CURRICULUM VITAE

Paula (Elizabeth) Scarborough Juras PhD

Education:

1986 BA Departments of Chemistry and Biology
University of North Carolina at Chapel Hill, Chapel Hill, North Carolina

1993 PhD Department of Biochemistry and Molecular Biology
University of Florida, Gainesville, Florida
Dissertation: Unique Active Site Specificity of Human Cathepsin D as studied through Kinetics, Molecular Modeling and Residue-Specific Mutagenesis

Chronology of Employment:

08/85-07/87 Research Assistant, Department of Chemistry, University of North Carolina, Chapel Hill, North Carolina; Supervisor: Nancy L Thompson PhD (1 yr part time; 1 yr full time)
Kinetics of membrane protein diffusion using total internal reflection fluorescence; cell culture and monoclonal antibody technology; protein purification and analysis

08/87-07/88 Research Assistant, Department of Biochemistry and Molecular Biology, University of Florida, Gainesville, Florida; Supervisor: Sue A Moyer PhD (35 hrs/wk)
Generation, analysis and use of monoclonal antibodies against structural proteins of vesicular stomatitis and Sendai viruses for studying virus assembly

1988-93 Graduate Research Assistant, Department of Biochemistry and Molecular Biology, University of Florida, Gainesville, Florida; Supervisor: Ben M Dunn PhD
Analysis of protein-ligand interactions, primarily as related to substrate/inhibitor specificity of proteolytic enzymes; specificities of selected aspartic proteinases explored employing synthetic peptide substrates, peptidomimetic inhibitors, and site-specific mutagenesis of enzymes. Dissertation work on active site specificity of human cathepsin D, a prognostic indicator of breast tumor invasiveness

1993-96 Research Associate, Department of Pathology, Duke University Medical Center, Durham, North Carolina; Supervisor: Guy S Salvesen PhD (full time)
Structure/activity and translation/activation studies of cysteine and serine proteinases and serpins, particularly those implicated in the mechanisms of viral infection, apoptosis and programmed cell death

1996-99 Intramural Research Training Award Fellow, Clinical Studies Group, Laboratory of Pulmonary Pathobiology, Environmental Diseases and Medicine Program (EDMP), Division of Intramural Research (DIR), National Institute of Environmental Health Sciences (NIEHS), National Institutes of Health (NIH), Department of Health and Human Services (DHHS) Research Triangle Park, North Carolina; Supervisor: Darryl C Zeldin MD (full time)
Clinical research study on the role of platelet-derived growth factor in the pathogenesis of Idiopathic Pneumonia Syndrome in primary breast cancer patients treated with high dose combination chemotherapy and autologous bone marrow transplantation; effects of eicosanoids on platelet-derived growth factor receptors in human lung fibroblasts

1999-present Contracting Officer's Representative and Technical Information Specialist, Epidemiology Branch (EB), EDMP, DIR, NIEHS, NIH, DHHS, Research Triangle Park, North Carolina; Supervisors: Allen J Wilcox MD PhD ('99 to '01; GS-12), Dale P Sandler PhD ('01-present; GS-13) (full time)

Currently Leader, Scientific Program Support Team, and COR Level III; budget and contracts development, management, and oversight; epidemiology scientific program support; COR for EB Sister Study support services contract; COR for NIEHS & NTP Archives and Repository contract; co-COR for EB Support Services contract

Development and day-to-day management and oversight of large multi-year, multi-project research support contracts with budgets of up to $103million; member of research teams, working with investigators and contractors on study designs, procedures, laboratory analyses, data and sample collection and management; Lead Investigator for Epidemiology Branch common protocols for anonymous sample collections. Knowledge and ability to advise scientific program support staff regarding management of research budgets, support contracts, analyses, and statutory requirements for federal, scientific and human subjects research. Lead coordinator of Branch fellows training program.

