

CURRICULUM VITAE

Paul Frank Baum

Current Addresses

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Home

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Personal information: US citizen

Education: Ph. D., Princeton University, 1963. Thesis advisors: John Moore and Norman Steenrod
M. A., Princeton University, 1961
A. B., Harvard College, 1958, *summa cum laude*

Employment:

Evan Pugh Professor, Pennsylvania State University, 1996-
Distinguished Professor, Pennsylvania State University, 1991-96
Professor, Pennsylvania State University, 1987-91
Professor, Brown University, 1971-87
Associate Professor, Brown University, 1967-71
Assistant Professor, Princeton University, 1965-67

Visiting Appointments:

Courant Visiting Professor, University of Göttingen, 2012
Visiting Member, Institute for Advanced Study (IAS), 1964-65, 1976-77, 2004
Visiting Mathematician, Institut des Hautes Etudes Scientifiques (IHES), 1980-2002
Visiting Member, Mathematical Sciences Research Institute (MSRI):
1984, 1987, 1989, 2001
Visiting Associate Professor, Princeton University, 1967-68
Post-Doctoral Fellow, Oxford and Cambridge Universities, 1963-64

Honors

- Honorary Doctorate, Australian National University (Canberra), 2012
- Fellow of the AMS, 2012
- Honorary Doctorate, University of Colorado (Boulder), 2011, “in recognition of his powerful, elegant and lasting contributions to the field of mathematics.”
- Meeting in honor of 70th birthday, Polish Academy of Sciences (Warsaw) 2007
- Meeting in honor of 60th birthday, University of Colorado (Boulder), 1996
- Phi Beta Kappa, Harvard College, 1957

Selected Lecture Series

- Takagi Lectures, Mathematical Society of Japan, University of Tokyo, 2012.
- Conference on Quantum Fields and K-Theory, Erwin Schrödinger Institute, Vienna, 2012.
- Conference on Harmonic Analysis, Deformation Quantization, and Non-Commutative Geometry, Scalea, Italy, 2011.
- Representation Theory XII Conference, University of Dubrovnik, Croatia, 2011.
- Shanks Workshop Lecture Series, Vanderbilt University, 2008.
- Sedano Winter School on K-Theory, Burgos, Spain, 2007.
- Distinguished Lecture Series, University of Hawaii, 2006.
- DeLong Lectures, University of Colorado (Boulder), 2005.
- Keio University, Pathways Lecture Series in Mathematics, Yokohama, Japan, 2005.
- Kemeny Lectures, Dartmouth College, 2004
- Main speaker, Summer School on K-theory of C^* Algebras, and the Baum-Connes Conjecture, University of Göttingen, 2002.
- Main speaker, Geometry-Topology Colloquium, University of Bologna, 2002.
- Main speaker "Introduction to the Baum-Connes Conjecture," Conference on Non-Commutative Geometry and Quantum Groups, Stefan Banach Centre, Mathematical Institute of the Polish Academy of Sciences, Warsaw, 2001.
- Frontiers in Mathematics Lectures, Texas A & M University, 2000.
- Max Planck lectures in Mathematics, "K theory and the index of elliptic operators," Max Planck Institut für Mathematik, Bonn, Germany, 1995.
- London Mathematical Society Invited Lectures , University of Manchester, 1995.
- Main Speaker, Workshop on the Baum-Connes Conjectures, Fields Institute, 1994.
- US-Chile Meeting, Representation Theory of p-adic Groups, Santiago- Valparaiso, Chile, 1993.
- University of Iowa, Distinguished Visitor Program, 1993.
- Main speaker, Conference Board for Mathematical Sciences Meeting, K Homology and Index Theory, Boulder, Colorado, 1991.

Selected Invited Addresses

- 2013 Arbeitstagung (in Memory of Friedrich Hirzebruch), MPIM, Bonn, Germany
- Conference on Operator Algebras and Non-Commutative Geometry in honor of the 70th birthday of S. Woronowicz, IMPAN, Warsaw, Poland, 2012.
- Keynote Speaker, Canadian Operator Algebra Symposium, University of New Brunswick, Fredericton, NB, Canada, 2010.
- Invited Lecturer, Special Semester on the Baum-Connes Conjecture, Münster University, Germany, 2009.
- Invited Lecturer, Chinese National Academy of Sciences, Beijing, China, 2009.
- Plenary Address, Australian Math. Society, La Trobe University, Melbourne, 2007.
- Alain Connes' 60th birthday, Institut Henri Poincaré, Paris, 2007.
- British Mathematical Colloquium, Newcastle, 2006.
- Conference for Max Karoubi's 60th birthday, Paris, 1998.
- AMS Special Session commemorating Harish Chandra, Baltimore, 1998

- Conference for 50th birthday of Alain Connes, Strasbourg, 1997.
- Conference for 100th anniversary of the birth of P. S. Alexandrov, Moscow, 1996.
- AMS Special Session in honor of I.M. Gelfand, 50 Years of Operator Algebras, San Antonio, 1993

Grants and Fellowships

- Continuously supported by NSF Research Grants, 1965 to present.
- US-UK Cooperative Science Program Research Grant: 1992-96.
- Fellowship to lecture in Japan, Japan Society for the Promotion of Science, 1986.
- US-France Cooperative Science Program Research Grant: 1982-85.
- National Science Foundation Postdoctoral Fellowship, 1963-64.
- National Science Foundation Graduate Fellowship, 1961-63.
- Harvard College-Ecole Normale Supérieure Fellowship, 1958-59.

