with Self-Calibration Capability. Pittcon 2003, Orlando, FL.
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- Stout, S.C., Porterfield, D.M., Roux, S.J. 2003. Calcium signaling during polarity development. Annual Meeting of the American Society for Gravitational and Space Biology Abstract 39.
- Porterfield, D.M., Liao J. 2002 Hypoxic root metabolism is not induced by disruption of gravity sensing in *Arabidopsis thaliana*. *Gravit. Space Biol Bull.* 15: 99.
- Porterfield D.M. 2002. Physiological flux of O<sub>2</sub> and H<sup>+</sup> through the rhizosphere of maize root tips are modulated in response to nitrogen metabolism. Am. Soc. Plant Biologists annual meeting (394).
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- Monje, O., Porterfield, D.M., Stutte, G.W. 2000. Boundary layers around plant leaf and root tissues depend on gravity. *Grav. Space Biol. Bull.* 14: 25.
- Porterfield, D.M., Monje, O., Stutte G.W., Musgrave, M.E. 2000. Rootzone hypoxic responses result from inhibition of gravity dependent oxygen transport in microgravity. *Grav. Space Biol. Bull.* 14: 50.
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- Porterfield, D.M., Baikie, I.D. 1999. Measurement of surface potential changes in phototropically stimulated corn coleoptiles using a multi-tip scanning bio-kelvin probe. *Grav. Space Biol. Bull.* 13: 40.
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- Chatterjee, A., Porterfield, D.M., Smith, P.J.S., Roux, S.J. 1998. Gravity-induced calcium currents in germinating fern spores. *Grav. Space Biol. Bull.* 12: 23.

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- Serikawa, K.A., Porterfield, D.M., Smith, P.J.S., Mandoli, D.F. 1998. Proton fluxes in *Acetabularia acetabulum* and their relationship to calcification patterns. *Mol. Biol. Cell* 9: 1955.
- Smith, P.J.S., Hammar, K., Porterfield, D.M. 1998. Calcium and oxygen flux measurements from single cultured neurons. *FASEB Journal* 12(4): A439.
- Porterfield, D.M., Musgrave, M.E. 1996. Oxytropism in plant roots. *ASGSB Bull.* 10(1) 23.
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- Kuang, A., Crispi, M., Xiao, Y., Porterfield, D.M., Musgrave, M.E. 1996. Effect of atmospheric oxygen on reproductive development of *Arabidopsis thaliana*. *ASGSB Bull.* 10(1): 68.
- Porterfield, D.M., Crispi, M.L., Musgrave, M.E. 1996. Metabolic responses of *Arabidopsis thaliana* to altered atmospheres. *Plant Physiol.* 111(2): 207.
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- Porterfield, D.M., Matthews, S.W., Musgrave, M.E., 1995. Activity, transcription, and localization of alcohol dehydrogenase in the roots of *Arabidopsis thaliana* as a result of spaceflight exposure. *ASGSB Bull.* 9(1): 16.
- Porterfield, D.M., Musgrave, M.E., Dreschel, T.W. 1995. Hypoxic metabolism and its effect on rootzone morphology in dwarf wheat grown on microgravity nutrient delivery systems. *Proceedings of the 11<sup>th</sup> Long Ashton Symposium on Plant Roots.*
- Porterfield, D.M., Musgrave, M.E., Dreschel, T.W. 1995. Rootzone morphology and alcohol dehydrogenase activity of dwarf wheat grown on nutrient delivery systems designed for microgravity application. *Plant Physiol.* 108(2): 148.
- Musgrave, M.E., Brown, C.S., Porterfield, D.M., Daugherty, C.J., Obenland, D.M., Matthews, S.W. 1994. Physiological changes in *Arabidopsis thaliana* during spaceflight. *Plant Physiol.* 105(1): 21.
- Porterfield, D.M., Daugherty, C.J., Matthews, S.W., Musgrave, M.E. 1994. Evidence of hypoxia in the roots of *Arabidopsis thaliana* during spaceflight. *ASGSB Bull.* 8(1): 14.
- Musgrave, M.E., Cummins, D.B., Matthews, S.W., Kuang, A., Daugherty, C.J., Porterfield, D.M. 1993. Growth and flowering of *Arabidopsis thaliana* during spaceflight. *ASGSB Bull.* 7(1): 183.
- O'Brien, J.J., Porterfield, D.M., Williams, M., Overstreet, R. 1993. Factors affecting infection of the blue crab by the rhizocephalan barnacle *Loxothylacus texanus* in the Gulf of Mexico. *Amer. Zool.* 33(5): 80a.
- O'Brien, J.J., Porterfield, D.M., Williams, M., Overstreet, R. 1993. Effects of salinity and temperature upon host-parasite interactions between the blue crab and the rhizocephalan *Loxothylacus texanus* in the Gulf of Mexico. *Proceedings of Benthic Ecology meeting* 38.