Honors and Special Recognition:

American Peptide Society Student Affairs Committee Travel Award, 1991

Eli Lilly Travel Award, 1992

University of Florida Medical Guild Graduate Research Award Finalist, 1993

NIH Intramural Research Training Award, 1996-99

Time Off Award, 05/2000

Time Off Award, 09/2000

Special Act or Service Award, 02/2001

Quality Step Increase Award, 06/2001

Special Act or Service Award, 08/2001

Special Act or Service Award, 09/2001

DHHS Office of the Secretary Honor Student Commendation, 2002

Special Act or Service Award, 08/2002

DHHS Office of the Secretary Honor Student Commendation, 2003

Individual Cash Award, 09/2003

Individual Cash Award, 03/2004

Quality Step Increase Award, 07/2004

Individual Cash Award, 05/2005

Time Off Award, 06/2006

Individual Cash Award, 09/2006

Performance Award, 04/2007

Promotion, 06/2007

Individual Cash Award, 12/2007

Individual Cash Award, 05/2008

Quality Step Increase for Performance Award, 05/2009

NIH Award of Merit, 12/2009

Individual Cash Award, 04/2010

Individual Cash Award, 03/2011

Individual Cash Award, 04/2012

Quality Step Increase for Performance Award, 07/2013

NIH NIEHS Leadership Development Program, 2013-14

Quality Step Increase for Performance Award, 07/2014

NIH Award of Merit, 12/2014

Individual Cash Award (Ratings Based), 04/2015

Individual Cash Award (Ratings Based), 05/2016

Individual Cash Award (Ratings Based), 04/2017

Individual Cash Award (Not-ratings Based), 07/2017

Individual Cash Award (Ratings Based), 04/2018

Promotion, 09/2018

Quality Step Increase for Performance Award, 08/2019

Individual Cash Award (Ratings Based), 04/2020

Individual Cash Award (Ratings Based), 05/2021

Memberships (past or present):

American Association for Cancer Research

American Peptide Society

International Society for Biological and Environmental Repositories

Protein Society

NIEHS Assembly of Scientists

Teaching:

Lecturer in Introduction to Biochemistry and Molecular Biology, Advanced Metabolism, Advanced Physical Biochemistry, and Enzyme Kinetics and Mechanisms graduate courses for medical, dental, veterinary, pharmacy, and basic science graduate students, 1988-1990

In the laboratory, trained and/or supervised new personnel, students, and visiting international scientists in laboratory methods

Committees and Workshops:

Organizing Committee, 12th American Peptide Symposium Job Fair, Boston, Massachusetts, 1990-91

Student Affairs Committee, American Peptide Society, 1990-92

University of Florida Interdisciplinary Center for Biotechnology Research Panel to encourage promising young scientists in Student Science Training Program to pursue advanced education in biotechnology fields, 1991

Employee Outreach Committee, Duke University Medical Center, 1994-95

Organizing Committee, NIH/NIEHS Trainees Assembly Science and Career Fair, 1998

User Representative to Scientific Computing Laboratory for Laboratory of Pulmonary Pathobiology, NIEHS, 1998-99

User Representative to Scientific Computing Laboratory for Epidemiology Branch, NIEHS, 1999-2001

Organizing Committee, *Epi-21: Epidemiology in the 21st Century* Workshop, Raleigh, North Carolina, 1999

Molecular Genetics: A Tool for Reproductive Health Research, Triangle Reproductive Health Network, NIEHS, 2000

Epidemiology Branch Retreat, NIEHS, 2000

Organizing Committee, Early Life Factors in Childhood Asthma Etiology Workshop, NIEHS, 2000

Organizing Committee, Environmental Contributors to Infant Mortality Workshop, NIEHS, 2001

Organizing Committee and Session Chair, *Respiratory Disease in the Agricultural Health Study* Workshop, 2002

Co-Chair, Biological Specimen Coordination Committee (representatives from NIEHS, EPL and SSS), 2002-2014

NIEHS Quality Council, 2002-2004

Organizing Committee Chair, *Sister Study* Scientific Advisory Board Meeting, 2004

Sister Study Steering Committee, 2004-

North Carolina Health Careers Access Program (NC-HCAP) Science Enrichment Preparation Program, 2005