Current Research

My current research centers on:

#1. Representation theory of reductive p-adic groups and the local Langlands conjecture

#2. Index theory for non-elliptic operators

#1. Let G be a reductive p-adic group. Examples are $GL(n, F)$, $SL(n, F)$ etc. where n can be any positive integer and F can be any finite extension of the p-adic numbers Q_p . The smooth dual of G , denoted \hat{G} , is the set of equivalence classes of smooth irreducible representations of G . One of the main problems in the representation theory of reductive p-adic groups is to describe \hat{G} . Anne-Marie Aubert, Roger Plymen, Maarten Solleveld, and I have formulated a conjecture – the ABPS conjecture – which states that the smooth dual \hat{G} is a countable disjoint union of complex affine algebraic varieties. These algebraic varieties are explicitly identified as certain (twisted) extended quotients. Basically, ABPS proposes an answer to the problem of describing \hat{G} which is far simpler than earlier attempts at understanding \hat{G} .

During 2012, my co-workers and I proved that ABPS is valid throughout the principal series of any connected split reductive p-adic group. As a corollary, we proved the validity of the local Langlands conjecture throughout the principal series of any connected split reductive p-adic group.

#2. K-homology is the dual theory to K-theory. In algebraic geometry, the K-homology of a projective (possibly singular) algebraic variety X is the Grothendieck group of coherent algebraic sheaves on X . In topology, there are three ways to define K homology. First (via homotopy theory), K-homology is the homology theory associated to the Bott spectrum. Second, K-homology is the group of geometric K-cycles which I defined in 1978. Third (via functional analysis as in the work of Atiyah, Brown-Douglas-Fillmore, and Kasparov), K-homology is the group of Fredholm modules.

Let X be a finite CW complex. Denote the K-cycle K-homology of X by $K_*^{top}(X)$. Denote the Atiyah-Kasparov (i. e. functional analysis) K-homology of X by $KK^*(C(X), C)$. In 1980, R. Douglas and I used Dirac operators to define a functorial map

$$K_j^{top}(X) \rightarrow KK^j(C(X), C) \quad j = 0, 1$$

and then proved that this map is an isomorphism. The isomorphism so obtained provided a framework for index theory which had the possibility of extending index theory to non-elliptic Fredholm operators. This possibility was realized in 2010 when Erik van Erp and I solved the index problem for a naturally arising class of hypoelliptic (but not elliptic) operators. Our result indicates that formulas like the Atiyah-Singer index formula apply well beyond elliptic operators.

Most Recent Teaching

Math140 (calculus) 1990

Math 140 H (Honors calculus) 1991, 1992, 1993, 1994, 1996
1997, 1998, 1999, 2000, 2001, 2002, 2003, 2008

Topology (1990)

Atiyah-Singer index theorem (1991)

Trees, symmetric spaces, and buildings (1992)

K theory and K homology (1993)

Representation theory and C* algebras (1994)

Operator Algebras (1996)

K theory for C* algebras (1997)

Bivariant K theory (1998)

K homology and homotopy theory (1999)

Elliptic operators and K homology (2000)

K homology and Dirac operators (2001)

Non-commutative geometry and representation theory (2002, 2003)

Calculus with emphasis on economics and biology (2005, 2006)

K-Theory for Operator Algebras (2006, 2008)

Business calculus (2009, 2010)

Geometry and Topology (2009)

Topological spaces and metric spaces (2013)

C* algebras (2013)

Individual Studies (2014)

- Supervised Ph.D. thesis (1990) of Hitoshi Moriyoshi, now a full Professor at the University of Nagoya, Japan.
- Supervised Ph.D. thesis (1995) of John (Jody) Trout, now a tenured associate professor at Dartmouth College.
- Supervised Ph.D. thesis (2004) of Jeff Raven.
- Supervised 6 Ph. D. theses at Brown University, 1973-1986.

Service

Academic

University Evan Pugh Professor Selection Committee (2009-2010)
Eberly College of Science Promotion and Tenure Committee (2008-2010)
Penn State Faculty Senate (2008-2011)
Mathematics Department Strategic Planning Committee
Mathematics Department Space Committee (2007-2010)
Mathematics Department Areas of Strength Committee, Operator
Algebras and Related Areas
Mathematics Department Subject Area Committee for Geometry and
Topology
Mathematics Department Personnel Committee, 1991-93, 2000-2003
Mathematics Department Faculty Awards Committee, 1999-2002
Mathematics Department Colloquium and Lectures Committee, 1998-2004
Mathematics Department Policy Committee (2001-2012)
Mathematics Department Advisory Committee
Eberly College of Science Evan Pugh Professor Selection Committee,
1997-1999 (Chair in 1997)
University Selection Committee for Faculty Scholar Medal in the Physical Sciences, 1998-2000

(at Brown University, served as Concentration Advisor, member of the Medical School Curriculum Committee, Freshman Advisor, Graduate Student Advisor, Director of the Graduate Program in Mathematics, and member of the Graduate Council.)