## INVITED LECTURES:

- Porterfield, D.M. 2010. The emergence of biological engineering for development of sustainable technologies, Plenary Speaker, International Conference for the Environment. Penang, Malaysia.
- Porterfield, D.M. 2010. Cell polarity and the role of NO, Ca<sup>++</sup>, and cGMP signaling. American Society for Gravitational and Space Biology, Plenary Session Speaker, Washington DC
- Porterfield, D. M. 2010. Gravitational and Space Biology: Advancing Research through Hypothesis Driven Engineering, Plenary Speaker, Chinese Society for Space Biology Annual Meeting, Beijing, China.
- Porterfield, D. M. 2010. New biosensors for physiology and medicine. School of Medicine, Tsinghua University, Beijing, China.
- Porterfield, D. M. 2010. Biophysical Biosensors and Physiological Sensing, Department of Physiology and Medicine, Peking University, Beijing China.
- Porterfield, D. M. 2010. Physiological sensors for agriculture and the environment. Institute for Crop Physiology. Beijing Normal University. Beijing, China.
- Porterfield, D. M. 2010. The Physiological Sensing Facility: a collaborative core organized to demonstrate the emerging, modern discipline of biological engineering at Purdue University. North Carolina State University, Hosted by the Vice Chancellor for Research.



- Porterfield, D. M. 2010. The Physiological Sensing Facility: A Trans-Center Facility Demonstrating the Emerging Discipline of Modern Biological Engineering. McGill University, Montreal, Canada, Hosted by the Dean of Engineering.
- Porterfield, D. M. 2009. Self-Referencing Physiological Sensing: A Technology Platform for Exploring the Rhizosphere. Chinese Academy of Science, Center for Eco-Environmental Sciences. Beijing, China.
- Porterfield, D. M. 2009. Engineering New Tools to Measure Biophysical Processes in Environmental Systems. Department of Environmental Science and Engineering, Tsinghua University. Beijing, China.
- Porterfield, D. M. 2009. New Advances in Biophysical Biosensors and Applications in Environmental Engineering. Centre for Research in Ecotoxicology and Environmental Remediation, Institute of Agro-Environmental Protection. Tianjin, China.
- Porterfield, D.M. 2009. Seminar Series Speaker, "BioMEMS approaches for advancing biosensors and physiological sensing. Yale University, Department of Electrical and Computer Engineering.
- Blatchley, E.R., Hua, I., Lu, H., Porterfield, D.M. 2008. Engineering for the Planet: Panel Discussion. Purdue-Silicon Valley Symposia, Santa Clara California, April 21, 2008
- Porterfield, D.M. 2008. BioMEMS and Photonic Sensor Technologies to Explore Form and Function in Biological Systems. University of South Florida, Department of Molecular Pharmacology and Physiology, Tampa, FL.
- Porterfield, D.M. 2008, Microsensor and Lab-on-a-Chip Technologies for Biological and Physiological Sensing. NASA Ames Research Center. Moffat Field, CA.
- McLamore, E.S., Porterfield, D.M., Banks, M.K. 2008. "Physiological Sensing in Environmental Engineering." Argonne National Laboratory. Argonne, IL.
- McLamore, E.S., Porterfield, D.M., Banks, M.K. 2008. "Physiological Sensing in Environmental Engineering." University of Massachusetts, Department of Civil Engineering, Amherst. Amherst, MA.
- McLamore, E.S., Porterfield, D.M., Banks, M.K. 2008. "Physiological Sensing in Environmental Engineering." University of Florida, Department of Environmental Engineering Sciences, Gainesville, FL.
- UI Haque, A., Porterfield, D.M. 2008. 1) Nanotechnology and medicine; 2) Microelectrode and biochip based sensors for medical diagnostics; 3) Principles of MEMS fabrication" H.E.J. Research Institute of Chemistry, ICCBS University of Karachi, Karachi, Pakistan.
- UI Haque, A., Porterfield, D.M. 2008. Nanotechnology in medicine. Dept. of Chemistry, Karachi University, Karachi, Pakistan.
- UI Haque, A. Porterfield D.M. 2008. Invited lecture: Nanotechnology and the path to graduate school in the US. Dept. of Biomedical Eng. NED University of Eng. and Tech, Karachi, Pakistan.
- Porterfield, D.M. 2007. Sensor technology for biological and physiological sensing. North Dakota State University, Departments of Biological Sciences, and Agriculture and Biological Engineering
- Porterfield, D.M. 2007. Advanced technology for measuring physiological processes in plant systems. Dahlia Greidinger Symposium 2007, Advanced Technologies for Monitoring Nutrient and Water Availability to Plants. Grand Water Research Institute, Technion - Israel Institute of Technology, Haifa.
- Porterfield, D.M. 2007. Advances in BioMEMS and Self-Referencing Optrodes for Physiological Sensing. University of Massachusetts-Amherst. Molecular and Cell Biology Seminar Program.
- Porterfield, D.M. 2007. The Role of Calcium, Nitric Oxide, and cGMP Signaling Cascades in the Development. Miami University, Ohio. Department of Botany Seminar Series.
- Porterfield, D.M. 2007. The development of advanced physiological sensor technologies to study plant systems. Department of Agronomy, Purdue University (PSF Outreach).
- Porterfield, D.M. 2006. Developing technology for physiological sensing at Purdue University. Department of Biomedical Engineering, Purdue University.
- Porterfield, D.M. 2006. In silico cell electrophysiology and the role of trans-cellular calcium currents in cell polarity signaling in *Ceratopteris richardii*. Department of Horticulture and Landscape Architecture, Purdue University.
- Porterfield, D.M. 2006. Bioanalytical Electrochemistry for Quantitative Measurement of Biomolecules, and Reactive Oxygen Species including NO. Plenary Lecture in Methods Workshop. International Conference on the Biology, Chemistry, and Therapeutical Applications of Nitric Oxide. Monterey, CA.
- Porterfield, D.M. 2006. The Physiological Sensing Facility: Advancing Technology for Multidimensional BioSensing. Department of Animal Science, Purdue University. (PSF Outreach).
- Porterfield, D.M. 2006. Signaling in gravity dependent developmental polarity in *Ceratopteris richardii*. Gulbenkian Institute, University of Lisbon, Portugal.

