

BIOGRAPHICAL SKETCH

Name	Position title
Peter John Shand Smith	Senior Scientist

Education/Training

Institution and location	Degree	Year conferred	Field of study
University of Aberdeen, Scotland	BS	1976	Zoology
University of Aberdeen, Scotland	PhD	1980	Physiology
University of Cambridge, England	MA	1991	Neurobiology

Principal Research and Professional Experience

1979- 1982 Research Associate, Univ. of Manchester, Dept. of Zoology, UK. (With D.M. Guthrie)

1982- 1984 Research Associate, Univ. of Cambridge, Dept. of Zoology, Cambridge, UK. (With J.E. Treherne)

1985- 1987 Leverhulme Research Fellow, Univ. of Cambridge, Dept. of Zoology, Cambridge, UK

1987- 1990 Higher Scientific Officer, AFRC Unit of Insect Neurophys. & Pharm., Dept. of Zool., Cambridge

1990- 1991 Senior Scientific Officer, AFRC Lab. Molecular Signalling, Dept. of Zoology, Cambridge

1992- 1999 Associate Scientist, Marine Biological Laboratory, Woods Hole, Mass. USA

1992- 1993 Co-Director, NIH NVPF, Woods Hole, Mass. USA. (With L.F. Jaffe)

1995- present Adjunct Professor, Zoology Dept., University of Rhode Island, Kingston, R.I.

1994- 1996 Director and Principal Investigator, NIH NCRR National Vibrating Probe Facility

1996- present Director and Principal Investigator, NIH NCRR BioCurrents Research Center

1997- present Consultant, Massachusetts General Hospital, Renal Unit, Program Project Grant

1999- present Senior Scientist, Marine Biological Laboratory, Woods Hole, MA

1999- present Consultant, CIR Biomedical Engineering and Technology, Falmouth, MA

2001- present Member of the Astrobiology Program, Marine Biological Laboratory, Woods Hole, MA

2003- 2008 Director, Molecular Physiology Program, MBL

2007- present Honorary Professor, School of Electronic Engineering, University of Wales

2007- present Member, Institute for Molecular & Nanoscale Innovation, Division of Engineering Brown Univ.

2008- present Professor of Engineering (Adjunct: Research), Brown University, RI

2008- present Director, Cellular Dynamics Program, Marine Biological Laboratory (MBL)

2008 Steering Committee, Brown University Clinical Science Translational Award

Honors

1972- 1976 Turner Scholarship in Biology; Nicol Prize in Zoology; MacGillivray Prize in Zoology.

1976 Graduated 1st Class Honors – Zoology (equivalent to *Summa cum laude*).

1976- 1979 Scholarship from the Carnegie Trust for the Universities of Scotland.

1985 Samuel Riker Fellowship from the Bermuda Biological Station (Bermuda).

1985- 1988 Leverhulme Research Fellow, Cambridge.

1986- 1991 Fellow, Sidney Sussex College, Cambridge.

1996, 2003, 2005, 2006, 2007 (twice), 2008 (3 times): Special Study Sections NIH:NCRR & NIBIB

2001 & 2002 Ad hoc member of the Endocrinology Study Section NIH

Societies

American Association for the Advancement of Science; Biophysical Society; Institute of Biology (UK); Soc. for General Physiol.; Soc. for Exp. Biology; Neuroscience Society; Corporate Member of the Marine Biological Laboratory.

Patents

Polarographic self-referencing probe and method for using. Patent no. 5,9683,40: 2000.

Determining ion flux of embryos and oocytes. Patent no. 08/732,618: 2000.

Self-referencing enzyme based microsensor and method of use. Patent application no. 09/966,581

Application of the Kelvin probe technique to mammalian skin and other epithelial structures. Patent app. no. 60/534,910

Editorial Boards

IET Nanobiotechnology
Biology of the Cell.