Professional

AMS Steele Prize Committee, 2014
AMS Centennial Fellowship Committee, 2012-2014
AMS-IMS-SIAM Committee on Joint Summer Research Conferences in the Mathematical
Sciences, 1998-2003.
AMS Eastern Section Program Committee, 1998-2001
NSF Panels to review proposals, 1997, 1998, 2009
Member, committee to select speakers for 1985 summer meeting of AMS-MAA
Editorial Committee, *Notices of the American Mathematical Society*, 1983-86

Invited Lectures

1963-64 University of California at Berkeley
AMS Summer Institute on Algebraic and Differential Topology
Oxford
Cambridge
Liverpool
1964-65 Institute for Advanced Study
Yale
Princeton
1965-66 Notre Dame
Cornell University Topology Festival
1966-67 Brown
Purdue
University of Chicago

1967-68 Cornell University Topology Festival
 AMS Summer Institute on Global Analysis
 1968-69 Harvard-Brandeis-MIT Colloquium
 AMS Summer meeting
 1969-70 Courant Institute, New York University
 Purdue
 1970-71 Notre Dame
 Purdue
 1971-72 Princeton
 University of Rhode Island
 1972-73 Harvard (R. Bott seminar)
 AMS Summer Institute on Differential Geometry, Stanford
 1974-75 University of North Carolina
 University of Virginia
 1975-76 Harvard (R. Bott seminar)
 AMS Summer Institute on Topology
 1976-77 Institute for Advanced Study
 University of Bonn
 Oberwolfach
 Oxford
 Johns Hopkins
 City University of New York
 Rutgers
 1978-79 SUNY at Stony Brook
 Harvard-Brandeis-MIT Colloquium
 1979-80 Purdue
 Indiana-Purdue
 Harvard-Brandeis-MIT Colloquium
 AMS Summer Institute on Operator Algebras
 1980-81 Institut des Hautes Etudes Scientifiques
 AMS Annual Meeting, San Francisco, Special Session on K theory and Operator Algebras
 Ecole Normale Supérieure
 University of Copenhagen
 Copenhagen Technical University
 Dalhousie University
 Canadian Math. Society summer meeting at Halifax
 Canadian Math. Society Symposium "Current trends in Algebraic Topology," London, Ontario
 1981-82 University of Paris (K theory colloquium)
 Dartmouth
 Tulane
 Cornell
 University of Paris (algebra seminar)
 University of Chicago
 Louisiana State University
 University of Texas at Austin
 University of Georgia at Athens
 1982-83 Princeton
 University of Geneva
 University of Pennsylvania
 SUNY at Stony Brook
 University of Maryland
 CUNY
 University of Rhode Island
 Purdue
 AMS Special Session "Topology and Geometry of Algebraic Varieties," University of Maryland
 Rutgers
 U.C.L.A.

- US-Japan Operator Algebra Seminar, Kyoto
 University of Tokyo
 University of Hokkaido at Sapporo
 Rikkyo University, Tokyo
 AMS Summer Meeting Special Session "Applications of Algebraic Topology" at SUNY Albany
- 1983-84 Princeton
 Pennsylvania State University
 University of Maryland
 University of Illinois at Chicago
 Midwest Topology Conference
 University of Western Ontario, London, Ontario
 SUNY Buffalo
 Oberwolfach
 Istituto Guido Castelnuovo, Rome, Italy
 Rutgers
 AMS Special Session on Algebraic Topology, Eugene, Oregon
- 1984-85 MSRI, Berkeley, California, Special Year on Index Theory and Operator Algebras
 University of California at Santa Cruz
 University of California at Berkeley
 Ecole Polytechnique, Paris
 CUNY
 Rutgers
- 1985-86 Mexican Mathematical Society Summer Meeting at Taxco
 AMS Northeast Regional Meeting at Amherst, MA
 University of Kansas
 Canadian Math. Society Winter Meeting at Calgary, Alberta
 Institut Henri Poincaré, Paris, Malliavin Algebra Seminar
 University of Paris, Karoubi K theory seminar
 Tokyo Metropolitan University
 University of Hokkaido
 University of Kyoto
 University of Tokyo
 SUNY at Stony Brook
 University of Western Ontario
- 1986-87 Pennsylvania State University
 University of Pennsylvania
 AMS Regional Meeting on Cyclic Homology and K Theory at Kent State University
 University of Maryland
 University of Edinburgh
 University of Durham
 University of Warwick, Coventry, England, Workshop on Cyclic Homology and K-theory
- 1987-88 Keystone Operator Algebra Seminar, PSU at Harrisburg
 Dalhousie University, Halifax, Nova Scotia, Canada
 University of California at Berkeley
 Max Planck Institut für Mathematik (Bonn), 4 lectures
 University of Bonn
 AMS Summer Institute "Operator Theory and Operator Algebras," Durham, NH
 AMS Summer Research Conference Topological Invariants of Elliptic Operators, Bowdoin College
- 1988-89 University of Pennsylvania
 SUNY at Stony Brook
 AMS Annual Meeting, Special Session Topology and Operator Algebras, Phoenix, Arizona
 UCLA
 Great Plains Operator Theory Seminar, Houston, Texas (main speaker, series of three lectures)
 MSRI (Berkeley)
- 1989-90 INCREST Conference on Geometrical Methods in Operator
 Algebras, Craiova, Romania
 AMS Regional Meeting at Pennsylvania State University (Operator Algebras and Index Theory)

