

CURRICULUM VITAE

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CONTENTS

PERSONAL INFORMATION	3
EDUCATION	3
PROFESSIONAL POSITIONS HELD	4
PROFESSIONAL SOCIETIES & ORGANIZATIONS	5
AWARDS AND HONORS	5
FUNDING SUPPORT	5
RESEARCH AND DEVELOPMENT	5
LANGUAGES	6
COLLABORATIONS	6
PUBLICATIONS	
<i>Papers Published in Peer-Reviewed Journals</i>	6
<i>Invited Book Chapters</i>	9
<i>Invited Seminars</i>	9
<i>Conference Proceedings</i>	11

CURRICULUM VITAE

PERSONAL INFORMATION

Marital Status: Single

Citizenship: USA

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EDUCATION

Ph.D. – 1999 Major: Chemistry
Department of Chemistry
University of Illinois at Chicago
Chicago, IL

M.S. – 1994 Major: Chemistry
Department of Chemistry
University of Illinois at Chicago
Chicago, IL

B.S. – 1992 Major: Chemistry
Department of Chemistry
University of Illinois at Chicago
Chicago, IL

PROFESSIONAL POSITIONS HELD

STAFF SCIENTIST

2001-PRESENT Biotechnology Division, National Institute of Standards and Technology,
Gaithersburg, MD

NRC POSTDOCTORAL FELLOW

1999-2001 Biotechnology Division, National Institute of Standards and Technology,
Gaithersburg, MD

Current Research Programs:

Genotyping of Single Nucleotide Polymorphisms (SNPs) by Mass Spectrometry

SNPs are the most frequent form of DNA sequence variation in the human genome and are becoming increasingly popular genetic markers for genome mapping studies, medical diagnostics, and identity testing. The primer extension assay (and variations upon it) has been employed to probe a known SNP site in DNA. One method for SNP identification currently employed relies on the mass resolution between a primer and its extension product(s) utilizing Matrix Assisted Laser Desorption Ionization Time-of-Flight Mass Spectrometry or MALDI-TOF MS. Data collection by this technique is rapid (on the order of 5 sec per sample) and has high throughput potential when interfaced with an automated robotics system and automated data analysis.

Multiplexing (probing more than one mutation in a single tube) of the SBE assay will further increase the power of the technique. An important aspect of multiplexing is primer design. Optimization of parameters such as primer size, molecular weight of extension product(s), prediction of primer annealing temperatures, and the detection of possible secondary structure are essential for the successful multiplexing of SBE reactions. A computer software program (SNPv3) written in Visual Basic 6.0 is currently being developed that deals with these issues.

Quality Control of PCR Primers Used in Multiplex STR Amplification Reactions

Short tandem repeat (STR) markers have become widespread in their use by the forensic DNA typing community due to their ability to provide a high degree of discrimination between individuals in a relatively short period of time and in spite of highly degraded sample material. The amplification of multiple STR markers in the same polymerase chain reaction (PCR) tube is made possible by using a combination of oligonucleotide primers that hybridize to multiple regions of genomic DNA. Multiplex STR analysis has dramatically improved the power of discrimination with the ability to analyze multiple regions of DNA simultaneously. From a single amplification with less than a nanogram of DNA template, it is possible to obtain random match probabilities of greater than 1 in 100 billion.

Commercially available STR multiplex sets vary based on which STR loci are included, the fluorescent dye combinations, the DNA strand that is labeled, allelic ladders present in kits, and most importantly, the primer sequences

utilized for PCR amplification. While these STR kits provide a solution to obtaining DNA typing results at most of the same DNA markers, the amplicon (PCR product) sizes differ because unique primer sequences are used in the kits.

Good quality control of the PCR primers included in STR multiplex kits will help maintain consistent and reliable results over time as these kits are used to amplify DNA samples from convicted offenders and crime scene samples. While both high performance liquid chromatography (HPLC) and time-of-flight mass spectrometry (TOF-MS) have been previously used for direct detection and accurate genotyping of STR products, our research focuses on the use of these techniques for measurement of the PCR primers used in multiplex STR amplification reactions. We are developing the techniques necessary to separate the various primers in the multiplex kits for the purposes of providing an independent quality control check on each primer.

Research Fellow
1993-1999

Department of Chemistry, University of Illinois at Chicago
Chicago, IL

Ph.D. Dissertation Title: Thermodynamic investigations of deoxyoligonucleotides utilizing differential scanning calorimetry.