- Porterfield, D.M. 2006. BioMEMS and self-referencing optical sensors as tools for physiological sensing. Department of Biochemistry, Center for Obesity Research, Boston University.
- Porterfield, D.M. 2006. The use of a cell electrophysiology lab-on-a-chip device to study the dynamics of cell gravity sensing and signaling during microgravity flight on the C-9B. Kennedy Space Center, Headquarters Building.
- Porterfield, D.M. 2005. NO signaling in plant gametophyte systems. University of Alabama-Birmingham. School of Medicine: Dept. of Physiology and Biophysics.
- Porterfield, D.M. 2005. Physiological Sensing for Biomarkers in Cancer: New Tools for Basic Research and Medicine. Discovery Park Oncological Sciences Symposia, Purdue University.
- Porterfield, D.M. 2005. Multidimensional Sensing for Cellular Physiomics. University of Michigan, Department of Chemistry.
- Porterfield, D.M. 2004. Self-Referencing Sensor Technologies For Micro- to Nano-Scale Biological Measurements. Food Sciences and Engineering Unit Seminar Series. University of Missouri-Columbia.
- Porterfield, D.M. 2004. New Sensor Technologies for Biological Research. Materials Research Center, University of Missouri-Rolla
- Liu, G, Dunlop, J., Phung, T., Porterfield, D.M. 2003. Principles of phosphate availability in complex soil systems. CSIRO, Canberra, Australia.
- Porterfield, D.M. 2003. Advanced Biosensor Technologies for Bioterrorism and Biodefense. Science and Technology Conference. Ft. Leonard Wood, US Army.
- Porterfield, D.M. 2003. Biosensors for the advancement of agricultural research. Institute of Natural Resources and Regional Planning, Chinese Academy of Agricultural Sciences (CAAS), Beijing, China.
- Porterfield, D.M. 2003. Gravity mediated biophysical parameters in the rhizosphere. Institute of Subtropical Agriculture, Chinese Academy of Sciences (CAS), Changsha, China.
- Porterfield, D.M. 2003. Advances in biosensor development, and their application to plant stress physiology research. Institute of Soil and Water Conservation, Chinese Academy of Sciences (CAS), Yangling, China.
- Porterfield, D.M. 2002. Electroanalytical sensors technologies for measuring nitric oxide in biological and biomedical systems. Plenary Lecture in Methods Workshop. International Conference on the Biology, Chemistry, and Therapeutical Applications of Nitric Oxide. Prague, Czech Republic.
- Porterfield, D.M. 2002. Self-Referencing Sensors and their use in basic biological research. AgResearch Grasslands Research Center, Palmerston North, New Zealand.
- Porterfield, D.M. 2002. Merck Lecturer: Advanced sensor technologies for micro- to nano-scale biological measurements. University of South Alabama, Mobile Alabama.
- Porterfield, D.M. 2001. Biophysical limitations in gas exchange and physiological transport in microgravity. Department of Biology, University of Louisiana-Lafayette.
- Porterfield, D.M. 2001. Development of new research technologies and advances in plant physiology research. North Carolina State University, Department of Botany.
- Porterfield, D.M. 2001. The root oxygen bioavailability sensor: A new tool for monitoring rhizosphere processes for crop production in controlled environments. Johnson Space Center, Advanced Life Support Research Group.
- Porterfield, D.M. 2001. Indirect effects of microgravity exposure on root physiology. NASA National Specialized Center of Research and Training for Gravitational Biology, Raleigh, NC.
- Porterfield, D.M. 2000. New adventures in plant physiology using developing sensor technologies. Washington University, Department of Biological Sciences, Plant Biology Seminar Series.
- Porterfield, D.M. 2000. Developing advanced electroanalytical sensor technologies for progress in cell biology research. LSU Medical Center, New Orleans.
- Porterfield, D.M. 2000. Gravity-dependent physiological processes in plants: Metabolism and tropic responses in spaceflight exposed roots. Department of Botany, University College Dublin, Ireland.
- Porterfield, D.M. 2000. New Sensors for Plant Research. Interdisciplinary Plant Group, University of Missouri-Columbia.
- Porterfield, D.M. 2000. The relationship between metabolism and tropic responses in roots exposed to microgravity. Advanced Life Support and Gravitational Biology research group, NASA, Kennedy Space Center.
- Porterfield, D.M. 2000. Probing the physiology of single cells using advanced sensor technology. Department of Chemical Engineering, University of Missouri-Rolla.
- Porterfield, D.M. 2000. The self-referencing electrochemical microelectrode technique: a new tool for cell biology research. Department of Molecular and Cellular Physiology, LSU Medical Center, Shreveport.
- Porterfield, D.M. 1997. Understanding the metabolic and tropic responses of plant roots grown in space. Boston University Marine Program seminar series.