- Courant Institute, NYU
MSRI (Berkeley)
- 1990-91 Canadian Math. Society, Annual Meeting, Waterloo, Ontario
Conference Board for Mathematical Sciences, "K-homology and Index Theory,"
Boulder, Colorado (main speaker, 10 lectures)
- 1991-92 SUNY at Stony Brook
Courant Institute, NYU
University of Manchester, UK
Yorkshire Mathematical Society (at Manchester)
AMS Annual Meeting, Special Session Operator Algebras and Group Theory, Baltimore, MD
Brown University
AMS Special Session Topology and Operator Algebras, Springfield, MO
AMS Special Session Characteristic Classes, Lehigh University
Oxford, UK, Index'92 Meeting
- 1992-93 Ohio State University
AMS Annual Meeting, Special Session "Fifty years of Operator Algebras," San Antonio, Texas
University of Iowa, Iowa City, Distinguished Visitor Program, 4 lectures
US-Chile meeting "Representation Theory of p-adic Groups,"
Santiago-Valparaiso, 4 lectures, 1993.
- 1993-94 AMS Regional Meeting at Texas A & M, Special Session "Non-commutative differential geometry."
Virginia Technical University
AMS Annual Meeting, Special Session "Geometric Applications of Index Theory," Cincinnati, Ohio
- 1994-95 Fields Institute for Research in the Mathematical Sciences, Workshop on the Baum-Connes Conjectures,
main speaker (3 lectures)
AMS Annual Meeting, Special Session "Index Theory," San Francisco
UCLA (3 lectures)
London Mathematical Society Invited Lectures (10 lectures)
University of Edinburgh, (2 lectures)
Max Planck Institut für Mathematik, Bonn (4 lectures)
Fields Institute for Research in the Mathematical Sciences, Cyclic Homology and Non-Commutative
Geometry meetings (2 lectures)
- 1995-96 Dartmouth College (2 lectures)
North British Functional Analysis Seminar (Main Speaker, 2 lectures), Manchester
AMS Annual Meeting, Special Session "Analysis on non-compact manifolds," Orlando, Florida
University of Mainz
University of Münster
University of Neuchatel
Rutgers University
Kings College, London
Meeting for 100th anniversary of birth of P. S. Alexandrov, Moscow
Conference for P.F. Baum's 60th birthday, University of Colorado at Boulder
Workshop on K-Theory and Index Theory, University of Colorado at Boulder
- 1996-97 AMS Regional Meeting at Rider College, Special Session on Geometric Topology
University of Pennsylvania
University of Münster Workshop on the Baum-Connes Conjecture
AMS Annual Meeting, Special Session Non-Commutative Geometry, San Diego, CA
Ontario Topology Seminar, Toronto,
University of Western Ontario (4 lectures)
- 1997-98 Dartmouth College Conference on E Theory and Quantization
Meeting for Alain Connes' 50th Birthday, Strasbourg, France
AMS Special Session commemorating Harish Chandra, Baltimore
Yorkshire Functional Analysis Group, Manchester, UK
University of Utrecht
Institut Mathématique de Luminy
University of Chicago
University of Münster, Workshop on Cyclic Homology
Oberwolfach (Non-commutative Geometry Meeting)

