

Richard Harding Smith, MBA, PhD

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CURRENT POSITION

RESEARCH DIRECTOR 5/2010 – present
Insight Institute of Neurosurgery & Neuroscience Flint, MI

- Research Director, Insight Business Incubator, to develop internal technologies and collaborative R&D projects.
 - Business, technical and intellectual property assistance for incubator companies.
 - Teaching experience: biomedical lectures in Grand Rounds; mentor for student interns (pre-baccalaureate to MD level); development of Medical Assistant curriculum.
 - Clinical research coordinator, preparation of IRB documents and reports for incubator companies and contract medical device and pharmaceutical firms.
 - Member of extended matrix teams in biomedical science and technology.
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PREVIOUS POSITIONS

PRINCIPAL 5/2009 – 5/2010
Analytical Connections, LLC Dexter, MI

- Consultant on technical documents, grant proposals, manuscripts for publication, invention disclosures and other intellectual property, business plans, surface chemistry.
- Technical reviewer for Small Business Innovation Research grants at the National Institutes of Health.

VICE PRESIDENT (promoted from Senior Scientist, 2001) 4/1997 – 5/2009
IA/Threefold Sensors, Inc. Ann Arbor, MI

Responsible for funding, hiring and management of scientists, communication with Federal agencies, research protocols, commercialization of proprietary fiber optic biosensor technology for rapid clinical diagnostic testing.

- Awarded over \$2 million in SBIR grants from NIH, DOD and DOE.
- Improvements in sensor design, optimization, sample handling and scale-up to production.
- Partner in the Federal Commercialization Assistance Plan for funded projects.

- Wrote protocols, progress reports, white papers, standard methods, data summaries, and over 50 invention disclosures. Active collaborator with outside parties.

SENIOR SCIENTIST 5/1995 - 4/1997
 Selective Technologies, Inc. Ann Arbor, MI

- Research on diagnostic and analytical technologies, in collaboration with Professor Mark Meyerhoff, University of Michigan Department of Chemistry.
- Supported as Postdoctoral Fellow with Prof. Meyerhoff.

SENIOR SCIENTIST (promoted from Scientist, 1990) 10/1986 - 4/1995
 BioQuant, Inc. (subsequently acquired by Pacific Biometrics, Irvine, CA) Ann Arbor, MI

- Wrote NIH grant proposals for product development, 510(k) applications to test medical devices, and performed lab research and market research studies.
- Hired, trained and supervised technical personnel to meet project goals.

RESEARCH ASSOCIATE (Part-time during BioQuant startup) 10/1986 - 6/1987
 Department of Internal Medicine University of Michigan Hospitals Ann Arbor, MI

- Localization of cancer-related proteins in animal model systems with Richard L. Wahl, MD (member, National Academy of Medicine).

EDUCATION

2002 Univ. of Michigan, Graduate School of Business Administration Ann Arbor, MI

- Master of Business Administration in the Evening program; focus on finance and corporate strategy. Awarded \$10k in national business plan competitions.
- Honors: Pryor-Hale Award (business plan competition) and MBA Entrepreneur of the Year, 2001.

1983-6 University of Michigan Medical School Ann Arbor, MI
 Postdoctoral Research Fellow, Depts. of Pathology and Microbiology and Immunology,

- Biochemical purification and analysis of neutrophil chemotaxis receptor complex.

1983 Wesleyan University Middletown, CT

- Doctor of Philosophy in Biochemistry, on the molecular basis of changes in cell adhesion during embryonic development.
- Teaching fellowship, cellular biology, 4 years.
- Honors: NSF Predoctoral Fellowship; Sigma Xi Grant-in-Aid of Research.

1978 Millersville University Millersville, PA

- Bachelor of Science in Biology and Chemistry.
- Departmental Honors in Biology; A.G. Breidenstine Award, Honors Thesis.

PROFESSIONAL MEMBERSHIPS

- American Association for the Advancement of Science
- American Association of Clinical Chemists (Michigan Section; charter member, Point of Care Testing Division; Abstract Review Committee, Industry Liaison Committee)
- American Chemical Society member (1983 – present)
- Institutional Review Board, Osteopathic Hospital, Lancaster PA
- Rotary Club of Ann Arbor North (President 1996 - 97)
- Reviewer, NIH Study Sections (2001 - present)
- National Academy of Clinical Biochemistry, Associate Fellow
- Pennsylvania Academy of Science, Life Member

CERTIFICATIONS

Collaborative Institutional Training Initiative (CITI) “Biomedical research – Basic/refresher”, completed 02/10/2014.

