

PUBLICATIONS - JOEL HASS

MINIMAL SURFACES AND DIFFERENTIAL GEOMETRY

1. J. Hass, *Minimal surfaces in low dimensional manifolds*, Ph.D. Thesis, UC Berkeley, 1981, (Prof. Robion Kirby, thesis adviser).
2. M. Freedman, J. Hass and G. P. Scott, *Closed geodesics on surfaces*, Bull. London Math. Soc. 14 (1982) 385-391.
3. J. Hass, *The geometry of the slice-ribbon problem*, Proc. Camb. Phil Soc. 94 (1983) 101-108.
4. M. Freedman, J. Hass and G. P. Scott, *Least area incompressible surfaces in 3-manifolds*, Invent. Math. 71 (1983) 609-642.
5. J. Hass, *Complete area minimizing surfaces which are not totally geodesic*, Pacific J. of Math. 111 (1984) 35-38.
6. J. Hass, *Minimal surfaces in Seifert fiber spaces*, Topology and its Applications 18 (1984) 145-151.
7. J. Hass and J. H. Rubinstein, *One-sided closed geodesics on surfaces*, Mich. Math. J. 33 (1986) 155-168.
8. J. Hass, *Minimal surfaces in foliated manifolds*, Comment. Math. Helvetici 61 (1986) 1-32.
9. J. Hass, *Minimal surfaces in manifolds with  $S^1$  actions and the simple loop conjecture for Seifert fiber spaces*, Proc. Amer. Math. Soc. 99 (1987) 383-388.
10. J. Hass, *Surfaces minimizing area in their homology class and group actions on 3-manifolds*, Math. Z. 199, (1988) 501-509.
11. J. Hass and G. P. Scott, *The existence of least area surfaces in 3-manifolds*, Trans. Amer. Math. Soc. 310, (1988) 87-114.
12. J. Hass and C. Frohman, *Compactifying Unstable minimal surfaces and Heegaard Splittings*, Invent. Math. 95, 529-540 (1989)
13. J. Hass, *Singular curves and the Plateau problem*, International J. of Math. 2, (1991) 1-16.
14. J. Hass, *Intersections of least area surfaces*, Pacific J. of Math. 152, (1992) 119-123.
15. J. Hass, J.T. Pitts and J.H. Rubinstein, *Existence of unstable minimal surfaces in manifolds with homology and applications to triply periodic minimal surfaces*, Proc. Symposia in Pure Math. 54 (1992) 147-162.

16. J. Hass, *Metrics on bounded manifolds with convex or concave boundary*, Contemporary Math. 164, (1994) 41-46.
17. J. Hass, *Bounded 3-manifolds admit negatively curved metrics with concave boundary*, J. Differential Geometry 40, (1994) 449-459.
18. J. Hass . M. Hutchings and R. Schlafly, *The double bubble conjecture*, ERA-AMS 1, (1995) 98-102.
19. J. Hass and F. Morgan, *Geodesics and soap bubbles on surfaces*, Math. Z. 223 (1996) 185-196.
20. J. Hass and F. Morgan, *Geodesic nets on the 2-sphere*, Proc. Amer. Math. Soc. 124 (1996) 3843-3850.
21. J. Hass and R. Schlafly, *Bubbles and Double Bubbles*, Amer. Sci. 84, (1996) 462-467.
22. J. Hass and R. Schlafly, *Histoires de bulles et de double bulles*, La Recherche 303, (1997) 4247.
23. C. Adams, J. Hass and G. P. Scott, *Simple closed geodesics in hyperbolic 3-manifolds*, Bull. London Math. Soc. 31, (1999) 81-86
24. J. Hass and R. Schlafly, *Double Bubbles Minimize*, Annals of Mathematics 151, (2000) 459-515.
25. J. Hass, *General Double Bubble Conjecture in  $R^3$  solved*, MAA FOCUS 20 (2000) 4-5.
26. J. Hass, P. Norbury, and J.H. Rubinstein, *Minimal spheres of arbitrarily high Morse index*, Communications in Analysis and Geometry 11, (2003) 425-439.
27. J. Hass, J. Lagarias and W. Thurston, *Area Inequalities for Embedded Disks Spanning Unknotted Curves*, J. Diff. Geom. 66 (2004), 495-525.
28. J. Hass, *Minimal surfaces and the topology of 3-manifolds*, Global theory of minimal surfaces, Clay Math. Proc., 2, Amer. Math. Soc., Providence, RI, (2005) 705–724.
29. J. Hass, *Selected Mathematical Review: Proof of the double bubble conjecture*, Bull. AMS 48 (2011) 463–465.
30. J. Hass and P. Scott. *Simplicial energy and simplicial harmonic maps*, (to appear in Asian Math. J.)

