CURRICULUM VITAE

Zvezdelina Stankova, *Frederick A. Rice Professor of Mathematics*

Education: B.A. /M.A. Bryn Mawr College 1992, M.A. 1996 and Ph.D. 1997 Harvard University, Single-subject Teaching Credential in Massachusetts 1997 (through Harvard Graduate School of Education) and in California 1998 (through University of California at Berkeley).

Employment: MSRI 1997-98, UC Berkeley 1998-99, 2002-09, MAA American Mathematics Competitions 1998-04, Mills College 1999-present.

Honors and Fellowships: Frederick Rice Professorship, *Mills College* 2009-12; Mu Alpha Theta Certificate of Appreciation from the *National High School and Two-Year College Mathematics Honor Society* 2005; *MAA* First Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member 2004; *Harvard University*: Summer research fellowship in algebraic geometry 1996, James K. Whitmore Scholarship, 1993-94, and An Wang Fellowship to four science graduate students 1992-94; AWM Alice T. Schafer Mathematics Prize 1992; *Bryn Mawr College*: Gertrude Taylor Slaughter Fellowship to one member of graduating class for excellence in scholarship and research 1992, Marshall Fellowship for senior year in research 1991-92, NSF fellowships for research in number theory 1992 and representation theory of Lie algebras 1991; Summer Research Undergraduate Program in combinatorics, *U. Minnesota at Duluth* 1991 and 1992; winner of first national scholarship competition to study abroad in the U.S. through *Sofia University* 1989; silver medals at the *International Mathematics Olympiads* (IMO) in Australia 1988 and Cuba 1987 and at the *Balkan Mathematics Olympiad* in Romania 1986; four times winner of the National Bulgarian Mathematics Contest for foreign language schools and multiple top prizes at the *Bulgarian Math Olympiads* and the semiannual national mathematics competitions 1983-1988; twice winner of national History and Politics Essay Competition in 1983 and 1984; winner of Regional Chemistry and Literature Olympiads, Bulgaria 1982; winner of Regional Competition in original poetry, Bulgaria 1980.

Books: *"A Decade of the Berkeley Math Circle – The American Experience"*, vol. 1, editor (with Tom Rike) and contributor of articles, AMS, 2009; vol. 2-3 are forthcoming; vol. 1 is on the best-selling list of AMS for 2009 at http://www.ams.org/notices/201002/rtx10020cov3p.pdf

Articles: ~ 25; *journals* include: Electronic J. of Comb., Disc. Math., J. of Algebraic Comb., J. of Algebraic Geometry, European J. of Comb.; in *books* and *publications* of AMS, MAA, MSRI, UCB, UCI, and Boston U.

Films: 4 commissioned by MSRI, produced by G. Csicsery – *"On Mathematical Grounds,"* 2009 (a bonus feature about the Berkeley Math Circle; Stankova's photo on the DVD cover); *"Circle-in-a-Box: How kids can be passionate about mathematics,"* 2008 (shows Math Circles in action, includes my session on "Inversion in the Plane" at the San Francisco Teachers' Circle); *"Inside the Circle,"* (based on the Berkeley and Boston Math Circles, 2006; features my session on "Vectors through Geometric Transformations in Olympiad Problem Solving"); *"Invitation to Discover,"* 2004 (includes interviews with me and Berkeley Math Circle students).

Website: The Berkeley Math Circle at http://mathcircle.berkeley.edu, 1998-present, created and maintained by me, with materials from 400+ sessions and 60+ monthly contests.

Invited Addresses and Presentations: 60+ on topics in algebraic geometry, combinatorics, representation theory, and the mathematics, organization, and pedagogy of math circles and mathematics competitions, including invited addresses at 1 MAA MathFest, 2 MAA regional conferences, plenary lectures and invited talks at 5 AMS/MAA Joint Meetings and other national conferences, special national and regional events organized by MSRI, AIM, NCTM, AMS, and other academic institutions and professional mathematics and teaching organizations; 200+ math circle sessions and lectures at 50+ locations in the U.S. and Canada, including several *live math circle demonstrations* at MathFests, AMS/MAA JMMs, and other national and regional conferences.

Committee Service: 2011 MathFest program committee; co-chair of Bay Area Math Olympiad (BAMO) organizing, problems, and grading committees, 1998-present; MSRI's Advisory Board on the MSRI/AMS book series "Mathematical Circles Library," 2007-present; MAA Lester R. Ford awards committee 2005-06; MAA Subcommittee for the USA Mathematical Olympiad 1998-05; AMS Arnold Ross Lecture Series Committee 2004-05; Chair of the Mathematics and Computer Science Department at Mills College, 2008-10.