- 1998-99 AMS Regional Meeting at Penn State, Special Session on K-theory for C^* algebras
 SUNY at Binghamton (2 lectures)
 Meeting for Max Karoubi's 60th birthday, Paris
 AMS Annual Meeting, Special Session on Differential Geometry, San Antonio
 London Mathematical Society K-Theory Day (2 lectures), Manchester, UK
 Rice University
 University of Illinois at Chicago
 Great Plains Operator Theory Symposium, Iowa State University
- 1999-00 AMS Regional Meeting at Providence College, Special Session on Non-commutative Geometry
 University of New Brunswick, Fredericton, NB
 AMS Annual Meeting, Special Session on Homotopy Theory and Special Session on History of Topology,
 Washington, D.C
 Texas A & M University (Series of 3 lectures), College Station, Texas
 Oberwolfach (non-commutative geometry meeting)
 London Mathematical Society K-Theory Day, Manchester, UK
 University of Paris VI, K theory seminar
 Strasbourg, Meeting on the Baum-Connes conjecture
 AMS Summer Research Conference on Non-commutative Geometry, Mt. Holyoke College
 London Mathematical Society Conference on Non-Commutative Geometry, Durham, UK
- 2000-01 AMS Special Session on Non-commutative Geometry, Toronto, CA
 Fall School and Workshop on Geometric Analysis, Potsdam, Germany
 AMS Special Session on Group Cohomology and Applications to Homotopy Theory and Representation
 Theory, New Orleans
 London Mathematical Society, K Theory Day, Manchester
 University of Maryland
 Vanderbilt University
 University of California at Santa Cruz
 MSRI, Operator Algebra Year (2 lectures)
- 2001-02 Stefan Banach Internat. Math. Centre, Warsaw, Poland (6 lectures)
 AMS Special Session on Low Dimensional Topology, San Diego
 University of Bologna (6 lectures)
 Oberwolfach, Meeting on Noncommutative Geometry
 University of Copenhagen (2 lectures)
 ETH-Zurich (3 lectures)
 University of Göttingen (5 lectures)
 ICTP Trieste, Meeting in honor of H. Bass
- 2002-03 Southampton, UK, Workshop on Discrete Groups and Analysis
 University of Florida, Gainesville
 AMS Special Session on Homotopy Theory and Geometric Topology, Orlando
 AMS Annual Meeting, Special Session Commemorating J. Von Neumann and M. Stone
 University of Western Ontario (4 lectures)
 Banff International Research Station (BIRS)
 University of Calgary
 Meeting on Non-Commutative Geometry, Vanderbilt University (2 lectures)
 University of Edinburgh (3 lectures)
 London Mathematical Society K Theory Day, University of Manchester, UK
 Meeting on Non-Commutative Geometry, University of Cork, Eire (3 lectures)
 International Centre for Theoretical Physics, Trieste (3 lectures)
- 2003-04 Mittag-Leffler Institute Workshop on Non-Commutative Geometry, Stockholm, Sweden
 University of Western Ontario, Homotopy Theory Meeting, London, Ontario
 AMS Special Session on Non-Commutative Geometry, University of Colorado, Boulder
 University of Bologna (3 lectures)
 Instituto Tecnico Superiore (Lisbon) (3 lectures)
 Mittag-Leffler Institute Workshop on Non-commutative Algebraic Geometry (2 lectures)
 CIRM, Luminy, Marseille, France
 Mittag-Leffler Institute, Stockholm
 Institute of Mathematics, Polish Academy of Sciences, Bedlewo, Poland

- Positive Scalar Curvature & Related Topics Meeting, University of Munich (3 lectures)
 Non-commutative Geometry Seminar, Stefan Banach International Mathematical Center, Warsaw, Poland
 Algebraic Topology Seminar, University of Warsaw, Poland
 London Mathematical Society K Theory Day, University of Manchester, UK
 Kemeny Lectures, Dartmouth College, 3 lectures
 K-Theory and Non-commutative Geometry Workshop, Institut Henri Poincaré, Paris, 4 lectures
 Non-commutative Geometry and Number Theory Workshop, Max Planck Institute, Bonn
 University of Goettingen, Germany
 K-Theory and Non-commutative geometry meeting, Institut Henri Poincaré Paris
- 2004-05 University of Southampton, UK, 5 lectures, London Mathematical Society School on Analysis
 and Group Theory
 University of Pennsylvania, Analysis Seminar
 Institute for Advanced Study, 5 lectures (4 on the Baum-Connes conjecture; 1 on representation theory
 of p-adic groups)
 TIFR (Tata Institute for Fundamental Research), 6 lectures
 Moscow State University, Meeting dedicated to memory of Yu. Solovoyov
 London Math Society K-theory Day, University of Manchester
 Keio University, Pathways Lecture Series in Mathematics, Yokohama, Japan, 4 lectures
 Keio University-sponsored meeting on noncommutative geometry, K-theory, and physics,
 at International Productivity Center, Shonan, Japan, 3 lectures
 DeLong Lectures, University of Colorado, 3 lectures
 Stephan Banach Institute, Warsaw, 4 lectures
 Mathematical Institute of the Polish Academy of Science, Warsaw, 2 lectures
- 2005-06 Vanderbilt University
 University of Michigan, 2 lectures
 Mathematical Institute of the Polish Academy of Science – University of Moscow Conference on C^*
 Algebras, Bedlewo, Poland
 University of Muenster, Germany, Workshop on Non-Commutative Algebras
 University of Manchester, UK, Algebra Seminar
 London Math Society K-theory Day, University of Manchester
 Penn State University Number Theory Seminar
 University of Hawaii Mathematics Department, Distinguished Lecture Series, 3 lectures
 Penn State University Mathematical Physics Seminar
 Banff International Research Station, Banff, Canada, Non-Commutative Geometry meeting
 British Mathematical Colloquium, University of Newcastle, UK, Special Session Analysis on Groups
 Penn State University, Slow Pitch Seminar
 Penn State University, Geometric Functional Analysis Seminar
 Mathematical Institute of Polish Academy of Science, Warsaw
 University of Warsaw
- 2006-07 Isaac Newton Institute, Cambridge, UK
 Penn State University, Mathematical Physics Seminar
 Penn State University, Mathematics Club
 Penn State University, Algebra & Number Theory Seminar
 Princeton University Undergraduate Mathematics Club
 Princeton University, Graduate Student Seminar
 Princeton University, Mathematics Colloquium
 Institut Henri Poincaré meeting “Higher Structures in Geometry and Physics”
 Sedano Winter School on K-Theory, Burgos, Spain (4 lectures)
 Moscow State University Meeting “Operator Algebras and Topology”
 Institut Henri Poincaré meeting “Groupoids in Operator Algebras and Non-commutative Geometry”
 Oxford University Mathematical Institute Colloquium
 Oxford University Mathematical Institute Algebra Seminar
 The Invariants (Oxford University Mathematics Club)
 Institut Henri Poincaré meeting “Non-commutative Geometry”
 Northwestern University Mathematics Department Colloquium
 Northwestern University Non-commutative Geometry Seminar
 University of Warsaw Mathematics Department (4 lectures)

