

DR. BOB PALAIS
Bob.Palais [at] uvu.edu

EDUCATION

Graduate:

1986 Ph. D. in Mathematics, University of California, Berkeley, Princeton University, 1985-6.

Thesis: Blowup and Stability for an Equation Modeling Stretched Vortices.
Written under the supervision of Professor Andy Majda.

1983 Master of Science, University of California, Berkeley.

Undergraduate:

1980 Bachelor of Science, cum laude in mathematics, Harvard University.

PROFESSIONAL EXPERIENCE

July 2013-: Associate Professor, Math Department, Utah Valley University

August 2011-June 2013: Assistant Professor, Math Department, Utah Valley University

January 2007-present: Adj. Research Associate Professor, Pathology Department, University of Utah.

March 2009-June 2011: Research Professor, Math Department, University of Utah.

September 2000-March 2009: Research Associate Professor, Math Department, University of Utah.

September 1998-August 2000: Associate Professor, Math Department, Westminster College.

September 1996-August 1998: Assistant Professor, Math Department, Westminster College.

September 1990-August 1996: Assistant Professor, Math Department, University of Utah.

September 1988-August 1990: Morrey Visiting Assistant Professor, UC Berkeley.

September 1986-August 1988: N.S.F Postdoctoral Research Fellow and Visiting Member,
Courant Institute of Mathematical Sciences, New York University.

ACADEMIC INTERESTS

Scientific computation; mathematical methods in molecular medicine and bioinformatics, high-resolution DNA melting analysis, diagnostic and therapeutic genomics and expression analysis; mathematical visualization and computer graphics; math education; history of math; singularity formation for nonlinear evolution equations; optimal design for materials and microstructures, theory and computation; pattern formation and recognition; adaptive algorithms (genetic, multigrid, multipole, wavelet, FFT, IFS); numerical analysis; mathematical modeling; variational and inverse problems; geometry and transformation groups.

SELECTED PUBLICATIONS

2015:

Copy Number Assessment by Competitive PCR with Limiting dNTPs and High Resolution Melting. Zhou, L., **Palais R.**, Paxton C., Geiersbach K., Wittwer, CT., Clin Chem. [accepted].

2014:

Palais B., A Missing Piece: Early Elementary Plane Rotations. Doceamus: Notices of the American Mathematical Society, Vol. 61, Issue 2, Feb 2014 - pp. 174-176.

Microfluidic genotyping by rapid serial PCR and high-speed melting analysis. Sundberg SO, Wittwer CT, Howell RM, Huuskonen J, Pryor RJ, Farrar JS, Stiles HM, **Palais RA**, Knight IT. Clin Chem. 2014 Oct;60(10):1306-13.

Quasi-digital PCR: Enrichment and quantification of rare DNA variants. Sundberg SO, Wittwer CT, Zhou L, **Palais R**, Dwight Z, Gale BK. Biomed Microdevices. 2014 Aug;16(4):639-44.

Genotyping accuracy of high-resolution DNA melting instruments. Li M, Zhou L, **Palais RA**, Wittwer CT. Clin Chem. 2014 Jun;60(6):864-72.

Heterozygote PCR product melting curve prediction. Dwight ZL, **Palais R**, Kent J, Wittwer CT. Hum Mutat. 2014 Mar;35(3):278-82

2013:

Zhou L, **Palais RA**, Ye F, Chen J, Montgomery JL, Wittwer CT. Symmetric Snapback Primers for Scanning and Genotyping of the Cystic Fibrosis Transmembrane Conductance Regulator Gene. Clin Chem. 2013 Jul;59(7):1052-61

2012:

Dwight ZL., **Palais R.**, Wittwer CT., uAnalyze : Web-Based High Resolution DNA Melting Analysis with Comparison to Thermodynamic Predictions. IEEE/ACM Trans Comput Biol Bioinform. 2012 Nov-Dec;9(6):1805-11.