- Porterfield D. M., Musgrave M.E. 1996. Nutrient delivery technologies and root metabolism in space. Institute of Botany and Pharmaceutical Biology, Freidrich-Alexander University, Erlangen, Germany.
- Porterfield, D.M., Musgrave, M.E., Matthews, S.W. Dreschel, T.W. 1995. Root metabolism in space: considerations in characterizing microgravity application nutrient delivery systems. Department of Biological Sciences, University of Nottingham, United Kingdom.

## CONFERENCE PRESENTATIONS:

- ul Haque, A., Claussen, J.C., Porterfield, D.M., 2009. A Novel PharmaSat Compatible Lab-on-a-chip Platform for Studying Cyanobacterial Gravitational Physiology. Selected Oral Presentation, American Society of Gravitational and Space Biology Annual Meeting, Raleigh, North Carolina. *Gravit. Space Biol. Bull.* 23:18.
- McLamore, E.S., Jaroch, D., Rickus, J.L., Porterfield, D.M., Banks, M.K. 2009 Real Time Physiology of Silica-Entrapped Biofilms Used for Water Reuse in Life Support. Selected Oral Presentation, American Society of Gravitational and Space Biology Annual Meeting, Raleigh, North Carolina. *Gravit. Space Biol. Bull.* 23:18.
- Porterfield, D.M. 2008. BioMEMS approaches for monitoring real-time calcium signaling in single cells during parabolic microgravity flight exposure. European Space Agency Sponsored International Congress: Life in Space for Life On Earth. Angers France, June 20-24.
- Porterfield, D.M., Musgrave, M.E. 2008. Biophysical transport in microgravity and associated effects on plant metabolism. European Space Agency Sponsored International Congress: Life in Space for Life On Earth. Angers France, June 20-24.
- Porterfield, D.M., Sanchez, B.C., Ochoa-Acuña, H., Sepúlveda, M.S. 2008. Physiologically coupled biosensing as a new approach for environmental monitoring. Annual Meeting of the Institute of Biological Engineering, Chapel Hill, NC.
- Porterfield, D.M., ul Haque, A. 2008. An Integrated BioMEMS Approach for Studying Electrophysiological Signaling in Single Cells. Annual Meeting of the Institute of Biological Engineering, Chapel Hill, NC.
- Porterfield, D.M., French, S.S., DeCarlo, A.R. 2008. Biometric sensing for root oxygen bioavailability. Annual Meeting of the Institute of Biological Engineering, Chapel Hill, NC.
- Porterfield, D.M. 2008. BioMEMS approaches for monitoring real-time calcium signaling in single cells during parabolic microgravity flight exposure. Life In Space For Life On Earth, European Space Agency Sponsored International Congress (International Society for Gravitational Physiology, the American Society for Gravitational and Space Biology and the European Low Gravity Research Association. Angers France.
- Porterfield, D.M., Musgrave, M.E. 2008. Biophysical transport in microgravity and associated effects on plant metabolism. Life In Space For Life On Earth, European Space Agency Sponsored International Congress (International Society for Gravitational Physiology, the American Society for Gravitational and Space Biology and the European Low Gravity Research Association. Angers France.
- Porterfield, D.M. 2007. The Development of a Biomimetic Root Oxygen Bioavailability Sensor. Conference for Biological Sensorics: Critical Technologies for Future Biosystems, sponsored by the American Society for Agricultural and Biological Engineering, Minneapolis, MN, June 15-17.
- Porterfield, D.M. 2006. Developments in bioMEMS and self-referencing optrode sensors for measuring biophysical calcium flux and metabolism in cells and tissues. International Conference on Mineralized Tissue Formation, Regeneration, and Repair, Lisbon, Portugal, November 16-17.
- Porterfield, D.M., Rickus, J.L., Kopelman, R. 2006. Measurements of Respiratory Oxygen Flux Using a Non-Invasive, Self-Referencing Oxygen Optrode. International Conference on Respiratory Biology, Bonn, Germany, June 25-29.
- Porterfield, D.M. 2006. From cells to tissues, technology for studying membrane transport physiology in plant systems. Pan Am Plant Membrane Workshop, South Padre Island, Texas, May 17-21.