Medidata University “BSC Rave 5.6 Data Entry and Approver Training”, 01/14/2014.

NIH “Protecting Human Research Participants”, Certification completed 10/21/2011.

PUBLICATIONS AND PRESENTATIONS

Vasandani, R and **Smith, RH**. Restrictions with a congenitally absent cervical pedicle. Case report submitted to New England Journal of Medicine, 2016.

Vasandani, R and **Smith, RH**. Gout in thoracic spine. Case report submitted to Radiology Case Reports, 2016.

Erb JL, Kruer TL, **Smith RH**, Downward JG, Andres SS, Wittliff JL. Development of a fiber optic biosensor for breast cancer biopsy screening. Presented to the 39th Annual Oak Ridge Meeting, April 13, 2007.

Smith RH, Henderson B, Priuska EM, Martin GB. Design features of a portable instrument for measurement of perchlorate and other small ions at trace levels. Presented to the Conference on Remediation, National Ground Water Association, New Orleans LA, Nov 2003.

Erb J, Lehr R, Wittliff JL, Allen R, Downward JG, **Smith RH**, Priuska EM. Effects of Great Lakes water samples on estrogen receptor and aryl hydrocarbon receptor activity measured with a

biosensor. Presented to the 3rd International Conference on Pharmaceuticals and Endocrine Disrupting Chemicals in Water, Minneapolis MN, Mar 2003.

Smith RH, Martin GB, Henderson B, Priuska EM, Downward IV JG, Erb JL. A new portable method for measurement of perchlorate and other small ionic species at trace levels. Presented to the Southwest Focus Conference, National Ground Water Association, Phoenix AZ, Feb 2003.

Smith RH, Henderson B, Lancaster WD, Hudson AP, Downward JG, Erb JL. Development of real-time DNA hybridization assays using fiber optic sensors. Presented to the 220th National Meeting of the American Chemical Society, Washington DC, August, 2000.

Smith RH, Martin GB, Cook, LN. A sensor system for monitoring of perchlorate remediation and groundwater contamination. Presented to the Pollution Prevention Conference, Texas, August, 2000.

Smith RH, Martin GB, Cook LN. Monitoring of trace levels of perchlorate by ion chromatography and an ion selective electrode. Presented to the 220th National Meeting of the American Chemical Society, Washington, DC, August, 2000.

Smith RH, Martin GB. Development of a method for in situ measurement of perchlorate. Presented to the 2000 Inorganics Contaminants Workshop, February, 2000.

Smith RH, Lemon WJ, Erb JL, Erb-Downward JR, Downward JG, Ulrich OE, Wittliff JL. Development of kinetic ligand binding assays using a fiber optic sensor. *Clinical Chemistry* 45:1683-5, 1999.

Smith RH, Erb-Downward JR, Erb JL, Downward JG, Ulrich OE, Wittliff JL. Use of a fiber optic sensor to obtain real time binding data on biological macromolecules. Presented to the 31st Annual Oak Ridge Meeting, April, 1999.

Ducey MW, Smith AM, **Smith RH**, Duan C, Meyerhoff ME, Nonseparation electrochemical enzyme immunoassay (NEEIA) using microporous gold electrodes, in *Biosensors and Their Applications*, T. Ngo and V. C. Yang (Eds), Kluwer Academic/Plenum, New York, 1999; pp. 113-130.

Meyerhoff ME, Xiao J, Coutant DE, Chen S, Francis AF, Martin GB, **Smith RH**. Novel solute selectivities of bonded porphyrin phases in liquid chromatography. Presented to the Pittsburgh Convention, March, 1997.

Martin GB, **Smith RH**, Xiao GJ, Weinert CS, Meyerhoff ME. Recombinant protein purification on an iron(III)porphyrin stationary phase. Presented to the Ohio Valley Chromatography Society, July, 1996.

Meyerhoff ME, Martin GB, **Smith RH**. Challenges in developing quantitative whole blood immunoassays. Presented to the 28th Annual Oak Ridge Meeting, April, 1996.

Warner JH, **Smith RH**. Sample size analysis for a study to determine the efficacy of a non-invasive screening technique for detecting elevated blood lead levels in children. Presented to the 1995 Joint Statistical Meeting, Orlando FL, August, 1995.

