

# Sergio Albeverio



## Academic career

- 1966 Dr. rer. nat., ETH Zürich, Switzerland (supervisor: R. Jost, M. Fierz)
- 1962 - 1971 Assistant Professor, Lecturer, Research Fellow: ETH Zürich (Switzerland), Imperial College London (England, UK), Princeton University (NJ, USA)
- 1972 - 1977 Professor (Marseille, Oslo, and Naples)
- 1977 - 1979 Professor (H3), University of Bielefeld
- 1979 - 1997 Professor (H4), University of Bochum
- 1997 - 2008 Professor (H4/C4), University of Bonn
- 1997 - 2009 Professor and Director of Mathematics Sect., Accademia di Architettura, USI, Mendrisio, Switzerland
- Since 2008 Professor Emeritus, University of Bonn  
Longer research stays and invited professorships at many universities and research centers in Europe, China, Japan, Mexico, Russia/USSR, Saudi Arabia, USA

## Honours

- 1969 - 1971 SNF Research Awards
- 1993 Max Planck Research Award
- Since 2002 Listed in the ISI Highly Cited Scientists
- 2002 Doctor honoris causa, Oslo University, Norway (Bicentennial of N. H. Abel)
- 2002 Visiting Professorship (over several years) per chiara fama, University of Trento
- 2003 Bonn University Prize for an interdisciplinary project "Extreme events in natural and artificial systems"
- 2011 - 2015 Chair Professorship in Mathematics, King Fahd University of Petroleum and Minerals (KFUPM), Dhahran, Saudi Arabia
- 2018 Doctor honoris causa, Stockholm University, Sweden

## Offers

- 1988 Chair of Mathematics, per chiara fama, Roma University II, Italy

## Invited Lectures

	Plenary lecturer at over 230 international meetings, including:
1977	International Congress on Mathematical Physics, Rome, Italy
1983	International Congress on Mathematical Physics, Boulder, CO, USA
1986	International Congress on Mathematical Physics, Marseille, France
1988	International Congress on Mathematical Physics, Swansea, Wales, UK
1994	N. Wiener Memorial Symposium, East Lansing, MI, USA
1995	S. Lefschetz Memorial Lecture, UNAM, Mex. Soc. Math./AMS, Mexico City
2000	Conference in Honor of S. Albeverio, MPI Leipzig
2000	30th Anniversary of Saint-Flour Lectures in Probability, Saint-Flour, France
2003	International Congress on Mathematical Physics, Organization of Session, Lisbon, Portugal
2005	Abel Symposium on the occasion of K. Itô's 90th birthday, Oslo, Norway
	Plenary lectures at symposia/conferences in honor of: L. Arnold (1977), E. Balslev (2010), Ph. Blanchard (2002 and 2012), G. Da Prato (1996), G. F. Dell'Antonio (1993, 2003 and 2013), M. Demuth (2011), D. Dürr (2011), V. Enss (2008), J. E. Fenstad (2005), M. Fukushima (1992 and 2012), F. Gesztesy (2012), L. Gross (2010), F. Guerra (2012), H. Heyer (2016), H. Holden (2016), D. Holm (2017), L. Streit (1998 and 2008), B. Tirozzi (2015).

## Research Projects and Activities

Directorial board of research centers: BiBoS (Bielefeld), CERFIM (Locarno, CH), IZKS (Bonn)  
 Over 20 DFG projects in Bonn (since 1998); SFB 1903 and SFB 611; various DFG Priority Programmes

INTAS project (EU, Leader)

Volkswagenstiftung 5 years project (BiBoS)

Cooperation project with former Soviet Union (with H. Föllmer)

EU Research Training Network

DAAD projects

SNF projects (Switzerland)

CIFAR project (Canada)

Host of over 30 Alexander von Humboldt Fellows, currently: 1 A. v. H. Research fellow; 1 A. v. H. Research Award winner

Organizer of over 70 international conferences, symposia, workshops, summer schools, in particular: Oberwolfach workshops (Stochastics, Nonstandard Analysis, Dirichlet Forms), CIRM (Marseille) and CIRM (Trento)

Preparatory committee and member of DFG Cluster of Excellence "Hausdorff Center of Mathematics" (since its inception)

Member of the scientific board of various research institutes (Czech Republic, Germany, Italy, Portugal, Sweden, Switzerland, UK)

Chair of plenary lecture at ICM, Beijing

Director (with A. B. Cruzeiro and D. Holm) of the research semester on "Geometric Mechanics, Variational and Stochastic Methods" at Centre Interfacultaire Bernoulli, EPFL (CH), 2015