B. Palais, R. Palais. Chasles' fixed point theorem for Euclidean motions. J. Fixed Point Theory & Applications. June 21 2012 15(4):1-7.

2011:

Snapback primer genotyping of the Gilbert syndrome UGT1A1 (TA)(n) promoter polymorphism by high-resolution melting. Farrar JS, **Palais RA**, Wittwer CT. Clin Chem. 2011 Sep;57(9):1303-10.

A. M. Svensson, L-S. Chou, C. Meadows, C. Miller, **R. Palais**, K. Sumner, T. C. Wayman², R. Mao^{1,2}, E. Lyon. Implementation of a Cost-effective Unlabeled Probe High-Resolution Melt Assay for Genotyping of Factor V Leiden. *Genetic Testing and Molecular Biomarkers*. 2011 15(4):1-7.

Kempe-Dustin, J, Aboul-Fadl, T., **Palais, R.**, Gerald J. Gleich, G, Wagner, L., Cell Screening Assay For Identifying Inhibitors of Eosinophil Proliferation. *Drug Development Research Wiley-Liss* 2011 72

Dwight Z., Palais R., Wittwer CT., uMELT : Prediction of high-resolution melting curves and dynamic melting profiles of PCR products in a rich web application. *Bioinformatics*. 2011 Apr 1;27(7):1019-20.

2010:

Zhou L, **Palais RA**, Smith GD, Anderson D, Rowe LR, Wittwer CT. Enrichment and Detection of Rare Alleles by Means of Snapback Primers and Rapid-Cycle PCR. *Clin Chem*. 2010 56(5):814-22.

Palais, B., Patents and Mathematics. Letter to the Editor, *Notices of the AMS*, Vol. 57(1). p. 7.

Palais, B., The Fast Fourier Transform, **B. Palais** and R. Palais, Introduction to Fourier Methods. (e-book Appendices to *Differential Equations, Mechanics and Computation*.)

McKinney JT, Nay LM, De Koeyer D, Reed GH, Wall M, **Palais RA**, Jarret RL, Wittwer CT. Mutation scanning and genotyping in plants by high resolution DNA melting. In: *The Handbook of Plant Mutation Screening*, Meksem K, Kahl G, eds. Wiley-VCH, Weinheim, 149-165, 2010.

2009:

Palais, RA, Wittwer, CT., Mathematical algorithms for high-resolution DNA melting analysis. (Invited) *Methods in Enzymology*. Vol. 454. Computer Methods, Part A) Elsevier, Jan. 2009.

Palais, B., Palais, R., Rodi, S., A Disorienting Look at Euler's Theorem on the Axis of a Rotation. *Am. Math Monthly*. Volume 116, Number 10, December 2009 , pp. 892-909(18) **(Recipient of the 2010 Lester R. Ford Award)**

Palais, R and Palais R, *Differential Equations, Mechanics, and Computation*, IAS/Park City Mathematics Series, American Mathematical Society (2009)

2008

Szabo, A., Perou, C., Karaca, M., Perreard, L., **Palais, R.**, Quackenbush, J., Bernard, P., Statistical Methods for Selecting Housekeeper Genes. *Genome Biology* 2008, 9:405

Crews, N., Wittwer, C., **Palais, R.**, Gale, B., Product differentiation during continuous-flow thermal gradient PCR. *Lab Chip*. 2008 Jun;8(6):919-24.

2007

Palais, B., Palais R. Euler's fixed point theorem: The axis of a rotation. *J. Fixed Point Theory and Applications*. Dec. 2007, Vol. 2, no. 2, 215-220.

Vandersteen, JG, Bayrak-Toydemir, P, **Palais RA**, Wittwer CT, Identifying Common Genetic Variants by High-Resolution Melting. *Clin. Chem* 2007; 53:1191-8.

Palais R, Quantitative Heteroduplex Analysis, *Clin. Chem* 2007; 53:1001-3.