North Carolina Health Careers Access Program (NC-HCAP) Science Enrichment Preparation Program, 2006

Organizing Committee Chair, *Sister Study* Scientific Advisory Board Meeting, 2006

Trans-NIH Bioethics Committee Human Specimen & Human Data and Specimen Subcommittee, 2006-9

Organizing Committee Chair, *Sister Study* Scientific Advisory Board Meeting, 2007

Organizing Committee, NIEHS Diversity Council Pride Month, 2007

Source Selection COR, NIEHS Institute-wide Specimen and Data Repository contract, 2008-

Organizing Committee Chair, Epidemiology Branch Retreat & Review Preparation, Friday Center, Chapel Hill NC, 2008-9

Organizing Committee Chair, *Sister Study* Scientific Advisory Board Meeting, 2009

Concept Review Panel for Clinical Research Unit Support Services Contract, 2011

Organizing Committee, *Sister Study* Survivorship Workshop, 2011

EB Training Guidelines Development Team (PULSE Survey Action Plan), 2011

Organizing Committee Chair, *Sister Study* Scientific Advisory Board Meeting, 2012

Organizing Committee, EB Parkinson's Disease Workshop, 2012

Lead Reviewer, Technical Evaluation Panel NCI Support Services Contract "Interdisciplinary Studies of Occupational and Environmental Cancer," 2012

Organizing Committee Chair, Epidemiology Branch Retreat & Review Preparation, NC Botanical Garden Education Center, Chapel Hill NC, 2012-13

NIH NIEHS Leadership Development Program, 2013-14

Concept Review for Clinical Research Unit Support Services Contract, 2014

NIH NIEHS Operation Clean Sweep Team, 2014

Selection Committees for EB Lead Administrative Assistant, 2014, 2016

Chair, Biological Specimen Coordination Committee (representatives from NIEHS, EPL and SSS), 2015-2017; Co-chair, 2017-present

Organizing Committee Chair, Epidemiology Branch Retreat & Review Preparation, NC Botanical Garden Education Center, Chapel Hill NC, 2016-17

SSL Migration/Lessons Learned Working Group, 2017

NLDP Leadership Tune-up & strategy working group, 2017

Invited panel member for OED Career Talks with visiting high school students, 2017

Organizing Committee Chair, Epidemiology Branch Science Days, 2018, 2019

NIEHS Biorepository Policy Group, 2019-20

Organizing Committee Staff Liaison, Epidemiology Branch Retreat & Research Day, 2020

NIEHS cross-divisional Environmental Health Disparities & Environmental Justice Faculty, 2021—

NIH Anti-Racism Steering Committee, Retention and Recognition (non-scientific) Subcommittee, 2021—

Reviewer for Journals:

Applied Pharmacology

Archives in Biochemistry and Biophysics

Biochemical Journal

Biochemistry

Blood

Genomics

Journal of Biological Chemistry

Protein Engineering, and Toxicology

Other Professional and Public Service:

Assisted in editing *Advances in Experimental Medicine and Biology* v306, "Structure and Function of the Aspartic Proteinases: Genetics, Structures and Mechanisms", 1990-91

Science Fairs: Primary Judge, Senior Biochemistry Division; Secondary Judge, Junior Biochemistry Division, Florida Regional Science Fair, 1990, 1991; Judge, Hillside High School Science Fair (Durham, North Carolina), 1997; Morrisville Elementary School Science Fair (Morrisville, NC) 2006

Susan G Komen Foundation Triangle Affiliate Grants Review Committee, 2006-10

Chair, Morrisville Elementary School Science & Math Fair (Morrisville, NC) 2007-11

NIEHS Environmental Health Science Education Outreach Program, 2007, 2012, delivered presentations to students at area elementary and middle schools for school scientific events

Invited panel member for NIEHS Career Talks with visiting high school students (regularly as needed)

National Charity League Cardinal Chapter (Cary NC) 2012-18

Publications and Reports:

Thompson NL, AG Palmer, LL Wright and **PE Scarborough**. (1988) Fluorescence techniques for supported planar model membranes. *Comments Mol. Cell Biophys.* 5, 109-131.