Specialized Experience

Experienced in the development of methodologies for genomic research. Experience in developing nucleic acid-based assays for typing genetic markers for human identification and medical diagnostic purposes. Experience with instrumental techniques such as mass spectrometry, capillary electrophoresis, high performance liquid chromatography, ultra violet and visible spectrophotometry, flow cytometry, chip-based electrophoresis, liquid handling robotic systems as well as experience with molecular biology techniques. Knowledge of the polymerase chain reaction and nucleic acid hybridization for the development of diagnostic assays. Computer programming skills for managing DNA sequence information and developing custom software for rapid assay design.

PROFESSIONAL SOCIETIES & ORGANIZATIONS

Biophysical Society (1996)

American Association for the Advancement of Science (1993)

AWARDS AND HONORS

1999 NRC Post-Doctoral Fellowship National Institute of Standards and Technology

FUNDING SUPPORT

<u>Source</u>	<u>Title</u>	<u>Year Granted</u>
National Research Council, NIST	NRC Post Doctoral Fellowship for conducting research in the field of nucleic acid based diagnostics.	1999

RESEARCH AND DEVELOPMENT

NIST, Gaithersburg, MD

- Genotyping single nucleotide polymorphisms utilizing MALDI-TOF MS based technologies.
- Typing polymorphisms located in the mitochondrial genome utilizing capillary electrophoresis instrumentation - Applied Biosystems 310 and 3100 Genetic Analyzer.
- LC/MALDI-TOF MS technology for quality controlling commercial multiplex PCR primer kits.
- Developed computer software programs “Oligo Suite” in Visual Basic 6.0 for PCR and SNP primer selection.

University of Illinois at Chicago, Chicago, IL

- Thermodynamic evaluation of helix-coil transitions in DNA oligomers by the methods of differential scanning calorimetry and optical thermal melting.
- Thermodynamic, spectroscopic, and equilibrium binding studies of DNA sequence context effects in deoxyoligonucleotides.
- Use of nearest-neighbor thermodynamic parameters for predicting DNA duplex stability.

LANGUAGES

English

COLLABORATIONS

- 2003-2006** Armed Forces DNA Identification Laboratory (AFDIL)
- 2002** National Center for Biotechnology Information Bethesda, MD USA
Working with Dr. Steven Sherry on developing primer selection software.
- 2000-2002** Bruker Daltonics Billerica, MA USA
Involved in performing assays for single nucleotide polymorphism detection.
- 2000** Transgenomic Inc. Gaithersburg, MD USA
Developing the use of denaturing HPLC systems for nucleic acid analysis.
- 2000** Research Center for Genetic Medicine, Children's National Medical Center
Washington D.C. USA. Detection of genetic mutations.

PUBLICATIONS

Papers Published in Peer-Reviewed Journals

Butler, J.M., Decker, A.E., **Vallone, P.M.**, and Kline, M.C. (2006) Allele frequencies for 27 Y-STR loci with U.S. Caucasian, African American, and Hispanic samples. *Forensic Sci Int.* 156: 250-60.

Mandell, K, **Vallone, P.M.**, Owczarczy, R., Riccelli, P.V., and Benight, A.S. (2005) Studies of DNA Dumbbells VIII: Melting analysis of DNA dumbbells with dinucleotide repeat stem sequences. *Biopolymers*. [Epub ahead of print]

Dixon, L.A., Dobbins, A.E., Pulker, H.K., Butler, J.M., **Vallone, P.M.**, Coble, M.D., Parson, W., Berger, B., Grubwieser, P., Mogensen, H.S., Morling, N., Nielsen, K., Sanchez, J.J., Petkovski, E., Carracedo, A., Sanchez-Diz, P., Ramos-Luis, E., Brion, M., Irwin, J.A., Just, R.S., Loreille,

O., Parsons, T.J., Syndercombe-Court, D., Schmitter, H., Stradmann-Bellinghausen, B., Bender, K., and Gill, P. (2005) Analysis of artificially degraded DNA using STRs and SNPs-results of a collaborative European (EDNAP) exercise. *Forensic Sci Int.* [Epub ahead of print]

Coble, M.D., **Vallone, P.M.**, Just, R.S., Diegoli, T.M., Smith, B.C., and Parsons, T.J. (2006) Effective strategies for forensic analysis in the mitochondrial DNA coding region. *Int J Legal Med.* 120: 27-32.