IMPAN (Math. Institute, Polish Academy of Sciences), Warsaw
 Abdul Salam International Centre for Theoretical Physics, Trieste
 Mathematical Institute, University of Goettingen, Germany
 IMPAN, Conference for P. F. Baum's 70th birthday
 University of Warsaw, AMS and Polish Math. Society Joint Meeting,
 Special Session Non-commutative Geometry and Quantum Groups
 2007-2008 Australian National University, Special Event on Baum-Connes conjecture, 3 lectures
 Canberra, Australia
 Annual Meeting, Australian Mathematical Society, La Trobe University, 2 lectures,
 Melbourne, Australia
 Newcastle University, 2 lectures, Newcastle, Australia
 Mathematical Physics Seminar, Penn State University
 Topology Seminar, Penn State University
 Annual Meeting, Canadian Math. Soc., Special Session on Non-commutative Geometry, London, Canada
 Annual Meeting, AMS, Special Session on Construction and Application of Expanders, San Diego, CA
 Annual Meeting, AMS, Special Session on E-theory, Extensions, and Elliptic Operators, San Diego, CA
 University of Copenhagen, Mathematical Institute, Operator Algebra Seminar
 University of Copenhagen, Mathematical Institute, Non-commutative Geometry Workshop
 European Mathematical Society Meeting, Special Session on Non-commutative Geometry,
 University of Copenhagen
 Algebra Seminar & London Mathematical Society K-theory Day, University of Manchester, UK
 Shanks Workshop Lecture Series (4 lectures), Vanderbilt University
 Non-commutative Geometry Seminar, Mathematical Institute of the Polish Academy of Sciences, Warsaw
 University of Warsaw (5 lectures)
 University College, Cork, Ireland, Meeting to Remember Gerard Murphy
 Mathematics Department, University of Krakov, Poland
 Fields Institute, Non-commutative Geometry Workshop, Toronto, Canada
 50th Reunion, Harvard & Radcliffe Colleges, Class of 1958, Cambridge, Mass.
 University of Montreal, Meeting to Remember Raoul Bott, Montreal, Canada
 University of Manchester (UK), Meeting for R. Plymen's 65th Birthday
 Texas A & M University, Meeting for R. Douglas's 70th Birthday
 2008-2009 Rutgers University, Lie Group Seminar
 Rutgers University, Algebra Seminar
 University of New Brunswick, Meeting "Hopf Algebras in Non-commutative Geometry,"
 Fredericton, NB, Canada
 GAP (Geometry, Algebra, & Physics) Seminar, PSU
 Plenary Address, Northern Regional Meeting, London Math. Society, University of
 Manchester, U. K.
 PSU, Slow Pitch Seminar
 Non-commutative Geometry Seminar, IMPAN, Warsaw (2 lectures)
 Colloquium, IMPAN, Warsaw
 Colloquium, Math. Dept., University of Southampton, UK
 Lunch Seminar, Math. Dept., University of Southampton, UK
 Japan American Math Institute Meeting, Johns Hopkins Univ.
 Non-commutative Algebra-Algebraic Geometry Seminar, MIT
 Lie Groups Seminar, MIT
 Non-commutative Geometry Seminar, IMPAN, Warsaw
 Topology Seminar, University of Warsaw
 Colloquium, Queen's University, Belfast, Northern Ireland
 Topology-Geometry Seminar, University of Glasgow, UK
 Algebra Seminar, University of Glasgow
 CBMS String Theory Meeting, Texas Christian University, Fort Worth, Texas
 Plenary Address, Great Plains Operator Theory Symposium, University of Colorado, Boulder, CO
 GAP (Geometry, Algebra, & Physics) Seminar, Szechuan University, Chengdu University,
 China (2 lectures)
 Mini-course on K-theory and K-homology, Fudan University, Shanghai, China (8 lectures)
 Chinese National Academy of Sciences, Beijing, China (3 lectures)

