

## VITAE

Phillip E. Parker

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<i>Birthdate and Place</i>	August 9, 1948	Asheville, North Carolina, USA
<i>Education</i>	1965–69 1969–70, 72–73 1973–77	Hendrix College, BA 1969 University of Missouri, MA 1970 Oregon State University, PhD 1977
<i>Employment</i>	2000– 1988–2000 1983–88 1982–83 1980–82 1978–80 1977–78	Professor, Wichita State University Assoc Prof, Wichita State University Asst Prof, Wichita State University Visit Asst Prof, University of Iowa Visit Asst Prof, University of Missouri Visit Asst Prof, Syracuse University Visit Asst Prof, SUNY Buffalo
<i>Professional Affiliations</i>	AMS, MAA, $\Sigma\Xi$ , $\pi\mu\epsilon$	

### Honors and Recognitions

NSF Summer Science Programs 1964 (Southern State College, Ark.) and 1965 (Louisiana State Univ.); Undergraduate Research Participation 1968 (Univ. of Missouri); Hogan Math Prize (one annually to a senior) 1969; NDEA Fellowship, Univ. of Missouri 1969–70 and 72–73.

Honorable Mention, AMS Fellowships 1977.

Supported by Lehrstuhl für Mathematik I, Universität Mannheim, during June and July 1979, as the Featured Guest Lecturer (15 lectures).

Partially supported by Theoretical Physics Group, Imperial College (London), during August 1984.

Faculty Summer Research Awards (competitive), Wichita State University, 1986 and 1988.

NATO Research Grant, 1989–94.

Supported by NSF for a scientific visit to CICY in Mexico, during January 1990.

Supported by Spanish Ministry of Education and Science (DGICYT) to visit Universidade de Santiago de Compostela from January to June 1991, and from February to July 1998, on sabbatical leaves (competitive) from Wichita State University.

Summer Research Fellowship (competitive), Wichita State University, 1994.

Sabbatical leave (competitive), Wichita State University, Spring 2010.

## Invited Speaker

Conference on Quantum Theory and Gravity, New Orleans LA, 1979, part of [1].

Seminar on Current Problems in General Relativity at Dublin I. A. S., July 1979, based on dissertation.

New York Grad. Math. Conferences: 1979, Physical Geometry, and 1980, Braids and Impossible Tori.

Special Session on Differential Geometry and General Relativity at AMS Annual Meeting in Biloxi MS, 1979, first part of [1].

Bolyai Society Colloquium on Differential Geometry, Hajdúszoboszló (Hungary), 1984, [30, 37].

MASUA Physics Conferences: Kansas City MO, 1984, [16]; Columbia MO, 1985, Quasimodes; and Lawrence KS, 1987, Spinors and Automorphic Forms.

Special Session on Differential Geometry at the AMS meeting in Columbia MO, November 1985, [20].

Cambridge (England) Meeting on Singular Metrics (principal speaker, 4 lectures), September 1988, [14, 9].

VI International Colloquium on Differential Geometry, Santiago (Spain), September 1988, [22, 4].

Bolyai Society Colloquium on Differential Geometry, Eger (Hungary), August 1989, [7].

International Conference on Differential Geometry and its Applications, Brno (Czechoslovakia), August 1989, [23, 5].

Special Session on Function Algebras and Function Spaces at the AMS Summer Meeting in Orono ME, August 1991, [49].

Special Session on Lorentz Transformations and Spacetime Geometry at the AMS meeting in Fargo ND, October 1991, [34].

Taller de Geometría Diferencial sobre Espacios de Geometrías (plenary lecture), April 1992, CIMAT, Guanajuato (Mexico), sponsored by Soc. Mat. Mex. and CONACYT, [24, 26, 33].

Second Midwest Differential Geometry Conference, Manhattan KS, May 1992, [34].

Special Session on Differential Geometry at the AMS Annual Meeting in San Antonio TX, January 1993, [26, 33].

Third Midwest Differential Geometry Conference, Columbia MO, April 1993, [33].

Special Session on Geometric Methods in Mathematical Physics at the AMS Summer Meeting in Vancouver, August 1993, [28].