Math Circles and Olympiads Service: *founder and director of the Berkeley Math Circle* (BMC) 1998-present; co-founder and co-director of BAMO 1998-present; co-founder of MSRI's Leadership group for math circles 1997-present; helped start dozens of circles in U.S. and Canada; *coach of the US team for the IMOs* 1998-04, including Assistant Director 1998-00, Associate Director 2001, and Deputy Assistant/Representative for the US team at IMO '01, Washington, USA, IMO '02, Glasgow, UK, IMO '04, Athens, Greece; instructor at the first COSMOS math program for talented students at UC Irvine 2000-2001.

Organizer of conferences, invited sessions, and special events: e.g., invited session *"The Mathematics of Math Circles and Beyond,"* at the MAA MathFest 2010; SF Bay Area participation and BMC victory in the AMS National Contest *"Who Wants to be a Mathematician,"* at the AMS-MAA JMM 2010; BMC participation and victory in the *"Russian-style Math Battle"* at the National Workshop *"Great Circles,"* MSRI 2009; sessions on math circles at AMS-MAA JMM in New Orleans, LA 2007 and MAA MathFest in San Jose, CA 2007; MSRI's *First National Conference on Math Circles*, Berkeley 2004; co-organizer of the 2nd *Annual International Conference on Permutation Patterns,* Nanaimo, British Columbia, Canada 2002; annual *BAMO Awards event* 1999-present; *U.S. First Introductory Math Circles 2-day workshop* at MSRI/Lawrence Hall of Science 1998.

Articles/TV about my work and results and media attention: 45+, e.g., Science News Online, Voice of America, National televising of the Spelling Bee Championship 2007, CBS News, Notices of the AMS, MSRI's Emissary, AMS Math in the Media, MAA Math Gateway, MAA Mini-Focus and Focus, MAA Newsletter, Newsletter of AWM, Sudbury Star (Ontario, Canada), Lincoln Journal Star, Tri-Valley Herald, San Jose Mercury, Sing Tao Daily, San Francisco Chronicle, Oakland Tribune, Philadelphia Inquirer, Education with Student News, Berkeleyan, Berkeley Mathematics Newsletter, Mills Newsroom, Mills College Weekly, Bryn Mawr Alumnae Bulletin, Bryn Mawr/Haverford Bi-College News, and others.

Books mentioning/featuring my work: 6+, e.g., *Circle-in-a-Box,* by S. Vandervelde, AMS in MSRI Math Circles Library; *Count Down – Six Kids Vie for Glory at the World's Toughest Math Competition,* by S. Olson, Houghton Mifflin, featuring the USA team at the IMO '01, Washington, D.C. (three of these students were from the BMC); *Combinatorics of Permutations*, Miklós Bóna, Chapman & Hall/CRC Press; *Enumerative Combinatorics*, vol. 2, Richard Stanley, Cambridge Studies in Adv. Math. 62, Cambridge U. Press; *Moduli of Curves*, Joe Harris and Ian Morrison, graduate textbook, Springer-New York; *Where Mathematics, Computer science, Linguistics and Biology Meet,* C. Martín-Vide, V. Mitrana, eds., Kluwer.

Grants: for Math Circles and Olympiads for a total of $500,000+ over the period of 1998-present through Hilde Mosse Foundation for Arts and Education, NSF Research grants with outreach components through M. Olsson and A. Givental (UCB) and R. Vakil (Stanford), ADC Foundation (MN), MSRI, UCB Math Dept, Clowes Foundation, Clay Mathematics Institute, Packard Foundation, Mills College; through awards for BMC wins at National Spelling Bee Championship 2007, MAA USAMO 2009, AMS "Who wants to be a mathematician?" at AMS-MAA JMM 2010; for Research Development from Mills College in 2008 for "*Project Classification and Enumeration of Restricted Permutations according to Wilf-Equivalence*"; for Course Development from Mills College, for designing "Math 180/280. *Topics in Mathematics: Advanced Problem Solving in Mathematics*," using Russian Math Circle materials in 2004; and in 2010 using my new book *"A Decade of the BMC – the American Experience"* (co-edited with T. Rike).

Teaching Experience: Since 1991, I have taught, often multiple times, 25 different math courses, at 6 institutions: Bryn Mawr College, Harvard University, Chelmsford High School (MA), Newton North High School (MA), UC Berkeley, and Mills College. The courses have varied from remedial algebra I for high school students and Math 1 for non-science students at Mills, through just about everything in the math major sequence, to a graduate course in Algebraic Curves at UCB. I have also given 200+ sessions at 25 math circles and schools around US and Canada, as well as trained the US team for the IMOs.

