

CURRICULUM VITAE of Giuseppe Molteni

Personal information

Address: Dipartimento di Matematica, Università di Milano,
Via Saldini 50, I-20133 Milano (Italy)

Phone number: (+39) 02 503 16127

e-mail: giuseppe.molteni1@unimi.it

Date and place of Birth: June 16, 1969, Como (Italy).

Education and degrees

Università di Milano

Degree: in Physics (110/110 with honor), 1993

Subject: continued fractions

Degree: Ph.D. in Mathematics, 1998

Subject: L -functions

Supervisor: Alberto Perelli

Post-doctoral positions

2000–2001 Research fellow at the University of Genova,

2001–2002 grant from Istituto Nazionale di Alta Matematica for a position as Research fellow at the University of Genova.

Academic position

2015–Present: Associate Professor in Mathematical Analysis, *Università di Milano*.

2001–2014: Assistant Professor in Mathematical Analysis, *Università di Milano*.

September 2009–June 2010: Member of the School of Mathematics, *Institute for Advanced Study* (IAS) in Princeton (USA).

Teaching activities

2001–2013 lecturer of the course *Matematica* (Calculus) for the degree in Chemistry.

2003–2013 lecturer of the course *Istituzioni di Matematiche* (Calculus) for the degree in Pharmacology.

2004–2008 lecturer of the course *Analisi 3* (Mathematical Analysis) for the degree in Physics.

2008–2009 lecturer of the course *Analisi 4* (Mathematical Analysis) for the degree in Physics.

2010–2011 and 2013–2017 lecturer of the course *Analytic Number theory* for the degree in Mathematics (International Algant degree).

2012–2013 lecturer of the course *Number theory* for the degree in Mathematics (International Algant degree).

2013–2014 teaching assistant for courses *Analisi 3* and *Analisi reale* for the degree in Mathematics.

2014–2017 teaching assistant for the course *Analisi 3* for the degree in Mathematics.

2015–2018 lecturer of the course *Analisi 2* (Mathematical Analysis) for the degree in Physics.

2017–2018 lecturer of the course *Analisi 3* (Mathematical Analysis) for the degree in Mathematics.

2017–2018 lecturer of the course *Advanced Analytic Number theory* for the degree in Mathematics (International Algant degree).

Congresses and visiting positions

- CIME school: *Arithmetical theory of Elliptic Curves*, Cetraro, July 12 – 19, 1997.
- Congress: *Approssimazione diofantea e teoria analitica dei numeri*, Pisa June 28 – July 9, 1999 (invited speaker).
- Congress: *Theory of Riemann zeta and allied functions*, Oberwolfach September 16 – 22, 2001 (invited speaker).
- CIME school: *Analytic number theory*, Cetraro, July 10 – 19, 2002.
- Congress: *II convegno italiano di Teoria dei Numeri*, Parma, November 14 – 16, 2003 (invited speaker).
- Workshop: *Matrix ensembles and L-functions*, at Newton Institute, Cambridge, July 12 – 16, 2004 (invited speaker).
- Joint meeting SMF-UMI *Mathematics and its applications, Special Session: “Number Theory”*, Turin, July 3 – 7, 2006 (invited speaker).
- Congress: *European Conference on Iteration Theory* (ECIT 2006) Gargnano, September 10 – 16, 2006.
- Workshop: *Analytic Number Theory*, Parma, May 15 – 16, 2008 (invited speaker).
- Congress: *Advances In Number Theory And Geometry* Verbania (Italy), April 19 – 24, 2009.
- Workshop: *Analytic Number Theory*, Roma, May 27 – 29, 2009 (invited speaker).
- Visiting: Member of the School of Mathematics, *Institute for Advanced Study* (IAS) in Princeton (USA), September 2009–June 2010 (invited).
- Congress: *The Analytic Theory of Automorphic Forms*, Oberwolfach August 28 – September 3, 2011.
- Congress: *Unione Matematica Italiana*, Bologna September 12 – 17, 2011 (invited speaker).
- Congress: *Unione Matematica Italiana*, Siena September 7 – 12, 2015 (invited speaker).