Differential Geometry, Hamiltonian Systems and Operator Theory Conference (first plenary lecture), Univ. of the West Indies, Jamaica, February 1994, [24, 26, 33].

Alumni Mathematics Symposium: Celebrating Twenty-Five Years of Undergraduate Research in Mathematics at Hendrix College (plenary lecture), Conway AR, April 1994.

Fourth Midwest Differential Geometry Conference, Iowa City IA, April 1994, [11].

Research and Advanced Study Period in Arithmetic and Geometry (two plenary lectures) at Akdeniz Univ. in Antalya (Turkey), July 1994, [24, 26, 33].

Special Session on Geometry and Geodesics at the AMS Meeting in Stillwater OK, October 1994, [11].

World Congress of Nonlinear Analysts in Athens (Greece), July 1996 (45 min. lecture)—declined due to disability.

Special Session on Differential Geometry at the AMS Meeting in Columbia MO, November 1996, [10, 12].

Special Session on Differential Geometry and Geodesics at the IV Joint Meeting AMS-SMM in Denton TX, May 1999, [11].

World Congress of Nonlinear Analysts in Catania, Sicily, July 2000 (45 min. lecture), [12]—declined due to terminal illness in family.

Special Session on Recent Advances in Riemannian and Lorentzian Geometries at the AMS Annual Meeting in Baltimore MD, January 2003, [40, 36].

Beemfest (plenary lecture) at the Univ. of Missouri in Columbia MO, May 2003, [37].

Special Session on Curvature and Geodesics at the VI Joint Meeting AMS-SMM in Houston TX, May 2004 (40 min. lecture), [40, 38].

Special Session on Geometric Analysis in Mathematical Physics at the World Congress of Nonlinear Analysts in Orlando FL, July 2004 (45 min. lecture), [39].

XIII Escola de Geometria Diferencial (plenary lectures) at the Universidade de São Paulo (Brazil), July 2004—cancelled due to expired passport.

World Congress of Nonlinear Analysts in Orlando FL, July 2008—cancelled due to medical problems.

### **Invited and Supported Participant**

Differential Geometric Control Theory Conference, Michigan Technological University, 1982.

Conference on Differential Geometry, Purdue University, 1983.

Conference on the Asymptotics of Mass and Spacetime Geometry, Oregon State University, 1983.

Conference on Riemannian Geometry, New York Polytechnic, 1984.

AMS-ISM-SIAM 1986 Joint Summer Research Conferences: general relativity (June) and representation theory (July), UC Santa Cruz.

AMS 1987 Summer Research Institute on Theta Functions, Bowdoin College.

LMS 1988 Symposium on Spinors, Twistors, and Complex Structures in General Relativity, Durham University (England).

Third Midwest Relativity Conference, University of Chicago, 1992.

### **Refereeing, Reviewing, and Editing**

*Referee for:* Arab Gulf J. Sci. Res., Bolyai Math. Soc., Class. Quant. Grav., Diff. Geom. Appls., Fulbright Program, Geom. Dedicata, Houston J. Math., J. Geom. Phys., J. Korean Math. Soc., J. Math. Arts, J. Math. Phys., J. Phys. A, NSF, Nonlinear Anal. A, Rev. Mat. Iberoamericana, SIAM J. Math. Anal.

*Reviewer for:* Math. Reviews, PWS-Kent, Zentralblatt

*Editor for:* Marcel Dekker, Kluwer Academic (D. Reidel)