Jesse Montgomery, Carl T. Wittwer, **Robert Palais**, Luming Zhou, Simultaneous Mutation Scanning and Genotyping by High-Resolution DNA Melting Analysis. *Nature Protocols*. 2007 Feb 22;2(1), 59-66.

Erali, M, **Palais, B**, Wittwer, CT. SNP genotyping by unlabeled probe melting analysis. In: *Molecular Beacons (Methods in Molecular Biology)*, Seitz, O and Marx, A, eds., Humana Press, Totowa, New Jersey, 2007.

2005

Palais RA, Liew MA, Wittwer CT. Quantitative heteroduplex analysis for single nucleotide polymorphism genotyping. *Anal Biochem*. 2005 Nov 1;346(1):167-75.

Zhou L, Wang L, **Palais R**, Pryor R, Wittwer CT. High-resolution DNA melting analysis for simultaneous mutation scanning and genotyping in solution. *Clin Chem*. 2005 Oct;51(10):1770-7.

2004 and prior

L. Zhou, J. Vandersteen, L. Wang, T. Fuller, M. Taylor, **B. Palais**, C.T. Wittwer, High-resolution DNA melting curve analysis to establish HLA genotypic identity. *Tissue Antigens* 2004, 64:156-164.

M. Liew, R. Pryor, **R. Palais**, C. Meadows, M. Erali, E. Lyon, and C. Wittwer, Genotyping of Single-Nucleotide Polymorphisms by High-Resolution Melting of Small Amplicons, *Clinical Chemistry* Jul 1, 2004, 50(7).

Elenitoba-Johnson, Kojo S.J., Stephen D. Jenson, Robert T. Abbott, **Robert A. Palais**, Sandra D. Bohling, Zhaosheng Lin, Sheryl Tripp, Paul J. Shami, Lai Y. Wang, Robert W. Coupland, Rena Buckstein, Bayardo Perez-Ordonez, Sherrie L. Perkins, Ian D. Dube, and Megan S. Lim, Involvement of multiple signaling pathways in follicular lymphoma transformation: p38-mitogen-activated protein kinase as a target for therapy. *Proceedings of the National Academy of Sciences* 2003 100: 7259-7264.

Palais, R. The Natural Sine and Cosine Curves. *Journal of Online Math and its Applications*, Jan. 2001

Palais, B. An example demonstrating the fundamental theorem of calculus, *College Mathematics Journal*, Vol. 29, No. 4, September 1998, pp. 311-2

Palais, B. Pi is wrong!, *The Mathematical Intelligencer*, Vol. 23, no. 3, Summer 2001, pp. 7-8.

Cherkaev, A. and **Palais, R.** Optimal design of three-dimensional axisymmetric elastic structures. Structural Dynamic Systems, Computational Techniques and Optimization, C. Leondes, ed. Gordon and Breach Intl. Series in Engineering, Technology, and Applied Science, v.9, 1999

Palais, B., Blowup for nonlinear equations using a comparison principle in Fourier space. Comm. Pure and Appl. Math., vol. XLI, pp.165-196 (1988).

COURSES TAUGHT

At Utah Valley University:

MATH 4620 Introduction to Numerical Analysis II, MATH 4310 Introduction to Modern Algebra I
MATH 1220 Calculus II, MATH 1100 Introduction to Calculus, MATH 1050 College Algebra.

In Past Positions:

Quantitative Analysis/Business Calculus, Calculus I-II-III, Introduction to Scientific Computing I-II, Complex Analysis, Abstract Algebra, Linear Algebra, Applied Mathematics, Partial Differential Equations Introduction, Graduate, Chaos, Fractals and Nonlinear Systems/Applied Dynamical Systems, Numerical Analysis Survey-I-II-Graduate I-II.