### 3-MANIFOLDS AND TOPOLOGY

1. J. Hass and J. Hughes, *Immersions of surfaces in 3-manifolds*, Topology 24 (1985) 97-112.

2. J. Hass and G. P. Scott, *Intersections of curves on surfaces*, Israel Math. J. 51 (1985) 90-120.
3. J. Hass, J.H. Rubinstein and G. P. Scott, *Compactifying Covering spaces of 3-manifolds*, Bull. Amer. Math. Soc. 16 (1987) 117-119.
4. J. Hass, J.H. Rubinstein and G. P. Scott, *Compactifying coverings of 3-manifolds*, J. Differential Geometry 30, (1989) 817-832.
5. J. Hass and A. Thompson, *A necessary and sufficient condition for a manifold to have Heegaard genus one*, Proc. Amer. Math. Soc. 107, (1989) 1107-1110.
6. J. Hass, *Genus two Heegaard splittings*, Proc. Amer. Math. Soc. 114, (1992) 565-570.
7. J. Hass and G. P. Scott, *Homotopy equivalence and homeomorphism of 3-manifolds*, Topology 31, (1992) 493-517.
8. J. Hass and G. P. Scott, *Curve flows on surfaces and intersections of curves*, Proc. Symposia in Pure Math. 54, (1992) 415-421.
9. J. Hass and G. P. Scott, *Homotopy and isotopy in non-Haken 3-manifolds*, Comment. Math. Helvetici 68, (1993) 341-364.
10. J. Hass and W. Menasco, *Topologically rigid non-Haken 3-manifolds*, J. Austral. Math. Soc. 55, (1993) 60-71.
11. J. Hass and G. P. Scott, *Shortening curves on surfaces*, Topology 33, (1994) 25-43.
12. J. Hass, *Acylindrical surfaces in 3-manifolds*, Michigan Math. J. 42 (1995) 357-365.
13. J. Hass and A. Thompson, *Neon bulbs and the unknotting of arcs in manifolds*, J. Knot Theory and its Ramifications 6 (1997) 235-242.
14. J. Hass, H. Rubinstein and S. Wang, *Boundary-slopes of immersed surfaces in 3-manifolds*, J. Differential Geometry 52 (1999) 303-325.
15. J. Hass and G. P. Scott, *Configurations of curves on surfaces*, Proc. of the KirbyFest, Geometry and Topology Monographs, Volume 2, J. Hass and M. Scharlemann Ed., (1999) 201-213.
16. J. Hass, S. Wang and Q. Zhou, *On finiteness of the number of boundary slopes of immersed surfaces in 3-manifolds*, Proc. Amer. Math. Soc. 130 (2002), 1851-1857.
17. J. Hass and A. Thompson, *Is it knotted?* in Mathematical Adventures for Students and Amateurs, Mathematical Association of America.
18. J. Hass and T. Nowik, *Invariants of knot diagrams*, Math. Ann. 342 (2008) 125–137.

19. J. Hass, J.H. Rubinstein and A. Thompson, *Knots and  $k$ -width*, *Geometriae Dedicata*, 143, (2009) 7–18.
20. J. Hass, A. Thompson and W.P. Thurston, *Stabilization of Heegaard splittings*, *Geometry & Topology* 13 (2009) 2029–2050. arXiv:0802.2145.
21. J. Hass and T. Nowik, *Unknot Diagrams Requiring a Quadratic Number of Reidemeister Moves to Untangle*, *Discrete & Computational Geometry*: 44 (2010), 91-95.
22. J. Hass, *What is an Almost Normal Surface*, *Proceedings of Geometry and Topology Down Under: The Rubinstein birthday conference*. *Contemporary Mathematics* 597 (2013), 1-14.
23. A. Coward and J.Hass, *Topological and physical knot theory are distinct*, (to appear in *Pacific Math. J.*)