Various research evaluation committees (e.g., CIVR, Roma; Mathematisches Forschungsinstitut, Oberwolfach; ERC Synergy, Bruxelles)

## Research profile

I have worked in many areas of mathematics and its applications. Among the areas of mathematics are probability theory (stochastic processes, SPDE), analysis (infinite dimensional-, non-standard-, p-adic), mathematical physics (statistical mechanics, quantum mechanics, quantum fields, quantum computation), differential geometry, topology, noncommutative geometry, spectral theory, dynamical systems, number theory, representation theory, algebra, statistics. I have also worked with applications in biology, earth sciences, information science, economics and insurance, engineering, physics, social sciences including urban systems, and epistemology.

Among the main goals have been and are the development of new methods for infinite dimensional analysis, in particular the theory of mathematical Feynman path integrals and other infinite dimensional integrals, and the theory of Dirichlet forms and associated processes with

their relations with S(P)Des. In this line one can also see my involvement with methods of non-standard analysis and, in another direction, representation theory of (infinite dimensional) groups and algebras. The applications in the study of models in quantum mechanics, quantum field theory (relativistic, gauge fields, quantum gravity) and hydrodynamics have lead to the development of a study of singular phenomena in partial differential equations (including the development of point interaction models and the study of universal low energy phenomena in multiparticle systems like the Efimov effect) and in dynamical systems (e.g. quantization-like phenomena in astrophysics).

My work on algebra, number theory and geometry can also be seen in a broad perspective, as part of an attempt to develop a unified picture of discrete/continuous aspects of structures, towards a better understanding of mathematical and natural phenomena.

In the years to come I intend to pursue these studies, having in mind mathematics in its great unity and building bridges between different areas of investigation. I am also interested in applications, particularly in the areas of physics and astrophysics, biology, medicine, economics, and philosophy.

Among the worldwide most cited mathematicians (Science Watch, ISI, 2002). Nearly 850 publications in scientific journals, author of 11 research monographs and 32 books of proceedings. In addition, several publications with cultural/philosophical content.

### Editorships

Editorial board of 20 journals/book series, currently

- Adv. Math. Phys.
- Akademie Verlag
- Analysis, Geometry and Number Theory
- Arabian J. Math.
- Atti del Sem. Mat. e Fisico, Univ. Modena e Reggio Emilia
- Cognitive Processing
- Encyclopedia of Mathematical Physics (Elsevier)
- Encyclopedia of Mathematics (Springer)
- Expositiones Mathematicae (honor. member)
- P-Adic Numbers, Ultrametric Analysis, and Applications
- Rep. Math. Phys.
- Random Operators and Stochastic Equations
- Scholarpedia

**Research Area G** Major developments included: quantum statistical mechanics on lattices, phase transitions; nonequilibrium statistical mechanics; asymptotics of probabilistic path integrals with applications in neurobiology; probabilistic methods for 3D Navier-Stokes; blow up phenomena in hyperbolic systems; study of SPDEs with non Lipschitz coefficients; probabilistic construction of quantum fields; stochastic processes and pseudodifferential operators on discrete metric spaces; spectral theory.

New research plans in this direction include: study of stochastic partial differential equations, in particular with singular or strongly growing coefficients and with general noise, (especially small noise/small time, large time, invariant measures, semiclassical type expansions), with applications in neurobiology and physics; infinite dimensional probabilistic and oscillatory-type integrals, especially in the case of a generate phase function, with applications in classical and quantum physics, as well as economics; representation theory of infinite dimensional groups (stochastic analytic and functional analytic methods); study of symmetries and singularities in SPDEs, with applications in quantum field theory, hydrodynamics and complex systems; studies in spectral theory, random matrices and operator algebras; problems in stochastic geometric mechanics (especially at the intersection of classical/quantum systems); stochastic processes on singular structures (thin networks, p-adic structures, random media); heat-semigroups, trace formulae and number theory; problems at the cut-edge of analysis and probability (moment problems, Dirichlet forms, stochastic analysis and pseudodifferential operators in finite and infinite dimensions); ergodic theory in relation with structure theory of singular measures, fractal sets and systems of statistical mechanics.