## Publications

- [1] New Directions in Relativity and Quantization of Manifolds, in *Quantum Theory and Gravitation*, ed. A. R. Marlow. New York: Academic Press, 1980. pp. 137–146.
- [2] Geometry of Leaves and the Heat Equation, in *Global Analysis-Analysis on Manifolds: dedicated to M. Morse*, ed. T. M. Rassias. Leipzig: B. G. Teubner, 1983. pp. 247–251.
- [3] The Geometry of Bicharacteristics and Stability of Solvability (with J. Beem), in *Differential Geometry, Calculus of Variations, and Applications*, ed. G. M. & T. M. Rassias. New York: M. Dekker, 1985. pp. 83–94.
- [4] The Higher-order Differential Invariant  $\alpha$  (with G. Fredricks and P. Gilkey), in *Proceedings of the sixth International Colloquium on Differential Geometry*, ed. L. A. Cordero. Santiago de Compostela: Universidade, 1989. pp.99–107.
- [5] Degenerate Sections and Acceleration (with J. Beem), in *Differential Geometry and its Applications*, ed. J. Janyška and D. Krupka. Singapore: World Scientific, 1990. pp. 291–296.
- [6] The Lorentzian Modular Group and Nonlinear Lattices (with G. Fox), in *The Mathematical Heritage of C. F. Gauss*, ed. G. M. Rassias. Singapore: World Scientific, 1991. pp. 282–303.
- [7] Examples of Spaces of Connections and Universal Connections (with L. Cordero and C. Dodson), in *Differential Geometry and its Applications (Eger, 1989)*, ed. J. Szenthe and L. Tamásy. Amsterdam: North Holland, 1992. pp. 171–176.
- [8] The Lorentzian Modular Group and Nonlinear Lattices II (with G. Fox), unpublished.
- [9] Hawking’s Radiation via Fourier Integral Operators, in *Geometry and Partial Differential Equations*, ed. A. Pràstaro and Th. M. Rassias. Singapore: World Scientific, 1994. pp. 253–258.
- [10] Some Nonlinear Planar Sprays (with L. Del Riego), in *Nonlinear Analysis in Geometry and Topology*, ed. T. M. Rassias. Palm Harbor: Hadronic Press, 2000. pp. 21–52.
- [11] Pseudoriemannian 2-step Nilpotent Lie Groups (with L. Cordero). DGS preprint CP4, 62 pp. rev. 18 Nov. 2000. arXiv:math.DG/9905188
- [12] Generalized Sprays and Nonlinear Connections (with L. Del Riego), DGS preprint DRP3, 22 pp. rev. 4 April 2003. (unpublished)
- [13] Skewadjoint Operators on Pseudoeuclidean Spaces (with C. Jang), DGS preprint JP2, 2003. 16 pp. arXiv:math.DG/0302030

## Refereed

- [14] Distributional Geometry, *J. Math. Phys.* **20** (1979) 1423–1426.
- [15] Klein-Gordon Solvability and the Geometry of Geodesics (with J. Beem), *Pacific J. Math.* **107** (1983) 1–14.
- [16] On Some Theorems of Geroch and Stiefel, *J. Math. Phys.* **25** (1984) 597–599.
- [17] Values of Pseudoriemannian Sectional Curvature (with J. Beem), *Comment. Math. Helv.* **59** (1984) 319–331.
- [18] Whitney Stability of Solvability (with J. Beem), *Pacific J. Math.* **116** (1985) 11–23.
- [19] Pseudoconvexity in General Relativity (with J. Beem), *J. Geom. Phys.* **4** (1987) 71–80.
- [20] Geometric Consequences of the Normal Curvature Cohomology Class in Umbilic Foliations (with R. Escobales), *Indiana U. Math. J.* **37** (1988) 389–408.