Noncommutative Geometric Methods in Global Analysis Meeting in honor of Henri Moscovici's 65th
 Birthday, Bonn University, Bonn, Germany
 Special Semester on the Baum-Connes Conjecture, Münster University, Münster, Germany
 2009-2010 Analysis Seminar, University of Houston, Houston, Texas
 GAP (Geometry, Algebra, & Physics) Seminar, PSU
 Special Session on Representation Theory of p-adic Groups, AMS Annual Meeting, San
 Francisco
 Special Session on Algebraic and Categorical Methods in Representation Theory, AMS
 Annual Meeting, San Francisco
 Non-commutative Geometry Seminar (3 lectures), IMPAN, Warsaw
 Colloquium, Dept. of Mathematics, University of Warsaw
 Colloquium, IMPAN, Warsaw
 Guest lecture, "The p-adic Numbers" in course "Introduction to Contemporary Mathematics,"
 University of Warsaw
 Colloquium, Departments of Mathematics, University of Rzeszow and the Technical
 University of Rzeszow
 Colloquium, Department of Mathematics, University of Western Ontario, Canada
 Non-commutative Geometry Seminar (3 lectures), Dept. of Mathematics, University
 of Western Ontario
 Colloquium, Department of Mathematics, University of Luxembourg
 Non-commutative Geometry Seminar, Department of Mathematics, University of
 Luxembourg
 Colloquium, University of Metz, France
 Special Session on Non-commutative Geometry, CMS 2010 Summer Meeting, University of
 New Brunswick, Fredericton, Canada
 University of New Brunswick Workshop on Index Theory (3 lectures), Fredericton, New
 Brunswick, Canada
 Keynote Speaker, Canadian Operator Algebra Symposium (2 lectures), University of New
 Brunswick, Fredericton, Canada
 PIMS (Pacific Institute for Math. Sciences), University of Victoria, Victoria, BC, Canada
 2010-2011 Conference in Honor of R. Nest's 60th Birthday, University of Copenhagen, Denmark
 GAP (Geometry, Algebra, & Physics) Seminar, PSU (3 lectures)
 Special Session on Expander Graphs, AMS Annual Meeting, New Orleans
 Special Session on Dirac Operators, AMS Annual Meeting, New Orleans
 Mathematics Colloquium, Dartmouth College, Hanover, NH
 Analysis Seminar, Dartmouth College, Hanover, NH
 Number Theory Seminar, Harvard University, Cambridge, MA
 Colloquium and Analysis Seminar (2 lectures), University of Kansas, Lawrence
 Colloquium, Department of Mathematical Methods in Physics, University of Warsaw
 Non-Commutative Geometry Seminar, IMPAN, Warsaw
 Algebraic K-theory and its Applications – Meeting in honor of 70th birthday of
 Aderemi Kuku, University of Nanjing, China
 Topology and Analysis Seminars, Colloquium (3 lectures), Fudan University,
 Shanghai, China
 Algebra Seminar and Colloquium (2 lectures), Mathematical Institute of the
 Chinese National Academy of Sciences, Beijing, China
 Colloquium, Mathematics Department, University of Colorado (Boulder)
 Non-commutative Geometry and Operator Algebras (NCGOA) Meeting, Vanderbilt
 University (2 lectures)
 Kazhdan Automorphic Representations of Classical Groups Seminar, Hebrew University,
 Jerusalem
 Amitsur Symposium, Ben Gurion University, Beer-Sheva, Israel
 Colloquium, Mathematics Department, Hebrew University, Jerusalem
 Kazhdan Basic Notions Seminar, Hebrew University, Jerusalem
 Noncommutative Harmonic Analysis and Representation Theory Conference, Luxembourg
 Colloquium and Analysis Seminar (2 lectures), University of Metz, France
 Representation Theory XII Conference (2 lectures), University of Dubrovnik, Croatia