- Porterfield, D.M. 2006. Bioanalytical Electrochemistry for Quantitative Measurement of Biomolecules, and Reactive Oxygen Species including NO. Plenary Lecture in Methods Workshop. International Conference on the Biology, Chemistry, and Therapeutical Applications of Nitric Oxide. Monterey California, June 25-29.
- ul Haque, A., De Carlo, A.R., Rokkam, M. Wereley, S.T., Wells, H.W., McLamb, W.T., Roux, S.J., Porterfield, D.M. Design, fabrication and characterization of an in silico cell physiology lab for measuring cellular responses to microgravity. International MEMS conference. Singapore, May 9-12, 2006.
- ul Haque, A., De Carlo, A.R., Rokkam, M. Wereley, S.T., Wells, H.W., McLamb, W.T., Roux, S.J., Porterfield, D.M. 2006 Biochip Sensor Systems For In Silico Cell Physiology, Institute of Biological Engineering Annual Meeting. March 8-12.

- De Carlo, A.R., Porterfield, D.M. 2005. Cobalt (II) phthalocyanine as an ionophore for the detection of potassium. Pittcon 2005, Orlando, FL.
- Kim, CS, Porterfield, D.M. 2004. Flexible Microsensor Array for the Monitoring and Control of Plant Growth Environment. Habitation Conference, Orlando, FL. Abstract ID: MC25.
- Liao, J., Monje, O., Porterfield, D.M. 2002. Induction of hypoxic root metabolism results from physical limitations in  $O_2$  bio-availability in microgravity. World Space Congress, Invited talk. Committee on Space Research, Annual Meeting.
- Porterfield, D.M. 2002. Electroanalytical sensors technologies for measuring nitric oxide in biological and biomedical systems. Plenary Lecture in Methods Workshop. International Conference on the Biology, Chemistry, and Therapeutical Applications of Nitric Oxide. Prague, Czech Republic.
- Porterfield, D.M. 2002. Advanced sensor technologies for micro- to nano-scale biological measurements. IEEE Sensors Meeting, Orlando, FL.
- Porterfield, D.M. 2002. Electroanalytical Self-Referencing Microsensors for Biological Research. PittCon, New Orleans.
- Porterfield, D.M., and Liao, J. 2002. Hypoxic root metabolism is not induced by disruption of gravity sensing in *Arabidopsis thaliana*. Annual Meeting of the American Society of Space and Gravitational Biology.
- Prado, A. M. M.; Porterfield D. M.; Feijó J.A. 2001. When pollen tubes say No to NO. Selected Oral Presentation, Joint meeting of affiliated European societies for microscopy and cell biology. Proceedings of the Microscopy, Barcelona 2001 Meeting. Designated co-senior authors.
- Monje, O., Porterfield, D.M., Stutte, G.W. 2000. Boundary layers around plant leaf and root tissues depend on gravity. Selected oral presentation, American Society for Gravitational and Space Biology annual meeting. Montreal, Canada.
- Porterfield, D.M., Monje, O., Stutte G.W., Musgrave, M.E. 2000. Rootzone hypoxic responses result from inhibition of gravity dependent oxygen transport in microgravity. Selected oral presentation, American Society for Gravitational and Space Biology annual meeting. Montreal, Canada.
- Chatterjee, A. Porterfield, D.M., Eastburn, D.J., Roux S.J. 1998. Cellular and molecular changes due to developmental polarity established by gravity in a single cell. Oral presentation, American Society of Plant Physiologist annual meeting. Providence, RI.
- Smith, P.J.S., Porterfield, D.M., Keefe, D.L. 1998. The self-referencing microelectrode technique as a tool to study early embryo development. Invited talk, International Embryo Transfer Society annual meeting. Boston, MA.
- Porterfield, D.M., Neichitailo, G. S., Mashinski, A. L., Musgrave, M.E. 1996. A brief history of complete plant growth systems in space. Invited talk, 31st COSPAR Scientific Assembly, Birmingham, United Kingdom.
- Porterfield, D.M., Musgrave, M.E. 1995. Spaceflight induced changes in ADH activity, expression and localization. Oral presentation, Southern Section of the American Society of Plant Physiologists annual meeting.
- Porterfield, D.M., Daugherty, C.J., Matthews, S.W., Musgrave, M.E. 1995. Hypoxic metabolism in the roots of *Arabidopsis thaliana* as a result of spaceflight exposure. Oral presentation, Southern Section of the American Society of Plant Physiologists annual meeting.