- [21] Pseudoconvexity and Geodesic Connectedness (with J. Beem), *Ann. Mat. Pura Appl.* **155** (1989) 137–142.
- [22] A Higher-order Invariant of Differential Manifolds (with G. Fredricks and P. Gilkey), *Transact. Amer. Math. Soc.* **315** (1989) 373–388.
- [23] Sectional Curvature and Tidal Accelerations (with J. Beem), *J. Math. Phys.* **31** (1990) 819–827.
- [24] The Space of Geodesics (with J. Beem), *Geom. Dedicata* **38** (1991) 87–99.
- [25] Null Directions and Curvature (with J. Beem), in *Geometry and Nonlinear Partial Differential Equations*, ed. V. Oliker and A. Treibergs. Contemp. Math. 127. Providence: AMS, 1992. pp. 1–15.
- [26] Spaces of Geodesics, in *Aportaciones Matemáticas, Serie: Notas de Investigación No. 8*, ed. L. Del Riego. San Luis Potosí: UASLP, 1993. pp. 67–79.
- [27] Smooth Limits of Piecewise Linear Approximations (with J. Barrett), *J. Approx. Theory.* **76** (1994) 107–122.
- [28] Compatible Metrics on Fiber Bundles, in *Differential Geometry and Mathematical Physics*, eds. J. K. Beem and K. L. Duggal. Contemp. Math. 170. Providence: A. M. S., 1994. pp. 201–205.
- [29] Connections on Principal  $S^1$ -Bundles over Compacta (with L. Cordero and C. Dodson), *Rev. Real Acad. Galega Cien.* **13** (1994) 141–149.
- [30] Symmetries of Sectional Curvature on 3-Manifolds (with L. Cordero), *Demonstratio Math.* **28** (1995) 635–650.
- [31] Examples of Sectional Curvature with Prescribed Symmetry on 3-Manifolds (with L. Cordero), *Czech. Math. J.* **45** (1995) 7–20.
- [32] Pseudoconvex and Disprisoning Homogeneous Sprays (with L. Del Riego), *Geom. Dedicata* **55** (1995) 211–220.
- [33] Spaces of Geodesics: Products, Coverings, Connectedness (with J. Beem and R. Low), *Geom. Dedicata* **59** (1996) 51–64.
- [34] Left-invariant Lorentzian Metrics on 3-Dimensional Lie Groups (with L. Cordero), *Rend. Mat. Appl.* **17** (1997) 129–155.
- [35] *A User's Guide to Algebraic Topology* (with C. T. J. Dodson), Mathematics and Its Applications 387. Boston: Kluwer Academic Publishers, 1997; reprinted 1998.
- [36] Examples of Conjugate Loci of Pseudoriemannian 2-step Nilpotent Lie Groups with Nondegenerate Center (with C. Jang), in *Recent Advances in Riemannian and Lorentzian Geometries*, eds. K. L. Duggal and R. Sharma. Contemp. Math. 337. Providence: AMS, 2004. pp. 91–108.
- [37] Geometry of Bicharacteristics, in *Advances in Differential Geometry and General Relativity*, eds. S. Dostoglou and P. Ehrlich. Contemp. Math. 359. Providence: AMS, 2004. pp. 31–40.
- [38] PseudoH-type 2-step Nilpotent Lie Groups (with C. Jang and K. Park), *Houston J. Math.* **31** (2005) 765–786.
- [39] Geometry of Nonlinear Connections (with L. Del Riego), *Nonlinear Anal.* **63** (2005) e501–e510.
- [40] Conjugate Loci of pseudoRiemannian 2-step Nilpotent Lie Groups with Nondegenerate Center (with C. Jang), *Ann. Global Anal. Geom.* **28** (2005) 1–18.
- [41] Pseudo-Riemannian Nilpotent Lie Groups, in *Encyclopedia of Mathematical Physics*, eds. J.-P. Francoise, G.L. Naber and Tsou S.T. Oxford: Elsevier, 2006. vol. 4, pp. 94–104.

- [42] Lattices and Periodic Geodesics in pseudoRiemannian 2-step Nilpotent Lie Groups (with L. Cordero), *Int. J. Geom. Methods Mod. Phys.* **5** (2008) 79–99.
- [43] Isometry Groups of pseudoRiemannian 2-step Nilpotent Lie Groups (with L. Cordero), *Houston J. Math.* **35** (2009) 49–72.

***Works in Progress***

- [44] Ehresmann Connections, Exponential Maps, and Second-order Differential Equations (with L. Del Riego), DGS preprint DRP5 (revised), 2009. 26 pp.
- [45] Jacobi Fields and Automorphism Groups of Ehresmann Connections (with L. Del Riego).
- [46] Parallelism and Holonomy of Ehresmann Connections (with L. Del Riego).
- [47] Sectional Curvature of  $n$ -Manifolds.
- [48] Algebraic Geometry and Sectional Curvature.
- [49] Nonlinear Theta Functions.