SELECTED LECTURES AND PRESENTATIONS

UVU NSF Scholars Roundtable, December 2014, The Very Reasonable Effectiveness of Math in the Natural Sciences...and Beyond

BYU Biology Seminar, November 2014, Engaging Math Students With Biology

UVU Physics Colloquium, Oct 2014, 2-Pi is Wrong: Quaternions and the significance of 720 degrees

UVU Biology Colloquium, Sept 2014, Counting Copies of DNA with Melting and Math

Northern Arizona University Honors Graduation, Flagstaff, AZ April 2014
Playing House: A Mathematician Meets the Pathology Department.

MAA Intermountain Section Meeting, Utah Valley University, Orem, UT March 2014
The Math of Artificial Intelligence.

PCR for Molecular Medicine Tri-Conference, San Francisco, CA. Feb 2014. Novel Approaches and New Ways of Thinking. (Session Chair and Speaker) Counting Copies: Digital Distributions and Math for Melting.

MAA Intermountain Section Meeting, BYU Idaho, Rexburg, ID, March 2013
Math of Digital PCR.

25th International Conference on Technology in Collegiate Mathematics, Boston, MA, March 2013
Real World Applications: Math and Climate Change and Why it Matters, Organizer and Presenter

Duke University Math Union, Durham, NC, Analyzing DNA Without Sequencing Using Math,
Duke University Graduate Seminar, Understanding Quaternions Without Four Dimensions, March 2013

Math Fest 2012, National MAA Meeting, Madison, WI, August 2012
How Rodrigues Did It: The Geometric Discovery of Quaternion Multiplication

College of Science and Health Symposium, Utah Valley University, Orem, UT, April 2012
Math and Molecular Medicine

24th International Conference on Technology in Collegiate Mathematics, Orlando, FL, March 2012
Real World Applications: Calculus For DNA Analysis

Math Club Presentation, Utah Valley University, Orem, UT, December 2011
The Math of Artificial Intelligence

MAA Intermountain Section Meeting, Southern Utah University, Cedar City, UT, April 2011
A new formula for computing a rotation matrix.

Mathematics Colloquium, Weber State University, Ogden, UT, April 2010
Discovering New Math While Analyzing DNA.

MAA Intermountain Section Meeting,, Utah State University, Logan, UT, March 2010
Runge-Kutta Methods, Rooted Trees, and the LISP programming language.

Mathematics Colloquium, University of Utah, Salt Lake City, UT, April 2009
Rendering with Randomness, Rotating With Reflections.

Mathematics Colloquium, Utah State University, Logan, UT, April 2009
From Linear Algebra to Molecular Classification and Quaternions.

MAA Intermountain Section Meeting, Brigham Young University, Provo, UT, 2008,
A new formula for computing a rotation matrix.

Mathematics Colloquium, USMA, West Point
3D Visualization and Molecular Diagnostics, Feb. 2007

19th International Conference on Technology in Collegiate Mathematics, Boston, MA, Feb. 2007
Pre-Session on 3D Visualization in the Math Curriculum

Applied Mathematical Colloquium, Massachusetts Institute of Technology
Surprising Algorithms for Performing Rotations and their Consequences, Feb. 2007

Institute of Mathematical Sciences Colloquium, University of Virginia, Charlottesville
Modeling and Analyzing DNA Melting Transitions for Molecular Diagnostics, Oct. 2006

AMS-MAA-SIAM Joint Meetings: San Antonio, 2006, Atlanta, GA 2005, Phoenix, AZ 2004.
NSF-DUE Poster Session: Linking visualizations online to discover and unify mathematics.

MAA Intermountain Section Meeting, Idaho State University, Pocatello, ID, 2005,
Odds ratios, event frequencies, and an optimization problem in DNA genotyping.

Beyond Genome Conference, San Francisco, CA 2004 Quantitative heteroduplex analysis for single
nucleotide polymorphism genotyping.