## INTELLECTUAL PROPERTY:

### Patent Awards

- Porterfield, D.M., Cassens, D. Biochemical Signaling Mechanisms for Controlling Wood Staining and Color During Post-Harvest Processing. Patent award date July 10, 2012. US Patent 8216644.
- Claussen, J.C., Franklin, A.D., Fisher, T.S., Porterfield, D.M. Electrochemical nanosensor. Patent award date May 6, 2014. US Patent 8715981
- Porterfield, D.M., Cha, T.G., Choi, J.H., Claussen, J.C., Diggs, A.R., Shi, J. Microbiosensors based on DNA modified single-walled carbon nanotube and Pt Black Nanocomposites. Patent Awarded November 11, 2014. US Patent 8882977.

### Patent Filed

- Liu, G., Porterfield, D.M. Solid Chemical Fertilizers to Improve Oxygen Bioavailability for Seed Germination and Plant Growth. US patent filed: January 2006, Serial No. 60/762,773. International patent filed: January 2007. International Application Number PCT/US2007/002200.
- Maier, D.E., Porterfield, D.M. Insect Time of Death (i-TOD) Pest Biosensor. Provisional patent and licensing with Insects Limited Inc. Provisional patent in progress. Utility patent filed, 2008.

### Provisional

Sanchez, B.C., Ochoa-Acuña, H, Porterfield, D.M. Sepúlveda, M.S. Determination of Water Quality by Measurement of Oxygen Flux in a Living Organism. US Provisional Patent Serial No. 60/988,594.

Porterfield, D.M. In silico biosensor array for multi-analyte detection. US Provisional Patent Serial No. 60/971,170.

Porterfield, D.M., ul Haque, A., Wereley, S.T. The Microfluidic Ion Sensor Array (MISA) Biochip for *In silico* Cell Physiology. Invention Disclosure with Purdue Office of Technology Commercialization, July, 2005. US Provisional Patent Serial No. 60/971,164.

Porterfield, D.M. Multi-Analyte Detection Biochip for Measuring Indicators of Skeletal Muscle Loss, Bone Loss, and Radiation Damage. US Provisional Patent Serial No. 60/971,170.

Claussen, J., Porterfield, D.M., Fisher, T. Nanocube-Augmented Carbon Nanotube Glucose Biosensor. US Provisional Patent Serial No.

## RESEARCH FUNDING:

Musgrave, M.E., Porterfield, D.M. 1995-1998. Astroculture root metabolism and cytochemical analysis. NASA, Johnson Space Center, TX. Grant number NAG9-860. \$16,000 (100%)

Porterfield, D.M. 2000-2001. New sensors for plant science research: The study of metal transport in the roots of *Typha latifolia*. Missouri Research Board. \$35,000 (100%)

Porterfield, D.M. 2001-2003 Root metabolism and ion transport mechanisms during hypoxia and anoxia in maize roots. USDA-NRI, Plant responses to the environment. \$145,000 (100%)

Burken, J.G., Fitch, M/L., Mormile, M., Porterfield, D.M. 2003-2006. Acquisition of Natural Treatment Systems Research. MRI: National Science Foundation, Award 0320721; \$436,797 (\$63,000 to Porterfield)

