

# DANIEL CRISTOFARO-GARDINER

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## Department Address:

Mathematics Department, McHenry Hall, Santa Cruz, CA 95064

## RESEARCH INTERESTS:

Contact and symplectic geometry; connections with topology, dynamics, and combinatorics

## EMPLOYMENT:

von Neumann Fellow, Institute for Advanced Study, 2019 - 2020  
Assistant Professor, Mathematics Department, University of California, Santa Cruz, 2016 - present  
National Science Foundation Postdoctoral Fellow, 2014 - 2017  
Benjamin Peirce Fellow, Harvard, 2014 - 2016  
Member, Institute for Advanced Study, 2013 - 2014

## EDUCATION:

Ph.D, University of California, Berkeley, 2013  
A.B., Harvard University, 2007

## PUBLICATIONS AND PREPRINTS:

Peer-reviewed research articles:

1. *The absolute gradings on embedded contact homology and Seiberg-Witten Floer cohomology*, Alg. and Geom. Topol. 13 (2013) 2239-2260.
2. *Symplectic embeddings into four-dimensional concave toric domains* [with K. Choi, D. Frenkel, M. Hutchings, and V. Ramos], J. Topol. 7 (2014), 1054-1076.
3. *The asymptotics of ECH capacities* [with M. Hutchings and V. Ramos], Invent. Math. 199.1 (2015), 187-214.
4. *From one Reeb orbit to two* [with M. Hutchings], J. Diff. Geom. 102 (2016), 25 - 36.
5. *Symplectic embeddings of four-dimensional ellipsoids into integral polydiscs* [with D. Frenkel and F. Schlenk], Alg. and Geom. Top. 17 (2017), 1189-1260.
6. *Symplectic embeddings of products* [with R. Hind], Comm. Math. Helv., 93 (2018), 1-32.
7. *The ghost stairs stabilize to sharp symplectic embedding obstructions* [with R. Hind and D. McDuff], J. Topol. 11 (2018), 309-378.
8. *Irrational triangles with polynomial Ehrhart functions* [with T. Li and R. Stanley], Disc. and Comp. Geo. 61(2):227-246 (2019).
9. *Symplectic embeddings from concave toric domains into convex ones*, J. Diff. Geom. 112 (2019), 199-232.
10. *Torsion contact forms in three-dimensions have two or infinitely many Reeb orbits* [with M. Hutchings and D. Pomerleano], Geom. Top., to appear
11. *The action spectrum characterizes closed contact 3-manifolds all of whose Reeb orbits are closed* [with M. Mazzucchelli], to appear in Comm. Math. Helv.

Preprints:

12. *Ehrhart polynomials and symplectic embeddings of ellipsoids* [with A. Kleinman], preprint, arXiv:1307.5493.
13. *Subleading asymptotics of ECH capacities* [with N. Savale], arXiv:1811.00485.
14. *Infinite staircases and rational four-dimensional ellipsoids*, near-final draft available at [dancg.sites.ucsc.edu/research](http://dancg.sites.ucsc.edu/research)
15. *Generic higher asymptotics of holomorphic curves and applications* [with M. Hutchings and B. Zhang], draft available at [dancg.sites.ucsc.edu/research](http://dancg.sites.ucsc.edu/research)
16. *Higher symplectic capacities and the stabilized ellipsoid into polydisc problem* [with K. Seigel], final version at [dancg.sites.ucsc.edu/research](http://dancg.sites.ucsc.edu/research), not intended for publication

Other articles:

17. *“The Berkeley Summer Research Program for Undergraduates”*: One model for an undergraduate summer research program at a doctorate-granting university [article on education], Directions for Mathematics Research Experience for Undergraduates, p. 73 - 98, World Scientific, editors: M. Peterson and Y. Rubinstein.
18. *“Volume in Seiberg-Witten theory and the existence of two Reeb orbits”*, Mathematisches Forschungsinstitut Oberwolfach, No. 34, 2015, 1968-1969.
19. *“The spectral recognition of rank one contact forms on closed three-manifolds”*, Mathematisches Forschungsinstitut Oberwolfach, to appear.