Lumley MA, Schramm W, Pomerleau CS, Pomerleau OF, **Smith RH**. The assessment of cortisol using salivary ultrafiltrate. Behavior Research Methods, Instruments and Computers 27:470, 1995.

Harwood AE, **Smith RH**, Nairn R. Monoclonal antibodies detect a protein, p22, in stable structural and functional association with the formyl peptide chemotaxis receptor. Molecular Immunology, 1995.

Schramm W, Hajizadeh K, **Smith RH**. Development of disposable sensors combining immunochromatography with electrochemical signal detection. Presented to the 20th Annual Meeting of the Federation of Analytical Chemistry and Spectroscopy Societies, Detroit MI, October, 1993.

Schramm W, Paek SH, **Smith RH**. Stereochemically favored immobilization of immunoglobulins. Presented to the 205th National Meeting of the American Chemical Society, Denver CO, March, 1993.

Schramm W, Craig PA, **Smith RH**. Saliva as a non-invasive fluid for diagnostic monitoring. Presented to the Learning Disabilities Association, 30th Annual International Conference, San Francisco CA, February, 1993.

Schramm W, **Smith RH**, Craig PA, Grates HE. Elevated testosterone concentration in saliva after toothbrushing. Clinical Chemistry 39/3: 519, 1993.

Schramm W, Craig PA, **Smith RH**, Berger GE. Cocaine and benzoylecgonine in saliva, serum and urine. Clinical Chemistry 39/3: 481, 1993.

Schramm W, **Smith RH**, Craig PA. Methods of simplified saliva collection for the measurement of drugs of abuse, therapeutic drugs, steroids, and other molecules. Annals of the New York Academy of Science 694 :311, 1993.

Schramm W, Kuo HH, Hajizadeh K, **Smith RH**. Single-step electrochemical immunoassay. The Second World Congress on Biosensors, Geneva, Switzerland, May, 1992.

Schramm W, **Smith RH**, Craig PA, Kidwell DA. Drugs of abuse in saliva. Journal of Analytical Toxicology 16: 1, 1992.

Schramm W, Annesley TM, Siegel GJ, Sackellares JC, **Smith RH**. Measurement of phenytoin and carbamazepine in an ultrafiltrate of saliva. *Therapeutic Drug Monitoring* 13: 452, 1991.

Schramm W, **Smith RH**. An ultrafiltrate of saliva collected in situ as a biological sample for diagnostic evaluation. *Clinical Chemistry* 37/1: 114, 1991.

Schramm W, **Smith RH**, Craig PA, Paek SH, Kuo HH. Determination of free progesterone in an ultrafiltrate of saliva collected in situ. *Clinical Chemistry* 36/8: 1488, 1990.

Schramm W, **Smith RH**, Jackson TM, Craig PA, Grates HE, Minton LL. A rapid solid-phase immunoassay for 6-keto-prostaglandin F_{2α} using microplates. *Clinical Chemistry* 36/3: 509, 1990.

del Rosario RB, Wahl RL, Brocchini SJ, Lawton RG, **Smith RH**. Sulfhydryl site-specific crosslinking and labeling of a monoclonal antibody by a fluorescent equilibrium transfer alkylation crosslink reagent. *Bioconjugate Chemistry* 1(1): 51, 1990.

del Rosario RB, Brocchini SJ, **Smith RH**, Strnat M, Jackson GA, Fisher SJ, Lawton RG, Wahl RL. New strategies for sulfhydryl site-specific labeling of monoclonal antibodies using biotin/streptavidin and "equilibrium transfer alkylation crosslink (ETAC)" reagents. Presented to The Fourth International Conference on Monoclonal Antibody Immunoconjugates for Cancer, San Diego CA, March, 1989.

del Rosario RB, Brocchini SJ, Baron LA, Lawton RG, **Smith RH**, Jackson GA, Scott PJ, Clavo AC, Fisher SJ, Wahl RL. Sulfhydryl site-specific radiolabeling of monoclonal antibodies using "equilibrium transfer alkylation crosslink" (ETAC) reagents. Applications to the biotin/streptavidin methodology. Presented to The Society of Nuclear Medicine 36th Annual Meeting, St. Louis MO, June, 1989.

Halberstadt CR, Ozturk SS, **Smith RH**, Palsson BO, Midgley AR. A novel mammalian bioreactor with transtubular, convective flow. Presented to The 194th National Meeting of the American Chemical Society, New Orleans LA, August, 1987.