Kim, C.S. and Porterfield, D.M. 2004-2005. A flexible microfluidic substrate for plant root zone. Missouri Research Board. \$21,800 (\$11,400 to Porterfield)

Baskin, T., and Porterfield, D.M. 2003-2007. Regulation of division and elongation during root growth. National Science Foundation, Award 0316876; \$445,000 total, (\$145,000 to Porterfield as subcontract from UMass)

Porterfield, D.M., and Wereley, S. 2005-2007. The microfluidic ion sensor array (MISA) for monitoring single cell ion fluxes. NASA. \$180,000 (\$110,000 to Porterfield)

Porterfield, D.M., Rickus, J.L. 2005-2007. Multifunctional sensors for biological and environmental sensing. Lily Foundation, Bindley Bioscience Center, and Center for the Environment. \$100,000 (100%)

Porterfield, D.M. 2006-2008. Development of a sensor for the plant hormone auxin: A new technology to enable plant science research. Agricultural Research Program Assistantship. \$34,000 (100%)

Evans, J., Cherkauer, K.A., Porterfield, D.M. Wireless sensor networks for spatial observations of environmental properties. Discovery Park Center for the Environment (C4E) Seed Grant Program. 2006-2007. \$75,000. (NA)

Sepúlveda, M., Adamec, J., Kane, M, Porterfield, D.M., Ochoa-Acuña, H. 2006-2007. From Genomics to Physiomics: Development of tools for environmental assessment and real-time sensing of contaminants. Discovery Park Center for the Environment (C4E) Seed Grant Program. \$75,000 (\$8,000)

Lancaster, J.R., Porterfield, D.M. 2006-2007 Studies of nitric oxide biochemistry in cardiovascular physiology. NIH. \$425,000 (\$40,000 to Porterfield as subcontract from University of Alabama-Birmingham)

Sherman, D. (PI), D. M. Porterfield (One of many minor Co-PIs). 2007. Dual Beam Electron Microscopy for Life Sciences Application. Instrumentation grant-DOE. \$414,000 (NA)

Vanryckeghem, A.; Porterfield, D.M. 2008-2009. Insect time of death biosensor development for stored product fumigation. SBIR-USDA. \$160,000 including state match (\$48,000 to Porterfield for graduate student support and direct equipment purchases).

Porterfield, D.M., Díaz-Rivera, R.E. 2008-2010 The use of the vibrating voltage probe to study electric fields during single cell electroporation. Collaboration in Biomedical Engineering Research (CIBER): Graduate Student Fellowship Grant. \$100,000 (\$50,000 to Purdue).

Ricco, A.T.; Porterfield, D.M., 2008-2011 GraviSat: A Nanosatellite-Compatible System to Generate Artificial Gravity using a Rotating CD Platform for Space Studies of Microorganisms and Cells. NASA Astrobiology Program \$986,686 (\$175,830 to Porterfield as a subcontract from NASA Ames Research Center).

Porterfield, D.M. 2008-2011 Development of a bioMEMS approach for cell and tissue network electrophysiology. Office of Naval Research-Undersea Medicine \$378,511 to Purdue.

Porterfield, D.M. 2009-2011 Early Gravid Perception and Polarity in Single Cells. NASA Fundamental Space Biology Program. NRA NNH08ZTT003N \$314,441

Porterfield, D.M. 2009-2010 Purdue Research Foundation: Application of nanomaterials for advanced electrochemical coupling for biosensors. \$30,000

Porterfield, D.M. 2009-2010. NASA Earth and Space Science Fellowship/Gravitational Physiology of the Photoautotroph Cyanobacteria, A Novel Study with a Pharmasat Compatible Lab-on-a-Chip. \$50,000

Porterfield, D.M. 2009-2010. NSF IDBR-EAGER/A Platform for Self-Referencing Optrodc Sensing. \$120,000

Porterfield, D.M. 2009-2012. NSF/Physiologically-Coupled Biosensing Approaches for Real-time Monitoring of Environmental Contaminants. \$397,282

Porterfield, D.M. 2010-2014. NASA Stand Alone Missions of Opportunity (FSB-Astrobiology). Sporesat: A microsatellite flight mission to measure the threshold for gravity sensing in single cells. \$2,000,000.

Porterfield, D.M. 2010-2013. NIH. The Goldman Chip. A bioMEMS platform for integrated cell electrophysiology. \$475,000.

Porterfield, D.M. 2011-2014. Nestle/Gerber. Optical Sensors for Smart Packaging Technology. \$475,000.

Banks, K.M., Porterfield, D.M. 2011-2014. Environmental Protection Agency. Self-powered autonomous sensor networks for environmental applications. \$700,000.