Selected full publications from 140 research papers, book chapters and reviews

- Smith P.J.S.** (1995) The non-invasive probes - tools for measuring transmembrane ion flux. Nature 378: 645-646 (invited method review).
- Breton, S., Smith, P.J.S., Lui, B. and Brown, D.** (1996) Acidification of the male reproductive tract by a proton pumping ATPase. Nature Medicine 2: 470-472.
- Baikie, I.D., Smith, P.J.S., Porterfield, D.M. and Estrup, P.J.** (1999) Multi-tip scanning Bio-Kelvin probe. Rev. Sci. Instr. 70: 1842-1850.
- Katoh, K., Hammar, K., Smith, P.J.S. and Oldenbourg, R.** (1999) Arrangement of radial actin bundles in the growth cone of *Aplysia* bag cell neurons shows the immediate past history of filopodial behavior. Proc. Natl. Acad. Sci. USA 96: 7928-7931.
- Trimarchi, J.R., Liu, L., Porterfield, D.M., Smith, P.J.S. and Keefe, D.L.** (2000) Oxidative phosphorylation-dependent and -independent oxygen consumption by individual preimplantation mouse embryos. Biol. Reprod. 62: 1866-1874.
- Trimarchi, J. R., Liu, L., Smith, P.J.S. and Keefe, D. L.** (2000) Non-invasive measurement of potassium efflux as an early indicator of cell death in mouse embryos. Biol. Reprod. 63: 851-857.
- Smith, P.J.S. and Trimarchi, J. R.** (2001). Non-invasive measurement of hydrogen and potassium ion flux from single cells and epithelial structures. Am. J. Physiol. 280: C1-C11.
- Kumar, S. M., Porterfield, D.M., Muller, K.J., Smith, P.J.S. and Sahley, C.L.** (2001) Nerve injury induces a rapid efflux of nitric oxide (NO) detected with a novel NO microsensor. J. Neurosci. 21: 215-220.
- Smith, P.J.S., Haydon, P.G., Hengstenberg, A. and Jung S.-K.**(2001) Analysis of cellular boundary layers and their modulation by plasma membrane transporters: Application of electrochemical microsensors. Electrochimica Acta 47 283-292.
- Jung, S.-K., Trimarchi, J.T., Sanger, R.H. and Smith, P.J.S.** (2001) Development and application of a self-referencing glucose microsensor for the measurement of glucose consumption by pancreatic β -cells. Anal. Chem. 72 (15): 3759-3767
- Howes, E.A. and Smith P.J.S.** (2001) Glial Cell Involvement in Brain Repair and the Effects of Aging. In: Neuroglia in the Aging Brain Ed. Jean S. de Vellis. 113-134.
- Lui, L., Hammar, K., Smith, P.J. S., Inoue, S. and Keefe, D.L.** (2001) Mitochondrial modulation of calcium signaling at the initiation of development. Cell Calcium 30(6): 423-433.
- Trimarchi, J.R, Liu, L., Smith, P.J.S., and Keefe, D.L.** (2002) Apoptosis recruits two-pore domain potassium channels used for homeostatic volume regulation. Am J Physiol. 282(3):C588-94.
- Dumollard R., Hammar K., Porterfield M., Smith P.J., Cibert C., Rouviere C. and Sardet C.** (2003) Mitochondrial respiration and Ca^{2+} waves are linked during fertilization and meiosis completion. Development 130(4): 683-692.
- Pepperell, J.R., Porterfield, D.M., Keefe, D.L., Behrman, H. and Smith, P.J.S.** (2003) Control of ascorbic acid efflux in rat luteal cells: Role of intracellular calcium and oxygen radicals. Am. J. Physiol. 285(3): C642-51
- Katzman S.M., Messerli, M.A., Grossman, A., Harel, T., Barry, D.T., Smith, P.J.S., Chenault, V.M. and Shirihai, O.** (2004) Mitochondrial metabolism reveals a distinguished functional architecture in intact islets of Langerhans from normal and diabetic *Psammomys obesus*. Am. J. Physiol 287(6): E1090-E1099.
- Twig, G., Graf, S., Messerli, M.A., Sung, S.K., Smith, P.J.S. and Shirihai, O.** (2005) Synergistic amplification of β -Amyloid and INF-induced microglial neurotoxic response by the senile plaque component, Chromogranin A. Am. J. Physiol. 288, C169-C175.
- Beaulieu, V., Da Silva, N., Pastor-Soler, N., Brown, C.R., Smith, P.J.S., Brown, D. and Breton, S.** (2005) Modulation of the actin cytoskeleton via gelsolin regulates vacuolar H^+ ATPase (V-ATPase) recycling. J. Biol. Chem 280, 8452-8463.
- Graber, S.S., Lewis, R., Messerli, M.A., Hammar, K., Hubert, M., Indyk, E. and Smith, P.J.S.** (2005) Monitoring Cl⁻ movement in single cells exposed to hypotonic solution. J. Memb. Biol. 203 101-110.
- Messerli, M.A., Amaral-Zetter, L.A., Zettler, E., Jung, S.K., Smith, P.J.S. and Sogin, M.L.** (2005) Life at acidic pH imposes an increased energetic cost for a Eukaryotic acidophile. J. exp. Biol. 208, 2569-2579.
- Li, R., Chase, M., Jung, S.-K., Smith, P.J.S. and Loeken, M.R.** (2005) Hypoxic stress in diabetic pregnancy contributes to defective embryo gene expression and defective development by inducing oxidative stress. Am. J. Physiol. 289, E591-599.