- 2011-2012 Conference on Harmonic Analysis, Deformation Quantization, and Non-Commutative Geometry
Scalea, Italy (3 lectures)
Meeting on Non-Commutative Geometry, Institute for Math. Research, Oberwolfach, Germany
Conference on Operator Algebras and Non-Commutative Geometry in honor of the 70th birthday of
S. Woronowicz, IMPAN, Warsaw, Poland
Australian National University, Canberra, Australia (3 lectures)
Colloquium and Number Theory-Representation Theory Seminar, (2 lectures) University of Toronto
Fields Institute, Toronto
Special Session Generalized Cohomology Theories in Engineering Practice, AMS-MAA-SIAM Joint
Meeting, Boston
Special Session Trends in Representation Theory, AMS-MAA-SIAM Joint Meeting, Boston
Special Session on Linear Algebraic Groups, AMS-MAA-SIAM Joint Meeting, Boston
Special Session on Homotopy Theory, AMS-MAA-SIAM Joint Meeting, Boston
Non-Commutative Geometry Seminar, IMPAN, Warsaw, Poland
Department of Math. Methods in Physics, University of Warsaw, Poland (2 lectures)
Algebraic Topology Seminar, Princeton University
Newton Institute-Wales Institute of Math. & Computer Science Meeting on Non-Commutative
Geometry, Cardiff University, Cardiff, Wales
Graduate Student Colloquium, Göttingen University Math. Institute, Göttingen, Germany
Conference on Quantum Fields and K-Theory, Erwin Schrödinger Institute, Vienna, Austria (2 lectures)
Minicourse “An Introduction to K-homology,” Göttingen University Math. Institute, Göttingen
(4 lectures)
Differential Geometry Seminar, University of Augsburg, Germany
Mathematics Department Colloquium, University of Augsburg
- 2012-13 Non-commutative Geometry and Algebraic Geometry Meeting, Fields Institute, Toronto
Non-commutative Geometry and Algebraic Geometry Workshop, University of New Brunswick, Fredericton
Non-commutative Geometry Seminar, Mathematics Department, University of Hawaii, Honolulu
Analysis Seminar, Mathematics Department, University of Hawaii, Honolulu
Geometry Seminar, Tohoku University, Sendai, Japan
Mathematics Department Colloquium, Tohoku University, Sendai, Japan
Takagi Lectures, Mathematical Society of Japan, Tokyo University, Japan (2 lectures)
Mathematics Department Colloquium, University of Hawaii, Honolulu
Australian National University, Canberra, Australia
Iwasawa Theory, Representations and the p-adic Langlands Program, Conference in Honour of
Peter Schneider’s 60th Birthday, Wilhelms-Universität, Münster, Germany
Mathematical Physics Seminar, University of Nijmegen, The Netherlands
Mini course on K-homology and index theory, TIFR, 4 lectures
Mini course on geometric structure and the local Langlands conjecture, TIFR, 3 lectures
Mathematics Department Colloquium, TIFR,
Mathematics Department Student Seminar, TIFR
Department of Mathematics, Mumbai Institute of Science
Non-Commutative Geometry Seminar, IMPAN, Warsaw, 2 lectures
Sde Boker School on group C* algebras, Ben Gurion University of the Negev, Israel, 2 lectures
Jagellonian University in Krakow, Krakow, Poland
Arbeitstagung 2013, Max Planck Institut für Mathematik, Bonn, Germany
Conference on Noncommutative Geometry and Quantum Groups, Fields Institute, Toronto, 6 lectures
Representations of Reductive Groups Meeting, University of Utah, Salt Lake City
Minicourse on Index Theory, Meeting in Honor of Ron Douglas’s 75th Birthday, Fudan University,
Shanghai, China (5 lectures)
University of Southampton, UK
Masterclass on p-adic Groups, University of Copenhagen, Denmark
- 2013-14 University of Maryland (2 lectures)
Conference on Quantum Groups and Non-commutative Geometry, Fields Institute, Toronto
Special Session on Recent Progress in the Langlands program, Joint Mathematics Meetings, Baltimore
GAP seminar, Penn State University
Colloquium, University of Minnesota, Minneapolis
Lie Theory Seminar, University of Minnesota, Minneapolis

Colloquium, Texas A & M, College Station, Texas
 Noncommutative Geometry Seminar, Texas A & M, College Station, Texas, Lecture Series on Index
 Theory (5 lectures)
 Algebraic Topology Seminar, Princeton University, Princeton, New Jersey
 IAS-Princeton University Number Theory Seminar, Princeton
 Noncommutative Geometry Festival in Honor of Henri Moscovici's 70th Birthday, Texas
 A & M University, College Station, Texas
 IMPAN, Warsaw, Poland (3 lectures)
 Joint Algebraic Geometry-Algebraic Topology Seminar, University of Warsaw, Poland
 2014-15 Opening Workshop, Geometric Representation Theory Program, MSRI, Berkeley, CA
 Geometry Seminar, Mathematics Department, University of California, Berkeley, CA
 Workshop, Methods of Noncommutative Geometry in Analysis and Topology, Leibniz
 University, Hannover, Germany
 Hausdorff Research Institute for Mathematics, Bonn, Germany (6 lectures)
 Max Planck Institute for Mathematics, Bonn
 AMS Special Session on Operator Algebras and Their Applications, A Tribute to Richard V.
 Kadison, Joint Mathematics Meeting, San Antonio, Texas
 AMS Special Session on Hopf Algebras and Tensor Categories, Joint Mathematics Meeting,
 San Antonio, Texas
 Operator Algebras Seminar, Dartmouth College, Hanover, NH
 Stratified Spaces in Geometric and Computational Topology and Physics, Meeting in honor of
 Julius Shaneson's 70th Birthday, University of Wisconsin, Madison WI
 Geometry Seminar, Mathematics Department, Wroclaw University, Poland
 IMPAN, Warsaw, Poland (2 lectures)

TIFR = Tata Institute of Fundamental Research, Mumbai, India
 AMS = American Mathematical Society
 MSRI = Mathematical Sciences Research Institute (Berkeley)
 CMS = Canadian Mathematical Society
 IMPAN = Mathematics Institute of the Polish National Academy of Science