Selected Publications in Combinatorics and Algebraic Geometry:

1. Shape-Wilf-ordering of permutations of length 3, *Electronic Journal of Combinatorics* 14(1) (2007) R56 1-46.
2. Explicit enumeration of the 321-hexagon avoiding permutations (with J. West), *Discrete Mathematics* 280 (1-3) (2004) 165-189.
3. 321-polygon-avoiding permutations and Chebyshev polynomials (with T. Mansour), *Electronic Journal of Combinatorics* 9(2) (2002) R5, 1-16.
4. A new class of Wilf-equivalent permutations (with J. West), *Journal of Algebraic Combinatorics* 15(3), (2002) 271-290.
5. Moduli of trigonal curves, *Journal of Algebraic Geometry* 9 (2000) 607-662.
6. Classification of forbidden subsequences of length 4, *European Journal of Combinatorics* 17(1996) 501-517.
7. Forbidden subsequences, *Discrete Mathematics* 132 (1994) 291-316.

Selected Publications in the Mathematics, Pedagogy, and Organization of Mathematical Circles:

1. The Berkeley Math Circle – High Expectations in Years Ahead, (with I. Matić, D. Wertheimer), *Berkeley Mathematics Newsletter*, Vol. XIV No.1 (spring 2009).
2. *"A Decade of the Berkeley Math Circle – the American Experience,"* vol. 1, editor (with T. Rike), AMS (2009); contributed the articles: "Inversion in the Plane, Part I," pp. 1-24; "Number Theory, Part I," pp. 63-85, "More on Proofs, Part II," (with M. Bernstein) pp. 155-178, "Introduction to Mathematical Circles," pp. IX-XVIII, "Epilogue to Mathematical Circles," pp. 285-298.
3. Geometric Puzzles and Constructions – Six Classical Geometry Theorems, Chapter 14 in "*Mathematical Adventures for Students and Amateurs,"* D. Hayes and T. Shubin (editors), MAA (2004) 169-184.
4. Berkeley Math Circle and the Bay Area Mathematical Olympiad (with J. Buhler), *Emissary*, (2001) p.4 and 15.
5. Bay Area Mathematical Olympiad and Math Circles, *Inclusions. The Arts of Mathematics,* Journal of the MAA Student Chapter, Boston University (1999).
6. "Mathematical Circles and the Bay Area Mathematical Olympiad (with H. Rossi), publ. by MSRI (1999).
7. "Bay Area Mathematical Olympiad: Description and Sample Problems," MSRI (1998).

Selected Invited Addresses:

1. *"The mathematics of mathematical circles,"* MAA MathFest, 2010.
2. *"Exploring pattern avoidance – unsolved questions and baffling answers,"* regional meeting of Southern California- Nevada Section of MAA, Harvey-Mudd College, 2010.
3. *"A decade of the Berkeley Math Circle – the American experience. What have we learned?"* national conference "Great Circles," MSRI, Berkeley, 2009.
4. *"What the future of restricted patterns holds,"* national conference "Communicating Mathematics" in honor of J. Gallian, University of Minnesota at Duluth, 2007.
5. *"Mathematical Olympiads and circles versus We: the mathematicians,"* Northern California, Hawaii and Nevada Section Meeting of the MAA, St. Mary's College, March 5 2005.
6. *"Opportunities for mathematically motivated youth,"* AMS/MAA Joint Meeting, San Diego, 2002.
7. *"The trigonal locus in the moduli space of curves of genus g,"* AMS meeting, Rider University, 1996.
8. *"The theory of Virasoro algebra and Verma modules,"* summer conference in Chaotic Theory and Dynamical Systems, Santa Fe Institute, 1993.
9. *"The Bay Area Mathematical Olympiad and Math Circles Project,"* NCTM National Meeting of US Mathematics Teachers, San Francisco, January 1999.
10. *"High School Olympiads – Talent, Excitement and Determination,"* first public presentation to the Math Circles and BAMO project, biannual public event of MSRI and UC Berkeley, 1997.