#### **GRANTS:**

1. “Holomorphic curves in embeddings and dynamics”, NSF-DMS #1711976, \$145,000
2. NSF Postdoctoral Research Fellowship, NSF-DMS #1402200, \$150,000
3. IAS “Summer Collaborators” Grant, 2017 (with T. Holm, A. Mandini, A. Pires)

#### **HONORS:**

FSMP (Fondation Sciences Mathématiques de Paris) Distinguished Professor Fellowship (2017)

National Science Foundation Postdoctoral Fellow (2014)

Phi Beta Kappa (2007)

Harvard University Certificate of Distinction in Teaching (2005, 2006, 2007)

#### **SERVICE:**

Workshops organized:

1. “Dusa McDuff ‘Master Lecture’: Embedding Questions in Symplectic Topology”, Sanya, China, 2017
2. “Quantitative symplectic geometry”, Simons Center, 2017
3. “Ehrhart theory and its applications”, Spring Eastern Sectional Meeting, AMS
4. “Summer school on moduli problems in symplectic geometry”, IHÉS, 2015
5. “UC Berkeley Geometry, Topology, and Operator Algebras RTG Summer Research Program 2012”, UC Berkeley, 2012
6. “UC Berkeley Geometry, Topology, and Operator Algebras RTG Summer Research Program 2013”, UC Berkeley, 2013

Postdocs supervised:

1. Andrew Lee, 2017 - 2019, now a tenure-track assistant professor at St. Thomas Aquinas College

Undergraduates supervised:

1. Sandra Nair, undergraduate reading/research student, UC Santa Cruz, 2019
2. Evan Forletta, undergraduate thesis student, UC Santa Cruz, 2019
3. Wenxue Zheng, undergraduate thesis student, UC Santa Cruz, 2018
4. Handong Park, undergraduate thesis student (co-advised), Harvard, 2018
5. Tara Aida, undergraduate thesis student, Harvard, 2016
6. Duligur Ibeling, undergraduate thesis student, Harvard, 2015
7. Greg Parker, summer research, HCRP, Harvard, 2015

Editorial work:

Associate editor for the "Virtual Book Series on Symplectic Geometry"

Departmental service:

1. Undergraduate research award committee, UC Santa Cruz, 2018
2. Graduate admissions committee, UC Santa Cruz, 2018-19
3. Co-organizer, Pseudoholomorphic curve learning seminar, UC Santa Cruz, 2018
4. Co-organizer, Symplectic geometry seminar, UC Santa Cruz, 2017-2018
5. Derived geometry and Floer theory learning seminar, Harvard, 2016-2017
6. Co-organizer, Gauge theory and symplectic geometry seminar, Harvard, 2015 - 2017
7. Undergraduate math colloquium organizer, Harvard, 2015
8. Qualifying exam committee, Harvard, 2015

**TALKS:**

Invited Lecture Series:

1. TBA, Beijing, 2019
2. "Embedded contact homology and its applications", Paris, 2018
3. "Symplectic embedding problems", Strasbourg, 2017
4. "Symplectic embedding problems", Madrid, 2015

Department Colloquia:

1. "'Length and volume in four-dimensional symplectic geometry", Dartmouth, 2019
1. "'Length and volume in four-dimensional symplectic geometry", Cornell, 2018
2. "Two or infinity", Dartmouth, 2017
3. "Symplectic embeddings and the Fibonacci numbers", Santa Cruz, 2016
4. "Symplectic embeddings and the Fibonacci numbers", UPenn, 2016
5. "Embedded contact homology and its applications", UMass (Boston), 2016

Invited Lectures at Conferences

1. "The spectral recognition of rank one contact forms on three-manifolds", Oberwolfach 2019
2. "The higher dimensional ellipsoid embedding problem", UMichigan, 2019
3. "Subleading asymptotics of ECH capacities", Haifa, 2019
4. "Subleading asymptotics of ECH capacities", Augsburg, 2018
5. "Symplectic embeddings in dimension greater than four", Northeastern, 2018

6. "Beyond the Volume Conjecture", Sanya 2017
7. "Two or infinity", Rio, 2017
8. "Two or infinity", Leiden, 2017
9. "Two or infinity", Houat, 2017
10. "Symplectic embeddings and the Fibonacci numbers", Edinburgh, 2016
11. "Symplectic embeddings and the Fibonacci numbers", Columbia, 2016
12. "Higher dimensional symplectic embeddings and the Fibonacci staircase", Georgia, 2015
13. "Symplectic embeddings of products", IHES, 2015
14. "Symplectic embeddings of four-dimensional toric domains", Princeton, 2015
15. "From one Reeb orbit to two", Oberwolfach, 2015
16. "Volume in Seiberg-Witten theory", Pisa, 2015
17. "Symplectic embeddings of four-dimensional toric domains", Washington, DC, 2015
18. "Symplectic embeddings of concave toric domains into convex ones", Simons Center, 2014.
19. "Involving graduate students in undergraduate research: the UC Berkeley summer research program for undergraduates", Mount Holyoke, 2013