Butler, J.M., Decker, A.E., Kline, M.C., and **Vallone, P.M.** Chromosomal duplications along the Y-chromosome and their potential impact on Y-STR interpretation. (2005) *J Forensic Sci.* 50: 853-9.

Kline, M.C., **Vallone, P.M.**, Redman, J.W., Duewer, D.L., Calloway, C.D., and Butler, J.M. (2005) Mitochondrial DNA typing screens with control region and coding region SNPs. *J Forensic Sci.* 50: 377-85.

Vallone, P.M., Decker, A.E. and Butler J.M. (2005) Allele Frequencies for 70 Autosomal SNP Loci with U.S. Caucasian, African American, and Hispanic Samples *Forensic Science International* 149: 279-86.

Just R.S., Irwin J.A., O'Callaghan J.E., Saunier J.L., Coble M.D., **Vallone P.M.**, Butler J.M., Barritt S.M., Parsons T.J. (2004) Toward increased utility of mtDNA in forensic identifications. *Forensic Sci Int.* 146 Suppl: S147-9.

Vallone P.M., Fahr K, Kostrzewa M (2004) Genotyping SNPs Using a UV-Photocleavable Oligonucleotide in MALDI-TOF MS. *Methods Mol Biol.* 297: 169-78.

Vallone, P.M. and Butler, J.M. (2004) AutoDimer: a screening tool for primer-dimer and hairpin structures. *Biotechniques*, 37: 226-231.

Vallone, P.M., Just, R.S., Coble, M.D., Butler, J.M., Parsons, T.J. (2004) A multiplex allele-specific primer extension assay for forensically informative SNPs distributed throughout the mitochondrial genome. *Int. J. Legal Med.*, 118: 137-146.

Vallone, P.M. and Butler, J.M. (2004) Y-SNP typing of U.S. African American and Caucasian samples using allele-specific hybridization and primer extension. *J. Forensic Sci.* 49(4): 723-732.

Schoske, R., **Vallone, P.M.**, Kline, M.C., Redman, J.W., Butler, J.M. (2004) High-throughput Y-STR typing of U.S. populations with 27 regions of the Y chromosome using two multiplex PCR assays. *Forensic Sci Int* 139: 107-121.

Butler, J.M., Schoske, R., **Vallone, P.M.**, Redman, J.W., Kline, M.C. (2003) Allele frequencies for 15 autosomal STR loci on U.S. Caucasian, African American, and Hispanic populations *J Forensic Sci.* 48: 908-11.

Schoske, R., **Vallone, P.M.**, Ruitberg, C.M., Butler, J.M., (2003) Multiplex PCR design strategy used for the simultaneous amplification of 10 Y chromosome short tandem repeat (STR) loci.

Anal Bioanal Chem. 375: 333-43.

Butler, J.M., Schoske, R., **Vallone, P.M.**, Kline, M.C., Redd, A.J., and Hammer, M.F. (2002) A Novel Multiplex for Simultaneous Amplification of 20 Y Chromosome STR Markers Forensic Sci Int. 129: 10-24.

Vallone, P.M., Devaney, J.M., Marino, M.A. and Butler, J.M. (2002) A Strategy for Examining Complex Mixtures of Deoxyoligonucleotides Using IP-RP HPLC, MALDI-TOF MS, and Informatics. Analytical Biochemistry 304: 257-265.

Benight, A.S., Pancoska P., Owczarzy, R., **Vallone, P.M.**, Nesetrl, J., and Riccelli, P.V. (2001) Calculating sequence-dependent melting stability of duplex DNA oligomers and multiplex sequence analysis by graphs. Methods Enzymol 340:165-92.

Butler, J.M., Devaney, J.M., Marino, M.A., and **Vallone, P.M.** (2001) Quality control of PCR primers used in multiplex STR amplification reactions. Forensic Sci Int 119: 87-96.

Devaney, J.M., Pettit, E.L., Kaler, S.G., **Vallone, P.M.**, Butler, J.M., and Marino, M.A. (2001) Genotyping of two mutations in the HFE gene using single-base extension and high-performance liquid chromatography. Anal. Chem. 73: 620-624.

Butler, J.M., Ruitberg, C.M., and **Vallone, P.M.** (2001) Capillary electrophoresis as a tool for optimization of multiplex PCR reactions. Fresenius J Anal Chem. 369: 200-205.