Wahl RL, Johnson J, **Smith RH**, Liebert M. Experimental comparison of three background subtraction agents for monoclonal antibody imaging of ovarian carcinoma xenografts. Presented to The 73rd Scientific Assembly of The Radiological Society of North America, 1987.

Feltner DE, **Smith RH**, Marasco WA. Characterization of the plasma membrane-bound GTPase from rabbit neutrophils: I. Evidence for an N_i-like protein coupled to the fMLP, C5a and LTB₄ chemotaxis receptors. *Journal of Immunology* 137: 1961, 1986.

Harwood AE, **Smith RH**, Nairn R. Monoclonal antibodies reactive with the N-formyl peptide receptor of rabbit neutrophils. Presented to The Sixth International Congress of Immunology, Toronto, Ontario, Canada, July, 1986.

Nairn R, **Smith RH**, Harwood AE. Antisera reactive with the N-formyl peptide receptor of rabbit neutrophils. *Federation Proceedings* 45: 1901, 1986.

Smith RH, Harwood AE, Nairn R. Immunoaffinity purification of the N-formyl peptide receptor of rabbit neutrophils. Presented to the Sixth International Congress of Immunology, Toronto, Ontario, Canada, July, 1986.

Brown CS, **Smith RH**, Ward PA, Marasco WA, Nairn R. Isoelectric focusing for the isolation of active rabbit formyl peptide chemotaxis receptor. *Federation Proceedings* 44: 1267, 1985.

Marasco WA, Charles J, Feltner DE, Brown CS, **Smith RH**, Nairn R. Fluid phase characterization of the rabbit neutrophil formyl peptide chemotaxis receptor. *Federation Proceedings* 44: 576, 1985.

Nairn R, **Smith RH**, Brown CS, Marasco WA. What are the molecular characteristics of the neutrophil receptor for chemotactic formylated peptides? *Survey of Immunological Research* 4: 213, 1985.

Smith RH, Brown CS, Ward PA, Marasco WA, Nairn R. Guinea pig antisera reactive with the N-formyl peptide receptor on rabbit neutrophils. *Federation Proceedings* 44: 1259, 1985.

Smith RH, Turner RS. Cell adhesion inhibitor in butanol extracts of nonadhesive sea urchin embryo mesenchyme cells. *Journal of Cell Biology* 97: 87, 1983.

Smith RH, Turner RS. Modification of a cell adhesion complex in embryonic development. Presented to The Northeast Regional Conference on Developmental Biology, Woods Hole MA, March, 1983.

Smith RH, Turner RS. Production of a polyclonal antiserum that inhibits sea urchin cell-plate attachment. *Journal of Cell Biology* 95: 159, 1982.

Smith RH, Hesson S, del Tito B, Ferrara K. Vitamin A deficiency: effects on pulmonary surfactant and on pulmonary ultrastructure. Presented to The Pennsylvania Academy of Science Annual Meeting, April, 1978.

Smith RH, Lewis LM. Effects of DMSO and cytochalasin B on binary fission and on micronuclear filaments in *Paramecium bursaria*. Presented to The Pennsylvania Academy of Science Annual Meeting, April, 1978.

Lewis LM, Panitz E, Krupa PL, **Smith RH**. Ultrastructure of the syncytial intestinal epithelium of a parasitic nematode. *Biological Bulletin (Woods Hole)* 153: 436, 1977.

PATENTS

Shah J, Iqbal A, **Smith RH**. Intra spinous process and method of bone graft placement. US and foreign patents pending (PCT/US12/28727 – filed Mar 12, 2012).

Shah J, **Smith RH**. Motor nerve root stimulation. US and foreign patents pending (USSN 13/293,964; PCT/US11/60205).

Pruiska EM, **Smith RH**, Erb JL, Downward JG, Ulrich OE. Fiber-optic sensor array (USPTO Application No. 20050181432, filed Aug 18, 2005).

Smith RH, Martin GB. Ion sensing device. US patent # 6,736,958; 2004.

Pruiska EM, **Smith RH**, Erb JL, Downward JG, Ulrich OE. Fiber-optic sensor array (European Patent Office Application No. 02756338.6-2404-US0220596 filed June 27, 2002).

Pruiska EM, **Smith RH**, Erb JL, Downward JG, Ulrich OE. Fiber-optic sensor array (USPTO Application No. 20030008314, filed Jan 9, 2003).

Kanan PG, Rudnick ER, **Smith RH**. Method of monitoring markers of bone metabolism. US patent #5,589,346; 1997.