**Teaching Experience**

*Undergraduate:* includes College Algebra, liberal arts math courses, math for secondary teachers (my notes), Calculus sequences (regular, and business etc.), Differential Equations, Matrix Methods for Engineers, Introduction to Advanced Mathematics (Smith *et al.*), Linear Algebra (Damiano & Little, Leon), Projective Geometry (my notes), Real Variables (Bartle), and Abstract Algebra (Maclane & Birkhoff).

*Graduate:* Abstract Algebra (Maclane & Birkhoff), Algebraic Topology (Dodson & Parker), Complex Analysis (Ahlfors), Differential Geometry and Relativity (my notes twice, Dodson & Poston once), Differential Topology (Bröcker and Jänich), Elementary Particles for Mathematicians (Sudbery), Engineering Math (Kreyszig, Trim), Manifolds and Lie Groups (Warner), Mathematical Physics (Arfken), Modern Geometry (Ryan), Obstruction Theory (Dodson & Parker), and Topology (Munkres twice, Sieradski the rest).

## Departmental and University Service

Departmental committees: Library 1975–77; Geometry Curriculum 1977–78; Curriculum 1981–82; Undergraduate Registration and Advising 1981–82; Library 1985–, chair 1987–90, 91–; PhD Proposal 1985; Prerequisites 1986; PhD Admissions 1986–88; Differential Equations textbook 1986–89; Junior Positions 1987; Scholarships 1987–90; Exceptions, Summer 1993; ISS/AI Search 1993–94; Instructor Search and Evaluation 1993–94, 1999; Linear Algebra textbook 1996–2008; KOSM 1997–2001; Math Awareness Week 1997–, chair of subcommittee on HS contest, 1999.

Chair of two Mathematics doctoral committees, 1987–91 and 2009–11.

Chair of eight Mathematics master’s committees, 1996–97, 2005–07, 2008, and 2009–10 (thesis).

Member of: two Physics doctoral committees, 1979–80; one Mathematics doctoral committee, 1997–2000; four Mathematics master’s committees, 1987, 1993, and 2008; one Engineering master’s committee, 2006.

MAA Visiting Lecturer: High School, 1986–96; College, 1989–93.

College committees: LAS Assessment, 1990–92; LAS Sabbatical Review, 1993–94.

Member of one University Libraries promotion committee, 2006.

University committees: Library and MRC Committee, 1985–90, chair 1986–90; Academic Subcommittee of Library Dedication Committee, 1988–89; Faculty Affairs Committee, 1989–92; Communications Task Force, 1994–95; Faculty Senate Library Committee, 1999–2007, chair 2000–03, 04–07.

Member of the Faculty Senate, 2001–03.

Cooperative education advisor, 1988–99.

Faculty advisor to: student Science Fiction Club, 1978–80;  $\pi\mu\epsilon$ , 1987–90; MAA Student Chapter, 1992–.

## Professional Activities

From 1966 on attended numerous regional MAA and AMS meetings (av. one per year); attended the AMS annual meetings at New Orleans in 1969 and Atlanta in 1978, a Symposium on Analysis at Arkansas State University in 1972, and the International Congress at Vancouver in 1974. Invited participant in the Texas Symposia on Relativistic Astrophysics, 1980 and 1982.

Presented a talk at the Oklahoma-Arkansas Section MAA Meeting in 1969 on material later included in R.M. Crownover, *Studia Math.* **33** (1969) 299–304. Presented a brief talk at NY City AMS meeting in March 1978, based on [14].

Attended AMS Annual Meetings in San Antonio, 1980, and spoke on [9]; in San Francisco, 1981, and spoke on [15]; in Cincinnati, 1982, and spoke on [18]; in Denver, 1983, and spoke on [17]; in Louisville, 1984, chaired a session, and spoke on [6]; in Anaheim, 1985, and spoke on [6, 8]; in New Orleans, 1986, and spoke on [48]; in San Antonio, 1987, chaired a session, and spoke on [6, 49]; in Atlanta, 1988, and spoke on [6]; in Phoenix, 1989, chaired a session, and spoke on joint work with P. Sinclair; in Louisville, 1990, and spoke on [24]; in San Francisco, 1991, and spoke on [27]; in Baltimore, 1992, and spoke on [34]; in San Antonio, 1993, and spoke on [33]; in Cincinnati, 1994, chaired a session and spoke on [11].

