Don Bernard Zagier

Academic career

1969	Diploma of Advanced Mathematics, Oxford University, England, UK
1971	D.Phil., Oxford University, England, UK
1971 - 1984	Scientific Member, DFG Collaborative Research Center SFB 72 “Approximation”, University of Bonn
1975	Habilitation, University of Bonn
1979 - 1990	Chair Professor of Number Theory, University of Maryland, College Park, MD, USA
1990 - 2001	Professor, University of Utrecht, Netherlands
1990 - 1991	Professor, Kyushu University, Fukuoka, Japan
1992 - 1993	Professor, Kyushu University, Fukuoka, Japan
2000 - 2014	Professor, Collège de France, Paris, France
Since 1976	APL Professor, University of Bonn
Since 1984	Scientific Member, Max Planck Institute for Mathematics, Bonn
Since 1995	Director, Max Planck Institute for Mathematics, Bonn
Since 2014	Distinguished Staff Associate, International Centre for Theoretical Physics, Trieste, Italy

Honours

1984	Carus Prize, Schweinfurt
1987	Frank Nelson Cole Prize in Number Theory
1996	Prix Elie Cartan, Académie des Sciences
2000	Chauvenet Prize of the Mathematical Association of America
2001	Karl Georg Christian von Staudt Prize
2017	Member of the U.S. National Academy of Sciences (NAS)

Research profile

Modular forms, which are my main area of research, can be seen as part of both the theory of automorphic forms and of moduli spaces (Research Area DE), but are also of great importance in many parts of quantum field theory and string theory (Area C). My research in the last years has touched all these aspects, two examples being my work with Dabolkar and Murthy on applications of ”mock modular forms” (as developed by my then student Zwegers, myself and others) to the string theory of black holes and my recent work with Möller on applications of the theory of modular and quasimodular forms to Teichmüller curves and to moduli spaces of flat surfaces. With Garoufalidis I have also been studying the arithmetic of quantum invariants of knots: we proved some cases of the conjectured ”quantum modularity” properties of Kashaev invariants that I had discoved experimently ten years ago and, in joint work with Frank Calegari, found a construction of algebraic units from classes in algebraic K-theory having as an unexpected consequence a proof of Nahm’s conjecture relating modularity to algebraic K-theory.
Recently I have become interested in the arithmetic and topology of differential equations (the subject of the ”Hirzebruch Lecture” that I gave at the ECM 2016). Together with Vasily Golyshev, with whom I have already published one paper on the subject (proving the so-called ”Gamma Conjecture” for all rank one Fano 3-folds) and others (in particular Masha Vlasenko and Spencer Bloch), I am studying the relation of ”motivic gamma functions” (a kind of Mellin transform of solutions of Picard-Fuchs differential equations) and Hirzebruch-like characteristic classes of algebraic varieties. In other directions, I am studying together with Lin Weng the

properties of the ”higher rank zeta functions” of curves over finite fields that he defined some years ago (in particular, we proved the Riemann hypothesis for the genus one case and are working on the general case), and am also working with T. Ibukiyama to extend our theory of ”higher spherical polynomials” to a theory of higher spherical functions. Finally, in collaboration with Martin Möller and others (recently Di Yang and Boris Dubrovin), we are extending our earlier work on combinatorial aspects of moduli spaces (Hurwitz numbers, graph counting, generalizations of the Bloch-Okounkov theorem, ...).

Editorships

- Journal of Number Theory (since 1981)
- Selecta Mathematica (since 1994)
- The Ramanujan Journal (since 1994)
- Kyushu Journal (since 1998)
- Ergebnisse der Mathematik und ihrer Grenzgebiete (since 1998)

Supervised theses

PhD theses: 23, currently 2

Selected PhD students

Georgia Triantafillou (1977): “Equivariant rational homotopy theory”,
now Professor, Temple University, PA, USA
Winfried Kohnen (1980): “Modular forms of alf-integral weight”,
now Professor, University of Heidelberg
Robert Sczech (1982): “Summation of L-series”,
now Associate Professor, Rutgers University, NJ, USA
Svetlana Katok (1983): “Modular forms and closed geodesics”,
now Professor, Pennsylvania State University, PA, USA
Nils-Peter Skoruppa (1984): “Jacobi and modular forms of half-integral weight”,
now Professor, University of Siegen
Maxim Kontsevich (1991): “KdV hierarchy and moduli spaces”,
now Permanent Professor, Institut des Hautes Études Scientifiques (IHÉS), France
Herbert Gangl (1994): “Functional equations of polylogarithms”,
now 1H Course Director, Reader, Durham University, England, UK
Sander Zwegers (2002): “Mock theta functions”,
now Professor (tenure), University of Cologne
Anton Mellit (2008): “Higher Green’s functions for modular forms”,
now Postdoc, International School for Advanced Studies (SISSA), and Consultant, International Centre for Theoretical Physics (ICTP), Italy
Maryna Viazovska (2013): “Modular Functions and Special Cycles”,
now Postdoc, Berlin Mathematical School, HU Berlin
Danylo Radchenko (2016): “Higher cross-ratios and geometric functional equations for polylogarithm”,
now Postdoctoral Fellow, International Centre for Theoretical Physics (ICTP), Trieste, Italy
Federico Zerbini (2017): “Elliptic multiple zeta values, modular graph functions and genus 1 superstring scattering amplitudes”,
now at Institut de Physique Théorique, CEA Saclay, France

Selected publications

[1] Dawei Chen, Martin Moeller, and Don Zagier. Quasimodularity and large genus limits of siegel-veech constants. *eprint arXiv:1606.04065*, page 107 pages, 2016.

[2] V. V. Golyshev and D. Zagir. Proof of the gamma conjecture for fano 3-folds with a picard lattice of rank one. *Izv. Ross. Akad. Nauk Ser. Mat.*, 80(1):27–54, 2016.

[3] Atish Dabholkar, Sameer Murthy, and Don Zagier. Quantum black holes, wall crossing, and mock modular forms. *eprint arXiv:1208.4074, to appear in Cambridge Monographs in Mathematical Physics*, page 151 pages, 2012.

[4] D. Zagier. Evaluation of the multiple zeta values ζ(2,ldots,2,3,2,ldots,2). *Ann. of Math. (2)*, 175(2):977–1000, 2012.
[5] Don Zagier. Ramanujan's mock theta functions and their applications (after zwegers and ono-bringmann). *Ast'erisque*, (326):Exp. No. 986, vii–viii, 143–164 (2010), 2009. S'eminaire Bourbaki. Vol. 2007/2008.
[6] J. Lewis and D. Zagier. Period functions for maass wave forms. i. *Ann. of Math. (2)*, 153(1):191–258, 2001.
[7] Benedict H. Gross and Don B. Zagier. Heegner points and derivatives of l-series. *Invent. Math.*, 84(2):225–320, 1986.
[8] J. Harer and D. Zagier. The euler characteristic of the moduli space of curves. *Invent. Math.*, 85(3):457–485, 1986.
[9] Martin Eichler and Don Zagier. *The theory of Jacobi forms*, volume 55 of *Progress in Mathematics*. Birkhäuser Boston, Inc., Boston, MA, 1985.
[10] F. Hirzebruch and D. Zagier. Intersection numbers of curves on hilbert modular surfaces and modular forms of nebentypus. *Invent. Math.*, 36:57–113, 1976.