Selected Classes I have taught:

1. *Introduction to Mathematics:* Chelmsford HS, Mills College
2. *Pre-Calculus*: Chelmsford HS, Newton North HS
3. *Calculus I-II*: Mills College, UC Berkeley, Harvard, Newton North HS
4. *Multivariable Calculus*: Harvard, Mills College
5. *Linear Algebra*: Harvard (regular & honors version), UC Berkeley, Mills College
6. *Differential Equations*: Mills College
7. *Real Analysis*: Mills College
8. *Abstract Algebra*: UC Berkeley, Mills College
9. *Euclidean and Non-Euclidean Geometry*, Mills College
10. *Problem Solving in Mathematics*: Bryn Mawr College, Newton North HS, Mills College (HS/undergrad/grad)
11. *Topics in Forbidden Subsequences*, Mills College
12. *Algebraic Curves*, UC Berkeley (graduate)

Program Initiatives at Mills College: To increase the number of female math majors and female math graduate students, upon being hired at Mills in 1999, I devised and introduced to the College a new *Integrated BA/MA in Mathematics 4+1 Program* and championed its development and final acceptance in 2004; we expect our first 3 graduates of the BA/MA Program to matriculate in 2011-2012. I also initiated and organized the acceptance of the *Budapest Semester in Math Abroad Program* at Mills College for our students to study advanced mathematics in Hungary. Two Mills College students were accepted and completed the Program. Another one will be applying for it next year. To increase the problem solving abilities and enrich the Olympiad experience of our students, I resurrected Putnam participation at Mills in 2006. I taught a new course in 2004, *MATH 180 Problem Solving in Mathematics*, which I will redesign from scratch in summer 2010, to incorporate my new book *"A Decade of the Berkeley Math Circle,"* vol. 1.

Short history of Math Circles (Abstract of "The Mathematics of Math Circles", an Invited Address at MathFest 2010): The creation of math circles in the San Francisco Bay Area over a decade ago started a chain reaction, spreading to California and neighboring states, and resulting in over 75 circles in the U.S. and Canada. But what is a math circle? Are math circles designed for talented pre-college students or for those who don't yet know if they like mathematics? Must they concentrate on math contest preparation or on discovering interesting mathematical facts? Could and should circlers be introduced to advanced mathematical theories and research?

The answer depends on which U.S. math circle you are thinking of. Born within a day apart in 1998, the Berkeley (BMC) and San Jose Math Circles (SJMC) combine all of the above aspects. They attract and train IMO medalists and Putnam winners; but more importantly, they introduce the students to beautiful mathematics in inspiring sessions by mathematical stars such as Vladimir Arnold, Elwyn Berlekamp, Robin Hartshorne, Olga Holtz, Ravi Vakil, and Kiran Kedlaya, to mention a few. Are you, as a mathematician, brave, skillful and confident to turn an advanced, even research, topic into a math circle session and deliver it with success? Are such "miracles" possible on a weekly basis? Does this have anything to do with your career as a research mathematician or as a math educator? In this talk, we shall address these questions and explore several possible paths of transforming advanced math topics and research into math circle sessions, by following examples selected from among the 750 sessions at the BMC and SJMC over the past decade.

Some Famous Berkeley Math Circle alumni whom I have mentored: *Gabriel Carroll* (4 times Putnam winner, 3 IMO medals, Ph.D. in Economics at MIT, named me as the most influential person for his capture of 3rd prize at the Intel Talent Search 2001); *Inna Zakharevich* (only female to have a perfect score at USAMO, Ph.D. in Mathematics at MIT); *Maksim Maydanskiy* (grand prize BAMO winner, Ph.D. from MIT, postdoc MSRI/Stanford/Cambridge); *Tiankai Liu* (2 times Putnam winner, 3 gold IMO medals, Ph.D. in Mathematics at MIT); *Victoria Wood* (USAMTS medals, consultant and inventor with 6 patents granted to-date, UCB graduate); *Andrew Dudzik* (BAMO brilliancy award, Ph.D. in Mathematics at UCB); *Jennifer Thompson* (BAMO 1st prize, Cambridge University); *Evan O'Dorney* (National Spelling Bee champion, two IMO medals, BAMO and USAMO brilliancy awards, Who Wants to be a Mathematician winner).

These students will give the talks and comprise the panel at the Invited Session *"The Mathematics of Math Circles and Beyond"* at MathFest 2010. Abstract of the session: The accomplishments of the nine young scholars in this session are stunning. They are formidable problem-solvers who have conquered multiple times any major national and international mathematics competition. From winning the Spelling Bee, to building automated submarines, to composing piano concertos, to studying large-population mechanisms in economics and authoring patents, they have also seriously explored the world beyond mathematics. Their research publications and current projects in mathematics and related disciplines are staggering in their breadth and depth: the paths from symplectic to algebraic geometry, and from probability to algebraic combinatorics, are only a small part of the picture. Very importantly, they all share a passion for mathematics that originated in their early years and was aided and developed to a large extent through mathematical circles.