Attended the International Congress at Berkeley (1986), chaired a session, and spoke on [8, 49].

Attended the 12<sup>th</sup> International Conference on General Relativity and Gravitation at Boulder (1989) and spoke on [9].

Coorganizer and cochair (with J. Beem) of the Special Session on Geometry and Mathematical Physics (19 speakers) at the AMS meeting in Lawrence (KS), October 1988.

Member of the Organizing Committee for the 2001 Midwest Geometry Conference in Wichita (held in March), 1998–2001.

Helped organize and lectured in a seminar on P. J. Cohen’s work at Missouri in 1973. Assisted in preparation of the notes for A. Andreotti’s seminar in 1973–74. Lectured in K. T. Smith’s seminar on differential operators on Riemannian manifolds in 1974. Gave some introductory lectures on manifolds in P. M. Anselone’s seminar on topological degree and fixed-point theorems, summer 1974. Directed seminar on characteristic classes, summer 1975. Codirector of Seminar on Fourier Integral Operators, 1976–77; gave lectures on symplectic geometry through the summer of 1976, and on propagation of singularities through the summer of 1977. Participated in Lawvere’s seminar on applications of category theory and Olsen’s seminar on  $C^*$ -algebras, 1977. Lectured on Fourier integral operators in the New Peoples’ Expository Seminar, 1978. Directed seminars on asymptotics and gauge theories, 1979–80, on distributions (in the sense of Schwartz), 1980–81, and on obstruction theory, 1981–82. Participated in Roseman’s seminar on the work of M. Freedman, 1982, and in the seminar of Atkinson and Bogomolny on applications of pseudodifferential operators in numerical analysis, 1983. Codirector of Seminar on Pseudodifferential Operators on Nilpotent Lie Groups, 1984–85. Lectured on Colombeau’s generalized functions, 1989. Director of Obstruction Theory Seminar, 1994–96. Lectured on Computational Galois Theory, 2005, and on [44], 2007. Gave a series of lectures on Modern Theory of Linear PDEs in C. Wolf’s analysis seminar 2008–9.

Gave colloquia at Buffalo (1977), U. Waterloo (1978), and U. Toronto (1979) on my work in distributional geometry and relativity, at Syracuse (1979) and U. of Missouri (1980) on the geometry of bicharacteristics, at Northern Illinois U. (1980) and Texas Tech (1980) on differential geometry and relativity, at St. Olaf College (1982) on the real projective plane, at U. South Alabama (1983) and WSU (1983) on stability of solvability of PDE’s, at U. Lancaster (1984) on globalizing Hadamard’s method, at U. Missouri K.C. (1987) on superstrings (phys), at U. Missouri Col. (1987) on superstrings (math), at Imperial College (1989) on Colombeau’s generalized functions (theor phys), at Universidad del Pais Vasco (1989) on pseudoconvexity, at WSU (1989) on superstrings (phys), at Newcastle U. (1990) on [16] (phys), at Cambridge U. (1990) on pseudoconvexity in general relativity (DAMTP), at Coventry Polytechnic and WSU (1990) on [27], at U. Santiago de Compostela (1991) on [16, 17, 30, 28, 37, 49], at Newcastle U., Coventry Polytechnic, and Southampton U. (1991) on Colombeau’s generalized functions, at Aberdeen U. (1991) on [30, 31, 34], at WSU (1992) on [24, 26, 33], at METU (Turkey, 1994) on [9], at WSU (1996) on [11], and at U. Oklahoma (spring 2003) and WSU (fall 2003) on [40, 36, 38].

## Other

Member of Mensa and the National Model Railroad Assn. Served as a program speaker for Central New York Mensa, 1980–81, giving talks on black holes, stellar evolution, and force and matter. Interests include cosmology, music, dirigibles, and spiders. The period 1970–72 was spent on leave from the Fellowship doing Alternative Service as a Conscientious Objector.