Scarborough, PE, GE Conner and BM Dunn. (1990) Expression, refolding and characterization of recombinant human procathepsin D. In *Peptides: Chemistry, Structure and Biology: Proceedings of the Eleventh American Peptide Symposium* (JE Rivier and GR Marshall, Eds.), ESCOM Science Publishers B.V., Leiden, The Netherlands, pp. 367-368.

Richards, AD, LH Phylip, WG Farmerie, **PE Scarborough**, A Alvarez, BM Dunn, Ph-H Hirel, J Konvalinka, P Strop, L Pavlickova, V Kostka and J Kay. (1990) Sensitive, soluble chromogenic substrates for HIV-1 Proteinase. *J. Biol. Chem.* 265, 7733-7736. PMID: 2186027.

Phylip, LH, AD Richards, J Kay, J Konvalinka, P Strop, V Kostka, AJ Ritchie, AV Broadhurst, WG Farmerie, **PE Scarborough** and BM Dunn. (1990) Hydrolysis of synthetic chromogenic substrates by HIV-1 and HIV-2 Proteinases. *Biochem. Biophys. Res. Comm.* 171, 439-444. DOI: 10.1016/0006-291X(90)91412-L.

Scarborough, PE, GR Richo, J Kay, GE Conner and BM Dunn. (1991) Comparison of kinetic properties of native and recombinant human cathepsin D. *Adv. Exp. Med. Biol.* 306, 343-347. PMID: 1812725.

Rao, C, **PE Scarborough**, WT Lowther, J Kay, B Batley, S Rapundalo, S Klutchko, MD Taylor and BM Dunn. (1991) Structure-function database for active site binding to the aspartic proteinases. *Adv. Exp. Med. Biol.* 306, 143-147. PMID: 1812702.

Pennington, MW, SM Festin, ML Maccecchini, F Dick and **PE Scarborough**. (1991) HIV protease, chromogenic substrate and inhibitor. In *Peptides 1990: Proceedings of the 21st European Peptide Symposium* (Giralt and Andreu, Eds.), ESCOM Science Publishers B.V., Leiden, The Netherlands, pp. 787-789.

Jupp, RA, AD Richards, LH Phylip, J Kay, J Konvalinka, P Strop, V Kostka, **PE Scarborough**, WG Farmerie and BM Dunn. (1991) Substrate cleavage by HIV-1 Proteinase. *Adv. Exp. Med. Biol.* 306, 461-467. PMID: 1812743.

Scarborough, PE, K Guruprasad, C Topham, GR Richo, GE Conner, TL Blundell and BM Dunn. (1993) Exploration of subsite binding specificity of human cathepsin D through kinetics and knowledge-based molecular modeling. *Prot. Sci.* 2, 264-276. PMID: 8443603.

Rao, C, **PE Scarborough**, J Kay, B Batley, S Rapundalo, S Klutchko, MD Taylor, E Lunney, CC Humblet and BM Dunn. (1993) Specificity in the binding of inhibitors to the active site of human/primate aspartic proteinases: Analysis of P_2-P_1-$P_{1'}$-$P_{2'}$ variation. *J. Med. Chem.* 36, 2614-2620. PMID: 8410973.

Pennington, MW, I Zaydenberg, ME Byrnes, J de Chastonay, BA Malcolm, W Swietnicki, WG Farmerie, **PE Scarborough** and BM Dunn. (1993) A strategy for characterizing new viral proteases: Applied to HIV PR and HAV 3C PR. In *Peptides 1992: Proceedings of the 22nd European Peptide Symposium* (C. H. Schneider and A. N. Eberle, Eds.), ESCOM Science Publishers B.V., Leiden, The Netherlands, pp. 936-937.