- MacLellan, J.D., Gowing, A., Gerrits, M., Smith, P.J.S., Sivitz, W., Wheeler, M.B. and Harper, M.-E.** (2005) Increased uncoupling protein 3 stimulates fatty acid, but not glucose oxidation, and decreases reactive oxygen species in muscle cells. *Diabetes* 54, 2343-2350.
- Osborn, D., Sanger, R.H. and Smith P.J.S.** (2005) Determination of single cell oxygen consumption with impedance feedback for control of sample-probe separation. *Anal. Chem.* 77, 6999-7004.
- Pethig, R., Jakubek, L., Sanger, R.H., Heart, E., Corson, E. and Smith, P.J.S.** (2005) Electrokinetic measurements of membrane capacitance and conductance for pancreatic β -cells. *IEE Proc. Nanobiotechnology.* 152, 189-193
- Messerli, M.A., Robinson, K.R. and Smith, P.J.S.** (2006) Electrochemical sensor applications to the study of molecular physiology and analyte flux in plants. In: *Plant electrophysiology - Theory and Methods*. Ed. Alexander G. Volkov. Springer Chapter 4.
- Smith, P.J.S. and Remsen, D.** (2006) Using Pharmabase to Perform Pharmacological Analyses of Cell Function. In *Current Protocols in Bioinformatics: Cheminformatics*. Eds. Baxevanis, A., Davison, D., Page, R., Petsko, G., Stormo, G. and Stein, L. John Wiley and Sons. Supplement 13, Section 14.2, 14.2.1 - 14.2.17.
- Smith, P.J.S., Sanger, R.S. and Messerli, M.A.** (2007) Principles, Development and Applications of Self-Referencing Electrochemical Microelectrodes to the Determination of Fluxes at Cell Membranes. In: *Methods and New Frontiers in Neuroscience*. Ed. Adrian C. Michael. CRC Press. Chapter 18
- Gray, J.P., Heck, D.E., Mishin, V., Smith, P.J.S., Hong, J.Y., Thiruchelvam, M., Cory-Slechta, D.A., Laskin, D.L., and Laskin, J.D.** (2007) Paraquat increases cyanide-insensitive respiration in murine lung epithelial cells by activating an NAD(P)H: Paraquat Oxidoreductase: Identification of the enzyme as thioredoxin reductase. *J. Biol. Chem.* 282(11): 7939-49.
- Kreitzer, M.A., Collis, L.P., Molina, A.J.A., Smith, P.J.S., Malchow, R.P.** (2007) Modulation of extracellular proton fluxes from retinal horizontal cells of the catfish by depolarization and glutamate. *Journal of General Physiology.* 130: 169-182.
- Heart, E. and Smith, P.J.S.** (2007) Rhythm of the beta-cell oscillator is not governed by a single regulator: Multiple systems contribute to oscillatory behavior. *Am J Physiol Endocrinol Metab.* 292(5):E1295-300
- Heart, E., Yaney, G., Corkey, R.F., Schultz, V., Luc, E., Liu, L., Deeney, J.T., Shirihai, O., Tornheim, K., Smith, P.J.S. and Corkey, B.E.** (2007) Ca^{2+} , NAD(P)H and membrane potential changes in pancreatic beta-cells by methyl-succinate: comparison with glucose. *Biochem J.* 403(1):197-205.
- Messerli, M.A., Corson, E.D., and Smith, P.J.S.** (2007) Measuring Extracellular Ion Gradients from Single Channels with Ion-Selective Microelectrodes. *Biophysical J.* 92(7): L52-54.
- Da Silva N., Shum W.W. C, El-Annan J., Paunescu T.G., McKee M., Smith P.J.S, Brown D., Breton S.** (2007) Relocalization of the V-ATPase B2 subunit to the apical membrane of epididymal clear cells of mice deficient in the B1 subunit. *Am. J. Physiol: Cell Physiology.* 293(1):C199-210.
- Pethig, R., Menachery, A., Heart, E., Sanger R.H. and Smith, P.J.S.** (2008). Dielectrophoretic assembly of insulinoma cells and fluorescent nanosensors into three-dimensional 'pseudo-islet' constructs. *IEE Nanobiotechnology.* 2(2): 31-38.
- Li, H., Chen, Y., Jones, A.F., Sanger, R.H., Collis, L.P., Flannery, R., McNay, E.C., Schwartzenbacher, R., Bossy, B., Bossy-Wetzell, E., Bennett, M.V.L., Pypaert, M., Hickman, J.A., Smith, P.J.S., Hardwick, J.M. and Jonas, E.A.** (2008) The anti-apoptotic protein BCL-xL controls synapse formation. *PNAS* 105(6): 2169-2174.
- Nuccitelli, R. Nuccitelli, P., Ramlatchan, S., Sanger, R. and Smith, P.J.S.** (2008). Imaging the electric field associated with mouse and human skin wounds. *Wound Repair and Regeneration.* 16 (3): 432-441.
- Messerli, M.A., Kurtz, I. and Smith, P.J.S.** (2008) Characterization of Optimized Na^+ and Cl^- liquid membranes for use with extracellular, self-referencing microelectrodes. *Anal. Bioanal. Chem.* 390(5): 1355-9.
- Winnie Wai Chi Shum, Nicolas Da Silva, Mary McKee, Peter J.S. Smith, Dennis Brown and Sylvie Breton** Transepithelial projections from basal cells are luminal sensors in pseudostratified epithelia. *Cell* in press