Wadkins, R.M., Tung, C.S., **Vallone, P.M.**, and Benight, A.S. (2000) The role of the loop in binding of an actinomycin D analog to hairpins formed by single-stranded DNA. Arch.Biochem.Biophys. 384: 199-203.

Vallone, P.M. and Benight, A.S. (2000) Thermodynamic, spectroscopic, and equilibrium binding studies of DNA sequence context effects in four 40 base pair deoxyoligonucleotides. Biochemistry 39: 7835-46.

Vallone, P.M., Paner, T.M., Hilario, J., Lane, M.J., Faldasz, B.D., and Benight, A.S. (1999) Melting studies of short DNA hairpins: influence of loop sequence and adjoining base pair identity on hairpin thermodynamic stability. Biopolymers 50: 425-442.

Vallone, P.M. and Benight, A.S. (1999) Melting studies of short DNA hairpins containing the universal base 5- nitroindole. Nucleic Acids Res. 27: 3589-3596.

Riccelli, P.V., **Vallone, P.M.**, Kashin, I., Faldasz, B.D., Lane, M.J., and Benight, A.S. (1999) Thermodynamic, spectroscopic, and equilibrium binding studies of DNA sequence context effects in six 22-base pair deoxyoligonucleotides. Biochemistry 38: 11197-11208.

Owczarzy, R., **Vallone, P.M.**, Goldstein, R.F., and Benight, A.S. (1999) Studies of DNA dumbbells VII: evaluation of the next-nearest-neighbor sequence-dependent interactions in duplex DNA. Biopolymers 52: 29-56.

Owczarzy, R., **Vallone, P.M.**, Gallo, F.J., Paner, T.M., Lane, M.J., and Benight, A.S. (1997) Predicting sequence-dependent melting stability of short duplex DNA oligomers. *Biopolymers* 44: 217-239.

Invited Book Chapters

Vallone, P.M., Fahr, K., Kostrzewa, M. (2004) Genotyping SNPs using a UV photocleavable oligonucleotide in MALDI-TOF MS. *Methods in Molecular Biology: Forensic DNA Typing Protocols* (Carracedo, A., ed.), Humana Press: Totowa, New Jersey, *in press*.

Butler, J.M. and **Vallone, P.M.** (2004) High-throughput genetic analysis through multiplexed PCR and multicapillary electrophoresis. *PCR Technologies: Current Innovations* (2nd edition), Weissensteiner, T., Griffin, H.G., Griffin, A. (Eds.), CRC Press: Boca Raton, Chapter 11, pp 111-120.

Vallone, P.M. and Butler, J.M. (2004) Multiplexed assays for evaluation of Y-SNP markers in U.S. populations. *Progress in Forensic Genetics 10*, Elsevier Science: Amsterdam, The Netherlands, International Congress Series 1261, 85-87.

Butler, J.M., Schoske, R., **Vallone, P.M.** (2003) Highly multiplexed assays for measuring polymorphisms on the Y-chromosome. *Progress in Forensic Genetics 9* (Brinkmann, B. and Carracedo, A., eds.), Elsevier Science: Amsterdam, The Netherlands, International Congress Series 1239, pp. 301-305.

Butler, J.M. and **Vallone, P.M.** (2002) High throughput genetic analysis through multiplexed PCR and multi-capillary electrophoresis. *PCR Technologies: Current Innovations* (2nd edition), *In Press*

Vallone, P.M. and Butler, J.M. Analysis of DNA Single Nucleotide Polymorphisms by Mass Spectrometry. In: *Encyclopedia of Mass Spectrometry*, Eds. Richard Caprioli and Michael Gross *In Press*

Invited Seminars

"Examining Candidate DNA Quantitation Standards with Real-Time Quantitative PCR Assays" **Peter M. Vallone** 58th Annual Meeting of the American Academy of Forensic Sciences Seattle, WA (February 23, 2006).

"Potential Application of Forensic DNA Testing Methods to Cancer Diagnostics" **Peter M. Vallone** and Mike Coble seminar to Fred Hutchinson Cancer Research Center Seattle, WA (February 17, 2006).

"Forensic DNA Typing: The Application of Nucleic Acid Based Technology to Human Identity Testing" **Peter M. Vallone** seminar for guest lecture series with the Science and Engineering Alliance at Southern University and A&M College Baton Rouge, LA (January 18, 2006).