Sawyer, TK, JF Fisher, JB Hester, CW Smith, AG Tomasselli, WG Tarpley, PS Burton, JO Hui, TJ McQuade, RA Conradi, VS Bradford, L Lui, JH Kinner, J Tustin, DL Alexander, AW Harrison, DE Emmert, DJ Staples, LL Maggiora, YZ Zhang, RA Poorman, BM Dunn, C Rao, **PE Scarborough**, WT Lowther, C Craik, D DeCamp, J Moon, WJ Howe and RL Heinrikson. (1993) Peptidomimetic inhibitors of human immunodeficiency virus protease (HIV-PR): Design, enzyme binding and selectivity, antiviral efficacy, and cell permeability properties. *Bioorganic & Medicinal Chemistry Letters* 3, 819-824. DOI: 10.1016/S0960-894X(00)80673-3.

Dunn, BM, **PE Scarborough**, R Davenport and W Swietnicki. (1994) Analysis of proteinase specificity by studies of peptide substrates: The use of ultraviolet and fluorescence spectroscopy to quantitate rates of enzymatic cleavage. *Methods Mol. Biol.* 36, 225-243. PMID: 7697110.

Scarborough, PE, and BM Dunn. (1994) Redesign of the substrate specificity of human cathepsin D: The dominant role of position 287 in the S_2 subsite. *Protein Engineering* 7, 495-502. PMID: 7913221.

Dunn, BM, **PE Scarborough**, WT Lowther and C Rao-Naik. (1995) Comparison of the active site specificity of the aspartic proteinases based on a systematic series of peptide substrates. *Adv. Exp. Med. Biol.* 362, 1-9. PMID: 8540305.

Dunn, BM, K Oda, J Kay, C Rao-Naik, WT Lowther, BM Beyer, **PE Scarborough** and M Bukhtiyarova. (1998) Comparison of the specificity of the aspartic proteinases toward internally-consistent sets of oligopeptide substrates. In *7th Aspartic Proteinase Conference Proceedings* (M. N. G. James, Ed.), Plenum Press, New York, pp. 133-138. PMID: 9561210.

Qu, W, RA Rippe, J Ma, **PE Scarborough**, C Biagini, FT Fiedorek, GS Travlos, C Parker and DC Zeldin. (1998) Nutritional status modulates rat liver cytochrome P450 arachidonic acid metabolism. *Mol. Pharmacol.* 54, 504-513. PMID: 9730909.

Gavett, SH, SL Madison, **PE Scarborough**, W Qu, JE Boyle, P Chulada, H Tiano, CA Lee, R Langenbach, V Roggli and DC Zeldin. (1999) Allergic lung responses are increased in PGH synthase deficient mice. *J. Clin. Invest.* 104, 721-732. PMID: 10491407.

Ma, J, W Qu, **PE Scarborough**, KB Tomer, CR Moomaw, R Maronpot and DC Zeldin. (1999) "Molecular cloning, enzymatic characterization, developmental expression and cellular localization of a mouse cytochrome P450 highly expressed in kidney. *J. Biol. Chem.* 274, 17777-17788. PMID: 10364221.

Scarborough, PE, J Ma, W Qu and DC Zeldin. (1999) P450 subfamily CYP2J and their role in the bioactivation of arachidonic acid in extrahepatic tissues. *Drug Metabolism Reviews* 31, 203-232. PMID: 10065373.

Zeldin DZ, C Wohlford-Lenane, P Chulada, JA Bradbury, **PE Scarborough**, V Roggli, R Langenbach, and DA Schwartz. (2001) Airway inflammation and responsiveness in prostaglandin H synthase-deficient mice exposed to bacterial lipopolysaccharide. *Am J Respir Cell Mol Biol.* 25, 457-465. PMID: 11694451.

Juras, PS and DP Sandler. Environmental contributors to infant mortality: A meeting report. 2002.

Juras, PS and DP Sandler, eds. Proceedings Report: Epidemiology in the 21st century. 2002.