**Over his career Dr. Porterfield and his collaborators have obtained \$9,586,027 worth of grant funding. He was responsible for \$7,022,647 of that funding. This funding was 96% from external sources. At Purdue he and his co-investigators have obtained \$8,914,430 in grant funding, and he was responsible for \$6,752,274 of this funding. At Purdue, 95% of this funding was from external agencies including the Department of Defense, the Environmental Protection Agency, the National Science Foundation, the National Institutes of Health, the National Aeronautic and Space Administration, and the United States Department of Agriculture.**

## ENGAGEMENT

### PROFESSIONAL ACTIVITIES:

#### Journal Editor

- Special Editor for Advances in Space Research (2001-present)  
2003, Volume 31: Space Life Sciences: Mission to Mars, Radiation Biology, and Plants as a Foundation for Long-Term Life Support Systems in Space. Editors: Horneck, G., Vasquez, M.E., Porterfield, D.M.
- 2005, Volume 33: Space Life Sciences: Gravity Related Effects on Plants and Spaceflight and Man-Made Environments on Biological Systems. Editors: Hasenstein, K.H., Levine, H., Porterfield, D.M.
- Editorial Board Member for Sensors (2006-present)
- Special Issue Editor for journal Sensors. Volume completed 2008: Development of sensor technology for physiological sensing. Editor: Porterfield, D.M.
- Special Issue Editor for journal Sensors. Volume in progress: BioMEMS approaches for physiological sensing. Editor: Porterfield, D.M.

#### Journal Manuscript Peer Review

- Reviewer for Advances in Space Research (5-10 per year)
- Reviewer for Biosensors and Bioelectronics (5-10 per year)
- Reviewer for Cellular and Molecular Life Sciences (1-2 per year)
- Reviewer for Environmental and Experimental Botany (1-2 per year)
- Reviewer for Habitation (1-2 per year)
- Reviewer for Hypertension (1 per year)
- Reviewer for Journal of Experimental Botany (2-4 per year)
- Reviewer for Nitric Oxide (4-6 per year)
- Reviewer for Plant Physiology (4-6 per year)
- Reviewer for Sensors and Actuators (4-6 per year)

#### Grant Review and Panel Member

- Panel Member, National Science Foundation and the Ecological Society of America, Sustainability in Biological Research Infrastructure Workshop (2010)
- Panel Member, National Academies, Pathogen/Disease Detection (PDD) citrus panel meeting (2008)
- Primary reviewer for NASA Special Initiative Program (2008)
- Primary reviewer for NASA Space Life Sciences Grants (2001, 2003)
- Primary reviewer NSF Biology Directorate (sensors and bio-complexity) (2003)
- Primary reviewer/panel member (2000-2008) NSF Engineering Directorate (BioTechnology).

- Primary reviewer/panel member (2007-2008) NSF Engineering Directorate (Environmental Technology).
- Primary reviewer/panel member NSF Engineering Directorate (Biomedical devices) (2005)
- Primary reviewer for USDA/NRI, Plant Responses to the Environment (2002, 2005, 2006)
- US-Israel Binational Agricultural Research and Development Fund, Ad-Hoc proposal review (2006-2007)

### **Professional Society Service**

- American Society for Gravitational and Space Biology: Governing Board member (Three year term: 2006-2009).
- American Society for Gravitational and Space Biology: Finance Committee member (2004-present).
- American Society for Gravitational and Space Biology: Public Affairs Committee member (2002-present).
- American Society for Gravitational and Space Biology: Session Chair, Spaceflight Experiment Results, (Annual Meeting-2006)
- American Society for Gravitational and Space Biology: Judge for undergraduate student poster competition, (Annual Meeting-2006)
- American Society for Gravitational and Space Biology: Session Chair, Plant physiology, (Annual Meeting-2008)
- Institute of Biological Engineering: Membership Committee (2006-present)
- Institute of Biological Engineering: Conference Committee (2007-present)
- Institute of Biological Engineering: Session Chair and Organizer, Biology-Inspired Sensors (Annual Meeting-2007)
- Institute of Biological Engineering: Conference Chair and Organizer for Annual Meeting-2008, Raleigh, NC
- Institute of Biological Engineering: Conference Chair and Organizer for Annual Meeting-2009, Santa Clara, CA
- Smart Medical and Biomedical Sensor Technology Conference. (Conference co-chair) Society for Photo-Optical Instrumentation Engineers: Optics East 2007 (September) annual meeting
- Sigma Xi: Vice President of University of Missouri-Rolla Chapter (2001-2002)
- Sigma Xi: President of University of Missouri-Rolla Chapter (2002-2004)