The five talks in this session present a combination of original research and exposition in the areas of algebraic K-theory, number theory, hyperbolic geometry, game theory and applications of functional equations and graph theory to economics. All topics have been presented, or are suitable after modifications to be delivered, at math circles. The ensuing panel discussion will incorporate the personal viewpoint of these nine past/present math circlers on the topic of "*Math Circles and Research Mathematics: Gaps, Bridges, and Successes.*"

IMO and Female impact: During 1998-2004, I trained the US math team, which placed 2nd among 80+ countries at the International Math Olympiads in USA'01 and in Greece'04, and placed 3rd in Scotland'02, Korea'00, and

Taiwan'98. The US team in 2001 was half from the BMC and the SF Bay Area: *Gabriel Carroll, Tiankai Liu* and *Oaz Nir*. I also mentored and coached *Melanie Wood, Alison Miller,* and *Sherry Gong*, the only females to qualify so far on the USA team for the IMO's. All three girls won silver and/or gold medals at the IMOs, scored among the highest on the Putnam exams, and completed or are currently in Ph.D. programs in Mathematics. In addition, the only female to score perfectly at USAMO is *Inna Zakharevich*, also an alumna from BMC.

Miscellaneous: In spring 2008, UC Berkeley students voted me in *The Shining Lights: Ten of the BEST Professors This Semester*, for my fall 2007 class MATH 16A Analytic Geometry and Calculus, a 250+ student class typically taken by non-science majors. I received an invitation for a personal meeting and photo op with *Governor Arnord Schwartzenegger* and the BAMO 2008 winners in his office at the State Capitol in Sacramento, June 12 2008; a photo from the meeting is published in MSRI's *Emissary*, 2008. Gavin Newson, the mayor of San Francisco, declared one day in May as the Math Circle Day, in honor of the math circles in the Bay Area.

Short Biography: Zvezdelina Stankova (Zvezda) is a Frederick A. Rice Associate Professor of Mathematics at Mills College, where she has served as the Department Head for two years. She is the founder and the Director of the Berkeley Math Circle at UC Berkeley.

Zvezda was drawn into the world of mathematics when, as a 5th grader, she joined the math circle at her school in Bulgaria and won, three months later, the Regional Math Olympiad. She represented her home country at two International Mathematical Olympiads (IMOs), earning silver medals. As a freshwoman at Sofia University, Zvezda won a competition to study in the U.S. and, encouraged by her advisors Professors Rhonda Hughes and Paul Melvin, completed a dual BA/MA degree at Bryn Mawr College in 1992. She did her first math research in the area of enumerative combinatorics at two summer REU's in Duluth, Minnesota, under the mentorship of Professor Joseph Gallian. The resulting papers contributed to her Alice T. Schafer Prize for Excellence in Mathematics by an Undergraduate Woman, awarded by the Association for Women in Mathematics. In 1997, Zvezda received her Ph.D. from Harvard University in the field of algebraic geometry under the supervision of Professor Joseph Harris, with a thesis on moduli spaces of trigonal curves. Meanwhile, she did something outside of the beaten path for math Ph.D.'s: she concurrently completed a year program at the Harvard Graduate School of Education, earning a high school teaching certificate in the state of Massachusetts, and later in California through UC Berkeley.

As a postdoctoral fellow at MSRI and UC Berkeley in 1997-1999, Zvezda came full circle by founding the Berkeley Math Circle (BMC) and co-founding the Bay Area Mathematical Olympiad. Since then, she has delivered more than 200 math circles sessions and conference presentations at over 45 locations. Starting with a handful of math circles in 1998, Zvezda's pioneering work in collaboration with MSRI, AIM and a number of SF Bay Area mathematicians, helped inspire and establish dozens of new circles throughout the U.S. and abroad (the current count is around 75). In addition, she trained the USA national team for the IMOs for six years, including the memorable year 2001 when three of the six U.S.A. team members were from BMC. In 2009, she co-edited "A Decade of the Berkeley Math Circle - the American Experience", volume I, published by AMS in the MSRI book series Mathematical Circles Library. Her article there on Inversion in the Plane was inspired by one of the very first lectures she heard as a teenager at the training of the Bulgarian IMO team. A second volume is forthcoming.

Since 1999, she has worked at Mills College. Her current research interests include classification of restricted patterns, specifically, Wilf-equivalences and shape-Wilf-ordering, in the area of enumerative and algebraic combinatorics. Zvezda's inspiring style and passion to teach and communicate mathematics beyond the classroom have been recognized by the MAA: in 2004 she was selected as a co-recipient of the first Henry L. Alder Award for Distinguished Teaching by a Beginning College or University Mathematics Faculty Member.