"NIST Projects in Human Identity Testing" **Peter M. Vallone** talk at Association of Forensic DNA Analysts and Administrators summer meeting Austin, TX (August 4, 2005).

"NIST Projects in Human Identity Testing" John Butler, Mike Coble, **Peter M. Vallone**, and Margaret Kline talk to the FBI Laboratory Quantico, VA (May 19, 2005).

"Evaluation of SNPs as Tools in Human Identity Testing" **Peter M. Vallone** 57th Annual Meeting of the American Academy of Forensic Sciences New Orleans, LA (February 26, 2005).

"NIST Research Summary for AFDIL" **Peter M. Vallone**, Michael D. Coble and John M. Butler Armed Forces DNA Identification Laboratory, Rockville, MD (August 3, 2004)

"New Autosomal Forensic Markers and a Review of the NIST Interlaboratory Quantitation Study" **Peter M. Vallone** and Margaret C. Kline, NIJ Grantees Meeting, Washington D.C. (June 30, 2004).

"A Multiplex Primer Extension Assay for Probing 11 SNPs Located in the Mitochondrial Genome" **Peter M. Vallone**, Uppsala University, Department of Genetics and Pathology, Uppsala Sweden (November 19, 2003).

"Multiplex SNP Assays for the Evaluation of Forensic Markers" **Peter M. Vallone**, Royal Institute of Technology, Department of Biotechnology, Stockholm, Sweden (November 18, 2003).

"Multiplexed Assays for Evaluation of Y SNP Markers in U.S. Populations" **Peter M. Vallone** talk at International Society of Forensic Genetics - 20th International Congress ISFG Arcachon, France (September 12, 2003).

"Development of Multiplexed SNP Assays from Mitochondrial and Y Chromosome DNA for Human Identity Testing" **Peter M. Vallone**, NIJ Grantees Meeting, Washington D.C. (June 25, 2003).

"Development of Multiplexed Assays for Evaluating SNP and STR Forensic Markers" **Peter M. Vallone**, The George Washington University Department of Biological Sciences, (February 28, 2003).

"Development of Multiplexed Assays for Typing SNP and STR Forensic Markers" **Peter M. Vallone**, National Cancer Institute – Advanced Technology Program, Gaithersburg, Maryland (July 10, 2002)

"Multiplexed Assays for Probing Y Chromosome and Mitochondrial Markers" **Peter M. Vallone**, 5th Annual Cambridge Healthsciences Institute DNA Forensics Meeting, Washington D.C. (June 28, 2002)

"Analyzing Single Nucleotide Polymorphisms" **Peter M. Vallone**, Forensic Mitochondrial DNA Analysis: A Community Forum AAFS Annual Meeting, Atlanta, GA (February 11, 2002)

“Genotyping of Single Nucleotide Polymorphisms (SNPs) by MALDI-TOF MS” **Peter M. Vallone**, Invited Seminar, Children’s National Medical Center, Washington, D.C. (October 30, 2001).

“Use of MALDI-TOF MS for DNA Quality Controlling at NIST” **Peter M. Vallone** and John M. Butler, Bruker Users Group Meeting held at the 49th Annual American Society of Mass Spectrometry, Chicago, Illinois (2001)

“Genotyping of Single Nucleotide Polymorphisms (SNPs) by MALDI-TOF MS” **Peter M. Vallone**, Virginia Commonwealth University School of Medicine, Richmond Virginia (March 13, 2001)

“NIST Research Projects Related to Forensic DNA Typing” John M Butler and **Peter M Vallone** and John M Butler September 8, 2000 Presentation to FBI Forensic Sciences Research Unit

“Analysis of Multiplex STR Kits and Primer Sequences” John M. Butler and **Peter M. Vallone** January 12, 2001 Special Presentation to National Institute of Justice

Conference Proceedings

"Evaluation of an autosomal SNP 12-plex assay" **Peter M. Vallone** poster at the International Society of Forensic Genetics meeting Ponta Delgada, Azores, Portugal (September 14-16, 2005).

“AutoDimer: A screening tool for primer-dimer and hairpin structures” Peter M. Vallone and John M. Butler 12th Annual Nucleic Acid-Based Technologies Meeting, McLean , VA (2004).