Sandler DP, ME Hodgson, SL Deming-Halverson, **PS Juras**, AA D'Aloisio, LM Suarez, CA Kleeberger, DL Shore, LA DeRoo, JA Taylor and CR Weinberg; Sister Study Research Team. (2017) The Sister Study Cohort: Baseline Methods and Participant Characteristics. *Environ Health Perspect.* Dec 20;125(12):127003. PMID: 29373861.

Posters at Scientific Meetings:

Scarborough, PE, GE Conner and BM Dunn: Expression, refolding and characterization of recombinant human procathepsin D. 11th American Peptide Symposium, La Jolla, California, July 1989

Scarborough, PE, GR Richo, J Kay, GE Conner and BM Dunn: Comparison of kinetic properties of native and recombinant human cathepsin D. Aspartic Proteinase Conference, Sonoma County, California, September 1990

Scarborough, PE, K Guruprasad, C Topham, GR Richo, GE Conner, TL Blundell and BM Dunn: Exploration of subsite binding specificity of human cathepsin D through kinetics and rule-based molecular modelling. Gordon Research Conference: Proteases and their Inhibitors, Holderness, New Hampshire, June 1992

Scarborough, PE, K Guruprasad, C Topham, GR Richo, GE Conner, TL Blundell and BM Dunn: Exploration of subsite binding specificity of human cathepsin D through kinetics and knowledge-based molecular modeling. 6th Symposium of The Protein Society, San Diego, California, July 1992

Scarborough, PE and GS Salvesen: Translation and Characterization of Granzyme H. International Granzyme Conference, Reno, Nevada, March 1995

Scarborough, PE, JC Bonner and DC Zeldin: Prostaglandin E_2 alters the response of human lung fibroblasts to platelet-derived growth factors. American Thoracic Society / American Lung Association International Conference, San Diego, California, April 1999

Invited Lectures:

"Mutagenesis of human cathepsin D as dictated by kinetics and rule-based molecular modeling." Miami Bio/Technology Winter Symposium, Miami, Florida, January 1993

"The dominant role of position 287 in the S_2 subsite of human cathepsin D." University of North Carolina at Chapel Hill Department of Pathology and Laboratory Medicine, April 1993.

"Redesign of the substrate specificity of human cathepsin D." Duke University Medical Center Department of Pathology, May 1993.

"Site-directed mutagenesis of specificity determinants within aspartic proteinases." Gordon Research Conference: Proteases and their Inhibitors, New London, New Hampshire, July 1994

"The Sister Study: Environmental and genetic risk factors for breast cancer." University of Florida Department of Biochemistry and Molecular Biology, March 2005.

"The Sister Study: Participation of American Indian women in a study of breast cancer risk." Annual Meeting of Association of American Indian Physicians, July 2005.

"The Sister Study: A prospective study of environmental and genetic risks for breast cancer." North Carolina Health Careers Access Program (NC-HCAP) Science Enrichment Preparation Program, June 2006.

"The Sister Study: Participation of working women in a study of breast cancer risk." Coalition of Labor Union Women Annual National Executive Board Meeting, August 2007.

"Why do healthy people get breast cancer? The Sister Study." 64th Joint Annual Meeting of The National Institute of Science (NIS) and Beta Kappa Chi (BKX) National Scientific Honor Society, March 2007.

Invited Community Presentations:

Sister Study presentations to various small focus groups of senior women, 2005-2007:

Front Street UMC Women's Circles Annual Meeting, September 2005 (Burlington, NC)

Dogwood Garden Club, October 2006 (Alamance, NC)

Spade & Trowel Garden Club, April 2007 (Burlington, NC)

"Diversity in breast cancer research: the Sister Study." Alamance Regional Medical Center Foundation Annual Breast Cancer Gala, March 2005.

"'Sharon Finds the Environment' and other resources for elementary students" for NIEHS Environmental Health Science Education Outreach Program. Morrisville Elementary School Science-Go-Round Day, March 2007.

"What has an Environmental Scientist done for you today?" for NIEHS Environmental Health Science Education Outreach Program. The Franciscan School Earth Day Celebration, April 2007.

"Careers in Science." for West Cary Middle School Career Day, 2012.