- Congress: 3^o *Incontro Italiano TdN* (3rd Italian Congress in Analytic Number Theory), Pisa September 21 – 24, 2015 (invited speaker).
- Visiting: Korean Institute for Advanced Studies, Seoul, November, 2015 (invited).
- Congress: *Number theory Day*, Tourin November 4, 2016 (invited speaker).
- Workshop: *Working group on Sarnak rigidity conjecture*, Bristol, January 16–20, 2017 (invited).
- Congress: *Number Theory Week 2017*, Poznań, 4–8 Settembre 2017.
- Congress: *2nd Number Theory Meeting*, Tourin October 26–27, 2017 (invited speaker).
- Congress: *INDAM Number Theory Days*, Genoa December 18–19, 2017 (invited speaker).
- *Joint meeting UMI–SIMAI–PTM*, Wrocław September 17–20, 2018 (invited speaker).

Activities connected to mathematical reviews

- reviewer for AMS Mathematical Reviews (2000–2017),
- referee for the journals: *Acta Arithmetica*, *Acta Applicandæ Mathematicæ*, *American Mathematical Monthly*, *Bulletin of the Polish Academy of Sciences*, *Colloquium Mathematicum*, *Expositiones Mathematicæ*, *Functiones et Approximatio*, *Integers*, *International Journal of Mathematics and Mathematical Sciences*, *International Mathematics Research Notices*, *Journal of Integer Sequences*, *Journal of Number Theory*, *Linear Algebra and its Applications*, *Mathematics of Computation*, *Monatshefte für Mathematik*, *Open Mathematics*, *Proceedings of the Steklov Mathematical Institute*.
- Project evaluator for the Superior Council of the National Fund for Scientific and Technological Development (FONDECYT) of Chile (2011, 2014).

Research interests

My general interests are in the area of the analytic number theory, with a special focus on Selberg's class [2, 3, 4, 6, 10, 14, 17, 21, 22, 23, 24, 25] and automorphic functions [7, 15, 19], transcendence problems [5, 18], exponential sums [26, 30], and combinatorics [27, 31].

Recently, in collaboration with Loïc Grenié I have proposed a new method to recover completely explicit versions of theorems estimating several quantities related to the cardinality of sets of the prime numbers and of prime ideals with bounded norms [33, 34, 37, 39, ?, 44] and the cardinality of the zeros of the Dedekind zeta function in compact intervals [32], under GRH. The new bounds greatly improve the previously known results, and allowed us to improve significantly the present implementations of the Buchmann's algorithm for the computation of the basic invariants (class number and regulator) for algebraic number fields [34]. The new algorithm has been implemented into the PARIgp software.

With Adrian Dudek and Loïc Grenié I have proved some explicit versions of theorems giving primes in short intervals under RH [36] and we are working on an extension of these results for primes in linear progressions [42]. With Alberto Perelli and Loïc Grenié I have produced a new and very compact proof of the classical Cramér's result on prime numbers in small intervals [38]. I am also interested into other branches of Number Theory [8, 12, 13] and in applications

of Number Theory: [1] (continued fractions are used as mathematical tool for the study of the stationary configuration in a laser), [16] (diophantine approximations characterizing the existence of a second bifurcating branch in a dynamic system of type Fermi–Pasta–Ulam), [28, 29] (spectrum of matrices appearing in some Digital Filter design), and special functions [20, 35].