#### Seminar talks:

1. "From one Reeb orbit to two", UC Berkeley, 2012
2. "Asymptotics of embedded contact homology capacities and the existence of two orbits", Northern California Symplectic Geometry Seminar, 2012
3. "Volume in Seiberg-Witten theory and the asymptotics of ECH capacities", Harvard, 2013
4. "Counting lattice points in triangles and the Fibonacci staircase", Bard, 2013
5. "Embedded contact homology and its applications", Bryn Mawr, 2013
6. "Reeb dynamics in dimension 3", IAS, 2013.
7. "Volume in Seiberg-Witten theory and the existence of two Reeb orbits", IAS, 2013
8. "Volume in Seiberg-Witten theory and the existence of two Reeb orbits", Columbia, 2013
9. "Volume in Seiberg-Witten theory and the existence of two Reeb orbits", UMass, 2013
10. "Volume in Seiberg-Witten theory and the existence of two Reeb orbits", MIT, 2014
11. "Length, volume, and the existence of two Reeb orbits", UVA, 2014
12. "Length and volume in Seiberg-Witten theory", Simons Center, 2014
13. "Length, volume, and the existence of two Reeb orbits", Notre Dame, 2014
14. "Counting lattice points in triangles and the Fibonacci staircase", Notre Dame, 2014
15. "Some open questions about Reeb flows in dimension 3", National Taiwan University, 2014
16. "From one Reeb orbit to two", Neuchâtel, 2014
17. "Symplectic embeddings of concave toric domains into convex ones", IAS, 2014
18. "Ehrhart quasi-polynomials and symplectic embeddings", MIT, 2014
19. "From one Reeb orbit to two", UPenn, 2014
20. "From symplectic geometry to combinatorics and back", Notre Dame, 2014
21. "From one Reeb orbit to two", Cal Tech, 2015
22. "Symplectic embeddings and lattice point enumeration", Harvard, 2015
23. "Higher dimensional symplectic embeddings and the Fibonacci staircase", IMPA, 2015
24. "Length and volume on contact three-manifolds", Harvard, 2015
25. "Symplectic embeddings and the Fibonacci numbers," Brown, 2015
26. "Symplectic embeddings and the Fibonacci numbers", Madison, 2015
27. "Symplectic embeddings and the Fibonacci numbers", UPenn, 2015
28. "Symplectic embeddings and the Fibonacci numbers", UC Santa Cruz, 2016
29. "Beyond the Weinstein conjecture", UMaryland, 2016
30. "The combinatorics of symplectic embeddings", Rutgers, 2016

31. "Two or infinity", Harvard, 2017
32. "Two or infinity", UGA, 2017
33. "Symplectic embeddings in dimensions greater than 4", UC Davis, 2017
34. "Beyond the Weinstein conjecture", Tokyo, 2018
35. "Symplectic embeddings in dimensions greater than 4", Cologne, 2018
36. "The spectral recognition of three-dimensional Besse contact forms", Berkeley, 2018.
37. "Subleading asymptotics of ECH capacities", Berkeley, 2019.
38. "Subleading asymptotics of ECH capacities", NCSGS, 2019.
39. "Subleading asymptotics of ECH capacities", UC Santa Cruz, 2019.
40. TBA, Harvard, 2019.
41. TBA, Columbia, 2019.
42. TBA, UC Davis, 2019.

**TEACHING:**

1. Multivariable calculus, UC Berkeley, 2009
2. Multivariable calculus, UC Berkeley, 2010
3. Introduction to research through combinatorial game theory, UC Berkeley, 2010
4. Introduction to research through knot theory, UC Berkeley, 2012
5. Honors linear algebra and real analysis II, Harvard, 2015
6. Topology II: Smooth manifolds, Harvard, 2015
7. Analysis II: Measure, Integration, and Banach Spaces, Harvard, 2015
8. Contact homology, Harvard, 2015
9. Morse theory, UC Santa Cruz, 2017
10. Multivariable calculus, UC Santa Cruz, 2018
11. Systems of ordinary differential equations, UC Santa Cruz, 2018
12. Algebraic topology, UC Santa Cruz, 2018
13. Classical geometry, UC Santa Cruz, 2018
14. History of math, UC Santa Cruz, 2019