

## CURRICULUM VITAE

*Name:* Paula (Elizabeth) Scarborough Juras

*Date and Place of Birth:* 7 March, Burlington, North Carolina

*Citizenship:* United States

### *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*

### *Training and Employment:*

1985-87      Research Assistant, Department of Chemistry, University of North Carolina, Chapel Hill, North Carolina; Supervisor: Nancy L Thompson, PhD  
Kinetics of membrane protein diffusion using total internal reflection fluorescence; cell culture and monoclonal antibody technology; protein purification and analysis

1987-88      Research Assistant, Department of Biochemistry and Molecular Biology, University of Florida, Gainesville, Florida; Supervisor: Sue A Moyer, PhD  
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
- 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
- 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 Technical Information Specialist, Epidemiology Branch, EDMP, DIR, NIEHS, NIH, DHHS, Research Triangle Park, North Carolina; Supervisors: Allen J Wilcox, MD PhD ('99 to '01), Dale P Sandler, PhD ('01-present)
- Project Officer for Division \$4M molecular analysis contract, and for Branch \$100M breast cancer study support services contract; environmental and reproductive epidemiology program, conference and contract administration; recruitment of new personnel; preparation of program status reports, discussions and materials for human subjects Internal Review Board, Office of Management and Budget, and confidentiality certifications; oversight of project review and program resources
- Special training courses include Contract Formation, Basic and Advanced Project Officer Courses for Research and Development Contracts, Performance-Based Contracting

*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

NIEHS Time Off Award, 05/2000  
NIEHS Time Off Award, 09/2000  
NIEHS On the Spot Award, 02/2001  
NIEHS Quality Step Increase Award, 03/2001  
NIH Special Act or Service Award, 08/2001  
NIH Special Act or Service Award, 09/2001  
DHHS Office of the Secretary Honor Student Commendation, 2002  
NIH Special Act or Service Award, 2002  
DHHS Office of the Secretary Honor Student Commendation, 2003  
NIH Special Act Award, 2003  
NIEHS Quality Step Increase Award, 2004

*Memberships (past and present):*

American Peptide Society  
Protein Society  
NIEHS Assembly of Scientists

*Teaching*

Lecturer in *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, 12<sup>th</sup> 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-

*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

*Early Life Factors in Childhood Asthma Etiology* Workshop, NIEHS, 2000

*Environmental Contributors to Infant Mortality* Workshop, NIEHS, 2001

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

Biological Specimen Coordination Committee (representatives from NIEHS, CODA, EPL and BioServe), 2002-

NIEHS Quality Council, 2002-2004

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

*The Sister Study* Steering Committee, 2004-

*Other Professional Service:*

Reviewer for Journals:

*Applied Pharmacology*

*Archives in Biochemistry and Biophysics*

*Biochemical Journal*

*Biochemistry*

*Blood*

*Genomics*

*Journal of Biological Chemistry*

*Protein Engineering, and Toxicology*

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

Lecture Courses for undergraduate and professional school students: Introduction to Biochemistry and Molecular Biology, Advanced Metabolism

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

*Publications:*

1. Thompson NL, AG Palmer, LL Wright and **PE Scarborough**. (1988) Fluorescence techniques for supported planar model membranes. *Comments Mol. Cell Biophys.* 5, 109-131.
2. **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* (J. E. Rivier and G. R. Marshall, Eds.), ESCOM Science Publishers B.V., Leiden, The Netherlands, pp. 367-368.
3. 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.
4. 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.
5. **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.
6. 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.
7. Pennington, MW, SM Festin, ML Maccicchini, F Dick and **PE Scarborough**. (1991) HIV protease, chromogenic substrate and inhibitor. In *Peptides 1990: Proceedings of the 21<sup>st</sup> European Peptide Symposium* (Giralt and Andreu, Eds.), ESCOM Science Publishers B.V., Leiden, The Netherlands, pp. 787-789.
8. 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.
9. **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.
10. 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<sub>2</sub>-P<sub>1</sub>-P<sub>1</sub>-P<sub>2</sub> variation. *J. Med. Chem.* 36, 2614-2620.
11. 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 22<sup>nd</sup> European Peptide Symposium* (C. H. Schneider and A. N. Eberle, Eds.), ESCOM Science Publishers B.V., Leiden, The Netherlands, pp. 936-937.

12. 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 Henrikson. (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.
13. 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.
14. **Scarborough, PE**, and BM Dunn. (1994) Redesign of the substrate specificity of human cathepsin D: The dominant role of position 287 in the S<sub>2</sub> subsite. *Protein Engineering* 7, 495-502.
15. 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.
16. 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 *7<sup>th</sup> Aspartic Proteinase Conference Proceedings* (M. N. G. James, Ed.), Plenum Press, New York, pp. 133-138.
17. 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.
18. 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.
19. 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.
20. **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.
21. 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.
22. **Juras**, PS and DP Sandler. Environmental contributors to Infant Mortality: A meeting report. in preparation.

23. **Juras**, PS and DP Sandler, eds. Proceedings Report: Epidemiology in the 21<sup>st</sup> Century. in preparation.

*Presentations at Scientific Meetings:*

**Scarborough, PE**, GE Conner and BM Dunn: Expression, refolding and characterization of recombinant human procathepsin D. 11<sup>th</sup> 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. 6<sup>th</sup> 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<sub>2</sub> 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:*

**Scarborough, PE**, BM Beyer, MM Rafanan and BM Dunn: Mutagenesis of human cathepsin D as dictated by kinetics and rule-based molecular modeling. Miami Bio/Technology Winter Symposium, Miami, Florida, January 1993

**Scarborough, PE** and BM Dunn: The dominant role of position 287 in the S<sub>2</sub> subsite of human cathepsin D. University of North Carolina at Chapel Hill Department of Pathology and Laboratory Medicine, April 1993.

**Scarborough, PE**, and BM Dunn. Redesign of the substrate specificity of human cathepsin D. Duke University Medical Center Department of Pathology, May 1993.

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