MAA Intermountain Section Meetings, Weber State University, Ogden, UT, 2003,
The belt trick, the plate trick, and orientation entanglement. Rick's College, Idaho Falls, ID, 2001
Enumerating Finite Abelian Groups and Jordan Canonical Forms with the FFT.

Unifying, motivating, and understanding fundamentals using the rotation formula.
Session on Geometry in the Classroom, Joint Math Meetings, San Antonio, Texas, Jan. 1999.

Legendre=Lagrange, An example in duality. MAA Section meeting, Provo, Utah, April, 1998.

SES Annual Meetings, College Station, 1994; New Orleans, 1995.

NIST International Workshop in Optimal Design, Salt Lake City, 1995.

ISSMO 1st World Congress, Goslar, Germany, 1995.

Danish Technical University, Lyngby, Denmark, 1995.

Princeton University, Applied Mathematics Colloquium 1995.

NATO Workshop on Singularities in Vortex Dynamics, Crete, 1992.

ORGANIZING COMMITTEES

25th International Conference on Technology in Collegiate Mathematics, Boston, MA, March 2013
Session on Real World Applications

DiYModeling Project Workshop, NASA, Clear Lake, TX, June 2012

High-Resolution DNA Melting Analysis: Simpler and More Efficient Next-generation Molecular
Diagnostics. American Association for Clinical Chemistry Annual Meeting, 2006.

The NIST International Workshop on Optimal Design of Materials and Structures. Salt Lake City, Utah,
August, 1995.

REVIEWING

Reviewing for Clinical Chemistry journal and for the National Science Foundation Division of
Undergraduate Education CCLI and TUES grants programs.

PATENTS AND APPLICATIONS

U.S. Utility Patent 8,068,992: Melting Curve Analysis with Exponential Background Subtraction. **B Palais** and CT Wittwer. (**Issued:** Nov 29, 2011)

U.S. Utility Patent 8,296,074: Melting Curve Analysis with Exponential Background Subtraction. **B Palais** and CT Wittwer. (**Issued:** Oct 23, 2012)

U.S. Utility Patent 8,860,764: Implementing And Interpolating Rotations From a Computing Input Device. **RA Palais** and RS Palais. (**Issued:** Oct 14, 2014)

U.S. Utility Patent Application 61839269: Methods of Performing Polymerase Chain Reaction and related uses thereof. CT Wittwer, L Zhou, **RA Palais**. Filed Jun 2013.

U.S. Utility Patent Application 13/128,289: Allele Amplification Bias and Quantification. JT McKinney, L Zhou, CN Gundry, **RA Palais**. Filed Nov 2009.

U.S. Utility Patent Application 13/132,856: Systems and Methods for Automated Melting Curve Analysis. TC Robbins, **RA Palais**, CT Wittwer. Filed March 2009.

U.S. Utility Patent Application 12/999,268 : Generating Point Clouds
Univ. Utah Res. Foundation. **RA Palais**, RS Palais, HRT Karcher. Filed Aug 2008.

U.S. Utility Patent Application 12/094,898: Methods and Compositions Involving Intrinsic Genes. MJ Ellis, PS Bernard, **RA Palais**, CM Perou, and **B.**. Filed Nov 2006.

POSTERS AND WORKSHOPS

Association for Laboratory Automation, LabAutomation 2008 Palm Springs, CA, Automation of a Genetic Assay With Real and Virtual Instruments, Integrating DNA Extraction, Amplification, High-Resolution Melting, and Analysis.

Association for Molecular Pathology Annual Meeting 2007, Los Angeles, CA. Thermodynamic parameters derived under standard conditions eliminating multiple correction factors.

American Association for Clinical Chemistry Annual Meeting 2006, Chicago, IL Mini-Course on High-Resolution DNA Melting.

MAILING ADDRESS

Dr. Bob Palais
Math Department, Utah Valley University
College of Science & Health - MS 261
800 W. University Parkway
Orem, UT 84058 USA