## Supervised theses

Diplom theses: 110

PhD theses: 36

## Selected PhD students

Werner Kirsch (1981, Bochum): “Über Spektren stochastischer Schrödingeroperatoren”,  
now Professor, Fernuniversität Hagen (University of Hagen)

Michael Röckner (1984, Bielefeld): “A Dirichlet Problem for Distributions and the Construction  
of Specifications for Gaussian Generalized Random Fields”,  
now Professor, University of Bielefeld

Astrid Hilbert (1989, Bochum): “Stochastic Perturbations of Hamiltonian Systems”,  
now Assoc. Professor, Linnaeus University, Sweden

Sylvie Paycha (1990, Bonn/Paris VI): “Probability measures in infinite dimensional manifolds  
and Polyakov strings”,  
now Professor, University of Potsdam

Koichiro Iwata (1990): “On Linear Maps Preserving Markov Properties and Applications to Mul-  
ticomponent Generalized Random Fields”,  
now Professor, Hiroshima University, Japan

J. Schäfer (1993, Bochum): “Generalized random fields on manifolds and Markov properties”,  
now Professor, Frankfurt Univ. Appl. Sci.

Haio Röckle (1994, Bochum): “Infinite-dimensional Gaussian processes and applications”,  
now Professor, Hochschule Ludwigshafen

Claas Becker (1996, Bochum): “Reflection positivity for quantum vector fields”,  
now Professor, Frankfurt Univ. Appl. Sci.

Hanno Gottschalk (1999): “Green’s Functions for Scattering in Local, Relativistic Quantum Field  
Theory”,  
now Professor, University of Wuppertal

Sonia Mazzucchi (2004, Trento): “Feynman path integrals”,  
now Assistant Professor, University of Trento, Italy

Eva Lütkebohmert (2004): “Finite dimensional realizations for Heath, Jarrow and Morton type  
forward rate models with jumps and an asymptotic expansion for the Black-Scholes model with  
generalized volatility”,  
now Professor, University of Freiburg

Frederik Herzberg (2005): “Path-Dependent Utility Functions and Nonstandard Analysis”,  
now Junior Professor, University of Bielefeld

Luca di Persio (2006, Bonn/Trento): “Asymptotic expansion of integrals: statistical mechanics  
and quantum theory”,  
now Assist. Prof., University of Verona, Italy

Kai Wallbaum (2006), “Option pricing and hedging in a model with interacting assets”,  
now MD of Allianz Global Investitions (München/Frankfurt)

Paolo Giordano (2009), “Fermat reals: nilpotent infinitesimals and infinite dimensional spaces”,  
now Research Leadership, University of Vienna, Austria

## Habilitations

Over 20 Habilitations

## Selected publications

- [1] S. Albeverio, B. Rüdiger, and P. Sundar. The enskog process. *J. Stat. Phys.*, 167(1):90–122, 2017.
- [2] Sergio Albeverio, Luca Di Persio, Elisa Mastrogiacomo, and Boubaker Smii. Invariant measures for sdes driven by l’evy noise: a case study for dissipative nonlinear drift in infinite dimension. *Commun. Math. Sci.*, 15(4):957–983, 2017.
- [3] Sergio Albeverio, Yuri Kondratiev, Roman Nikiforov, and Grygoriy Torbin. On new fractal phenomena connected with infinite linear ifs. *Math. Nachr.*, 290(8-9):1163–1176, 2017.
- [4] S. Albeverio and S. Mazzucchi. A unified approach to infinite-dimensional integration. *Rev. Math. Phys.*, 28(2):1650005, 43, 2016.

- [5] Sergio Albeverio, Luca Di Persio, Elisa Mastrogiacomo, and Boubaker Smii. A class of Lévy driven sdes and their explicit invariant measures. *Potential Anal.*, 45(2):229–259, 2016.
- [6] Sergio Albeverio and Ambar N. Sengupta. Complex phase space and weyl's commutation relations. *Expo. Math.*, 34(3):249–286, 2016.
- [7] S. Albeverio, B. K. Driver, M. Gordina, and A. M. Vershik. Equivalence of the brownian and energy representations. *Zap. Nauchn. Sem. S.-Peterburg. Otdel. Mat. Inst. Steklov. (POMI)*, 441(Veroyatnost i Statistika. 22):17–44, 2015.
- [8] S. Albeverio, U. A. Rozikov, and I. A. Sattarov. p-adic (2,1)-rational dynamical systems. *J. Math. Anal. Appl.*, 398(2):553–566, 2013.
- [9] Sergio Albeverio and Claudio Cacciapuoti. The riemann zeta in terms of the dilogarithm. *J. Number Theory*, 133(1):242–277, 2013.
- [10] Sergio Albeverio, Aleksey Kostenko, Mark Malamud, and Hagen Neidhardt. Spherical schrödinger operators with  $\delta$ -type interactions. *J. Math. Phys.*, 54(5):052103, 24, 2013.