#### COMPUTATIONAL COMPLEXITY

1. J. Hass, J. Lagarias and N. Pippenger, *The computational complexity of knot and link problems*, preliminary report, *Proc. 38th Annual Symp. on Foundations of Comp. Sci.*, (1997) 172-181.
2. J. Hass, *Algorithms for knots and 3-manifolds*, *Chaos, Solitons and Fractals* 9, (1998) 569-581.
3. J. Hass, J. Lagarias and N. Pippenger, *The computational complexity of knot and link problems*, *Journal of the ACM*, 46, (1999) 185-211.
4. J. Hass and J. Lagarias, *The number of Reidemeister moves needed for unknotting*, *J. Amer. Math. Soc.* 14 (2001), no. 2, 399-428.
5. I Agol, J. Hass and W. P. Thurston, *3-manifold knot genus is NP-complete*, 761-766, *STOC 2002*.
6. J. Hass, J.Snoeyink and W.P. Thurston, *The size of spanning disks for polygonal knots*, *Discrete and Computational Geometry* 29 (2003) 1-17.
7. J. Hass and J. C. Lagarias, *The minimal number of triangles needed to span a polygon embedded in  $R^d$* , *Discrete and computational geometry*, 509-526, *Algorithms Combin.*, 25, Springer, Berlin, 2003.
8. I Agol, J. Hass and W. P. Thurston, *The Computational Complexity of Knot Genus and Spanning Area*, *Trans. A.M.S* 358, (2005) 3821-3850.
9. J. Hass and G. Kuperberg, *The Complexity of Recognizing the 3-Sphere*, *Oberwolfach Reports*, Volume 9, Issue 2, 2012, *Triangulations*, Gert-Martin Greuel (ed.), *Oberwolfach Reports*, EMS Publishing House, Zurich, Switzerland, (2012), Non-refereed extended abstract 1425-26.

## GEOMETRIC DESIGN

1. X. Song, T. Sederberg, J. Zheng, R. Farouki and J. Hass, *Linear perturbation methods for topologically consistent representations of free-form surface intersections*, Comput. Aided Geom. Design 21 (2004), no. 3, 303-319.
2. R. Farouki, C. Y. Han, J. Hass, and T. W. Sederberg), *Topologically consistent trimmed surface approximations based on triangular patches*, Computer Aided Geometric Design 21, (2004) 459-478.
3. J.Hass, R. Farouki C. Y. Han, X. Song and T. W. Sederberg, *Guaranteed consistency of surface intersections and trimmed surfaces using a coupled topology resolution and domain decomposition scheme*, Advances in Computational Mathematics, 27 (2007), 1–26.
4. J. Hass and R. Farouki, *Evaluating the boundary and covering degree of planar Minkowski sums?and other geometrical convolutions*, Journal of Computational and Applied Mathematics 209, (2007) 246-266.
5. R. Farouki, C. Y. Han and J. Hass, *Boundary evaluation algorithms for Minkowski combinations of complex sets using topological analysis of implicit curves*, Numer. Algorithms 40 (2005), 251-283.

## GEOMETRICAL BIOLOGY

1. P. Francis-Lyon, S. Gu, J. Hass, N Amenta and P. Koehl, *Sampling the conformation of protein surface residues for flexible protein docking*, BMC Bioinform 11 (2010) 575–588.
2. S. Gu, P. Koehl, J. Hass and N. Amenta, *Surface-histogram: A new shape descriptor for protein-protein docking*, Proteins: Structure, Function, and Bioinformatics 80, (2012), 221–238.
3. Alex Tsui, Devin Fenton, Phong Vuong, Joel Hass, Patrice Koehl, Nina Amenta, David Coeurjolly, Charles DeCarli, and Owen Carmichael, *Globally Optimal Cortical Surface Matching With Exact Landmark Correspondence*, Proceedings Information Processing in Medical Imaging, IPMI 2013, 487-498, 2013.
4. P. Koehl and J. Hass, *Automatic alignment of genus-zero surfaces*, IEEE Transactions on Pattern Analysis and Machine Intelligence, 36, (2014) 466-478.