“Multiplex Detection of 10 SNPs Located in the Coding Region of the Mitochondrial Genome” Peter M. Vallone, Michael D. Coble, Ilona H. Letmanyi, Thomas J. Parsons, John M. Butler 52st Annual American Society of Human Genetics, Baltimore, MD (2002).

“Rapid genotyping of Y chromosome SNPs using a UV photocleavable oligonucleotide in MALDI-TOF MS” Peter M. Vallone, Anupara Gaur, Thomas Wenzel, Jay Stoerker, Thomas Froelich, John M. Butler, Markus Kostrzewa 50th Annual American Society of Mass Spectrometry, Orlando, Florida (2002)

“Detection of Single Nucleotide Polymorphisms by MALDI-TOF Mass Spectrometry” Peter M. Vallone and John M. Butler 51st Annual American Society of Human Genetics, San Diego, CA (2001).

“Genotyping Single Nucleotide Polymorphisms in the Y Chromosome and the Mitochondrial Genome” Peter M. Vallone and John M. Butler 12th Annual International Symposium on Human Identification, Biloxi, Mississippi (2001).

“Comparisons of MALDI-TOF MS Methods for DNA Analysis” Peter M. Vallone and John M. Butler 49th Annual American Society of Mass Spectrometry, Chicago, Illinois (2001)

“Multiplex PCR and Comparison of Primer Sequences Used in STR Kits” John M. Butler and Peter M. Vallone 11th Annual International Symposium on Human Identification, Biloxi, Mississippi (2000).

“DNA Mass Spectrometry at NIST” 8th Annual Sigma Xi poster session, NIST (2001).

“DNA Mass Spectrometry at NIST” 11th Annual International Symposium on Human Identification, Biloxi, Mississippi (2000).

“Development of Primer Selection Software for SNP Detection” 8th Annual Nucleic Acid-Based Technologies Meeting, Washington D.C. (2000).

“Development of Primer Selection Software for SNP Detection” 1st Annual Divisional Retreat Center for Advanced Research in Biotechnology, Rockville, Maryland (2000).

“Melting Analysis of DNA Dumbbells with Repeating Dinucleotide Stem Sequences Reveals Evidence for Long Range Sequence Dependent Interactions in Short Duplex DNA” 7th Annual Sigma Xi poster session, NIST (2000).

“Evaluation of the Next-Nearest-Neighbor Sequence Dependent Interactions in Duplex DNA” 44th Annual meeting of the Biophysical Society, New Orleans, Louisiana (2000).

“Thermodynamic, Spectroscopic, and Equilibrium Binding Studies of DNA Sequence Context Effects in Four 40 Base Pair Deoxyoligonucleotides” 44th Annual meeting of the Biophysical Society, New Orleans, Louisiana (2000).

“The Unwinding of a DNA Hairpin Loop: A Thermodynamic and Kinetic Description” 44th Annual meeting of the Biophysical Society, New Orleans, Louisiana (2000).

“Melting Analysis of DNA Dumbbells with Repeating Dinucleotide Stem Sequences Reveals Evidence for Long Range Sequence Dependent Interactions in Short Duplex DNA” 44th Annual meeting of the Biophysical Society, New Orleans, Louisiana (2000).

“Investigations of DNA Context Effects: Influences of Flanking Sequence Stability on Site Specific Binding of *Bam*HI Restriction Enzyme to Duplex DNA Oligomers.” 41st Annual meeting of the Biophysical Society, New Orleans, Louisiana (1997).

“Predicting Melting Temperatures of Short Duplex DNA Oligomers.” 41st Annual meeting of the Biophysical Society, New Orleans, Louisiana (1997).

“Melting Behavior of DNA Hairpins Containing the Universal Base 5-Nitroindole.” 41st Annual meeting of the Biophysical Society, New Orleans, Louisiana (1997).

“Predictions of the Melting Stability of Short Duplex DNA Oligomers from Their Base Pair Sequence.” 11th Annual Gibbs Conference on Biothermodynamics, Carbondale, Illinois (1997).

“Sequence Dependent Melting Stability and Structure of Flanking DNA Regions Modulate Equilibrium Site-Specific Binding of *BamHI* Restriction Endonuclease.” 11th Annual Gibbs Conference on Biothermodynamics, Carbondale, Illinois (1997).

“Thermodynamics of DNA Hairpins Containing the Universal Base 5-Nitroindole.” 10th Annual Gibbs Conference on Biothermodynamics, Carbondale, Illinois (1996).