Publications

- [1] G. Molteni, F Prati, and L. Zucchetti. Rotating patterns in class-b lasers with cylindrical symmetry. *Physical Review A*, 51(5): 4093–4108, 1995.
- [2] J. Kaczorowski, G. Molteni, and A. Perelli. Linear independence in the Selberg class. *C. R. Math. Acad. Sci. Soc. R. Can.*, 21(1): 28–32, 1999.
- [3] G. Molteni. A note on a result of Bochner and Conrey-Ghosh about the Selberg class. *Arch. Math. (Basel)*, 72(3): 219–222, 1999.
- [4] G. Molteni. Existence of a non-entire twist for a class of L -functions. *Acta Arith.*, 93(1): 53–65, 2000.
- [5] G. Molteni. Some arithmetical properties of the generating power series for the sequence $\{\zeta(2k+1)\}_{k=1}^{\infty}$. *Acta Math. Hungar.*, 90(1-2): 133–140, 2001.
- [6] G. Molteni. On the algebraic independence in the Selberg class. *Arch. Math. (Basel)*, 79(6): 432–438, 2002.
- [7] G. Molteni. Upper and lower bounds at $s = 1$ for certain Dirichlet series with Euler product. *Duke Math. J.*, 111(1): 133–158, 2002.
- [8] G. Molteni. About two trigonometric matrices. *Linear Algebra Appl.*, 382: 39–59, 2004.
- [9] G. Molteni. Counting sets with exceptions. *Math. Inequal. Appl.*, 7(2): 161–164, 2004.
- [10] G. Molteni. General linear independence of a class of multiplicative functions. *Arch. Math. (Basel)*, 83(1): 27–40, 2004.
- [11] G. Molteni. Limits of integrals involving almost periodic functions. *Result. Math.*, 46(3–4): 361–366, 2004.
- [12] G. Molteni. Two trigonometric matrices. *Riv. Mat. Univ. Parma*, 7: 261–273, 2004.
- [13] G. Molteni. About a question of Kannappan and Zhang. *Result. Math.*, 47(1–2):130–131, 2005.
- [14] J. Kaczorowski, G. Molteni, and A. Perelli. Linear independence of L -functions. *Forum Math.*, 18: 1–7, 2006.
- [15] J. Kaczorowski, G. Molteni, A. Perelli, J. Steuding, and J. Wolfart. Hecke theory and the Selberg class. *Funct. Approx. Comment. Math.*, 35: 183–193, 2006.
- [16] G. Molteni, E. Serra, M. Tarallo, and S. Terracini. Asymptotic resonance, interaction of modes and subharmonic bifurcation. *Arch. Ration. Mech. Anal.*, 182(1): 77–123, 2006.

- [17] J. Kaczorowski, G. Molteni, and A. Perelli. Some remarks on the unique factorization in certain semigroups of classical L -functions. *Funct. Approx. Comment. Math.*, 37(2): 263–275, 2007.
- [18] G. Molteni. The behavior of $\sum_{n=1}^{\infty} \zeta^{\lfloor n\theta \rfloor} / n$ for particular values of θ . *Acta Math. Hungar.*, 117(1-2): 61–76, 2007.
- [19] G. Molteni and J. Steuding. (Almost) primitivity of Hecke L -functions. *Monatsh. Math.*, 152: 63–71, 2007.
- [20] G. Molteni. An explicit bound for the error term of the development at $s = 1$ of a set of lacunary series. *Math. Inequal. Appl.*, 11(1): 173–188, 2008.
- [21] J. Kaczorowski, G. Molteni, and A. Perelli. Unique factorization results for semigroups of L -functions. *Math. Ann.*, 341(3): 517–527, 2008.
- [22] G. Molteni. Factorization in the extended Selberg class of L -functions associated with holomorphic modular forms. *Math. Nachr.*, 282(2): 232–242, 2009.
- [23] J. Kaczorowski, G. Molteni, and A. Perelli. A Converse Theorem For Dirichlet L -Functions. *Comment. Math. Helv.*, 85(2): 463–483, 2010.
- [24] G. Molteni. Multiplicity results for the functional equation of the Dirichlet L -functions. *Acta Arith.*, 145(1): 43–70, 2010.
- [25] G. Molteni. Multiplicity results for the functional equation of the Dirichlet L -functions: case $p = 2$. *Acta Arith.*, 145(1): 71–81, 2010.
- [26] G. Molteni. Cancellation in a short exponential sum. *J. Number Theory*, 130(9): 2011–2027, 2010.
- [27] G. Molteni. Representation of a 2-power as sum of k 2-powers: the asymptotic behavior. *Int. J. Number Theory*, 8(8): 1923–1963, 2012.
- [28] Z. Lin, Y. Liu, G. Molteni, D. Zhang. Spectral properties for a new composition of a matrix and a complex representation. *Electron. J. Linear Algebra*, 23: 530–539, 2012.
- [29] Y. Liu, Z. Lin, G. Molteni, D. Zhang. Eigenvalues and equivalent transformation of a trigonometric matrix associated with filter design. *Linear Algebra Appl.* 437(12): 2961–2972, 2012.
- [30] J. Kaczorowski, G. Molteni. Extremal values for the sum $\sum_{r=1}^{\tau} e(a2^r/q)$. *J. Number Theory*, 132(11): 2595–2603, 2012.
- [31] A. Giorgilli, G. Molteni. Representation of a 2-power as sum of k 2-powers: a recursive formula. *J. Number Theory*, 133(4): 1251–1261, 2013.
- [32] L. Grenié, G. Molteni. Zeros of Dedekind zeta functions under GRH. *Math. Comp.*, 85(299): 1503–1522, 2016. Electronically published on October 8, 2015.
- [33] L. Grenié, G. Molteni. Explicit versions of the prime ideal theorem for Dedekind zeta functions under GRH. *Math. Comp.*, 85(298): 889–906, 2016. Electronically published on October 6, 2015.