Current, Pending and Recent Funding**SMITH, P.J.S.**ACTIVEP41 RR001395 (Smith)
NIH/NCRR

12/01/04-11/30/09

BioCurrents Research Center

This is a national resource grant from the NCRR targeted to the development of specialized microprobe designs for studying molecular transport at the single cell or tissue level. There is also an extensive collaborative and service component.

RECENT**R21 DK063984 (Smith)**

04/01/03-04/01/06

NIH/NIDDK

Pancreatic Islets: Role of islet structure and function in regulated insulin release.

The major goals of this project are to examine the electrical coordination and insulin secretion from primary, reconstituted and engineered islets. No cost extension.

R43 GM069194-01 (RPN Enterprise Inc)

08/01/03 – 01/31/06

NIH Subcontract SBIR-Phase I & II

Development of bioelectric field imaging instrumentation

The Phase I aim of this commercial collaboration is to further develop the field imaging equipment with the Phase II target of clinical applications to skin disease and damage.

R41 DK065351-01 (Smith & BRInc)

09/15/03 – 09/14/05

NIH/NIDDK STTR-Phase I

Ultra-micro oxygen sensor development

The Phase I aim of this commercial collaboration is to refine the production procedures for solid-state amperometric electrodes - improving yield and efficiency. No cost extension.

DBI-0215829 (Smith)

07/15/02-07/14/05

NSF Major Research Instrumentation

Acquisition of a confocal microscope for cell biology and biophysics

This grant is for the purchase of the Zeiss LSM 510 multiphoton confocal microscope equipped with the Meta system. It was a collaborative application by resident and visiting scientists of the MBL and included a strong teaching component

OVERLAP

There are no scientific overlaps between these different projects. If pending grants are awarded, and as current grants expire or come into effect, the percentage effort on P41 RR001395 will be adjusted accordingly.