- [34] L. Grenié, G. Molteni, Explicit smoothed prime ideals theorems under GRH, *Math. Comp.*, 85(300): 1875-1899, 2016. Electronically published on October 6, 2015.
- [35] L. Grenié, G. Molteni, Inequalities for the Beta function, *Math. Inequal. Appl.*, 18(4): 1427-1442, 2015.
- [36] A. Dudek, L. Grenié, G. Molteni, Primes in explicit short intervals on RH, *Int. J. Number Theory*, 12(5): 1391-1407, 2016. Electronically published on October 14, 2015.
- [37] G. Molteni, Recent results about the prime ideal theorem, *Boll. Unione Mat. Ital.*, 10(1): 19–28, 2017. Electronically published on May 31, 2016.
- [38] L. Grenié, G. Molteni, A. Perelli, Primes and prime ideals in short intervals, *Mathematika*, 6(2): 364-371, 2017. Electronically published on February 9, 2017.
- [39] L. Grenié, G. Molteni, Explicit versions of the prime ideal theorem for Dedekind zeta functions under GRH, II, *Funct. Approx. Comment. Math.*, 57(1): 21–38, 2017. Electronically published on May 5, 2017.
- [40] L. Grenié, G. Molteni, Explicit bounds for generators of the class group, *Math. Comp.*, 87(313): 2483–2511, 2018. Electronically published on November 16, 2017.
- [41] S. Bettin, J. W. Bober, A. R. Booker, B. Conrey, M. Lee, G. Molteni, T. Oliver, D. J. Platt, R. S. Steiner, A conjectural extension of Hecke’s converse theorem, *Ramanujan J.*, 47(3): 659–684, 2018. Electronically published on November 10, 2017.
- [42] A. Dudek, L. Grenié, G. Molteni, Explicit short intervals for primes in arithmetic progressions on GRH, arXiv:1606.08616, <http://arxiv.org/abs/1606.08616>, to appear in *Int. J. Number Theory*, 2019.
- [43] S. Bettin, G. Molteni, C. Sanna, Small values of signed harmonic sums, *C. R. Math. Acad. Sci. Paris*, 365(11-12): 1062–1074, 2018.
- [44] L. Grenié, G. Molteni, An effective Chebotarev density theorem under GRH, *J. Number Theory*, 200: 441–485, 2019. Electronically published on January 22, 2019.

Works submitted to a review

- [wr1] L. Grenié, G. Molteni, *An improvement to an algorithm of Belabas, Diaz y Diaz and Friedman*, preprint arXiv:1507.00602, <http://arxiv.org/abs/1507.00602>
- [wr2] S. Bettin, G. Molteni, C. Sanna *Greedy approximations by signed harmonic sums and the Thue–Morse sequence*, preprint arXiv:1805.00075, <http://arxiv.org/abs/1805.00075>.

Milan, March 20, 2019.