

## 7590 Heegaard Floer Theory: Bibliography and further reading

### Introductory lectures on Heegaard Floer theory

- P. Ozsváth & Z. Szabó, *An introduction to Heegaard Floer homology and Lectures on Floer homology*, from *Floer Homology, Gauge Theory, and Low Dimensional Topology* published by Clay Math Institute. (Both of these sets of lecture notes can be downloaded from Ozsváth's web page. The second one is more advanced – it includes a description of the maps induced by cobordisms, and a proof of the Dehn surgery characterization of the unknot.)
- Z. Szabó, *Lecture notes on Heegaard Floer homology*, notes from Park City 2006, to appear in Park City Mathematics Series. A very nice set of introductory notes!
- P. Ozsváth & Z. Szabó, *Heegaard diagrams and holomorphic disks*, arXiv:math/0403029. Another nice expository article.

### More detail on Heegaard Floer theory

- P. Ozsváth & Z. Szabó, *Holomorphic disks and topological invariants for closed three-manifolds*, arXiv:math/0101206. This paper and the next define Heegaard Floer invariants of 3-manifolds and establish their basic properties.
- P. Ozsváth & Z. Szabó, *Holomorphic disks and three-manifold invariants: properties and applications*, arXiv:math/0105202.
- P. Ozsváth & Z. Szabó, *Holomorphic triangles and invariants for smooth four-manifolds*, arXiv:math/0110169. Defines and studies maps due to 4-dim cobordisms, also defines absolute grading, and an invariant of closed 4-manifolds which is conjectured to equal the Seiberg-Witten invariant.
- P. Ozsváth & Z. Szabó, *Absolutely graded Floer homologies and intersection forms for four-manifolds with boundary*, arXiv:math/0110170. Defines correction term invariants using the absolute grading. Proves Froyshov-type generalization of Donaldson's diagonalisation theorem.
- P. Ozsváth & Z. Szabó, *Knots with unknotting number one and Heegaard Floer homology*, arXiv:math/0401426. Uses correction terms of double branched cover to give an obstruction to unknotting number one.
- P. Ozsváth & Z. Szabó, *Holomorphic disks and knot invariants*, arXiv:math/0209056. Definition and basic properties of knot Floer homology.
- J. Rasmussen, *Floer homology and knot complements*, arXiv:math/0306378. Another source of the definition of knot Floer homology.
- P. Ozsváth & Z. Szabó, *Knot Floer homology and the four-ball genus*, arXiv:math/0301149. Defines and studies the concordance invariant  $\tau(K)$ .

- P. Ozsváth & Z. Szabó, *Knot Floer homology and integer surgeries*, arXiv:math/0410300. Describes how to compute Heegaard Floer invariants of surgery on a knot from knot Floer homology.

### Background reading

- Gompf & Stipsicz, *4-manifolds and Kirby calculus*. Graduate Studies in Mathematics, 20. American Mathematical Society. An excellent textbook on handle decompositions of manifolds, with lots of basic background material on low-dimensional topology.
- Milnor, *Morse theory* and *Lectures on the h-cobordism theorem*. Princeton University Press. These two books include a nice detailed account of classical Morse theory and handle decompositions.
- McDuff & Salamon, *Introduction to symplectic topology*. Oxford Mathematical Monographs. Very useful textbook (compatible almost-complex structures, Grassmannian of Lagrangians, Maslov index and much more).
- Fukaya, *Floer homology,  $A_\infty$ -categories and topological field theory*. Geometry and physics (Aarhus, 1995), 9–32, Lecture Notes in Pure and Appl. Math., 184, Dekker, New York, 1997. Includes a nice description of the Witten complex and Morse homology, including the product structure and its analogue in Lagrangian intersection Floer theory.
- Betz, Martin; Cohen, Ralph L. *Graph moduli spaces and cohomology operations*. Turkish J. Math. 18 (1994), no. 1, 23–41. Another interesting paper on Morse homology and related constructions.
- Austin, D. M.; Braam, P. J. *Morse-Bott theory and equivariant cohomology*. The Floer memorial volume, 123–183, Progr. Math., 133, Birkhauser, Basel, 1995. Section 2 gives a nice self-contained account of Morse homology, including a proof that it is a manifold invariant. Some of the main technical proofs required are given in an appendix.
- Floer, Andreas, *Morse theory for Lagrangian intersections*. J. Differential Geom. 28 (1988), no. 3, 513–547. The original source for Lagrangian intersection Floer homology.
- Atiyah, Michael. *New invariants of 3- and 4-dimensional manifolds*. The mathematical heritage of Hermann Weyl (Durham, NC, 1987), 285–299, Proc. Sympos. Pure Math., 48, Amer. Math. Soc., Providence, RI, 1988. A fascinating expository paper; includes a conjecture known as the Atiyah-Floer conjecture relating certain Floer homology invariants of 3-manifolds. This conjecture is analogous to the more recent conjectured equivalence between Heegaard Floer theory and Seiberg-Witten theory.
- Donaldson, S. K., *Floer homology groups in Yang-Mills theory*. Cambridge Tracts in Mathematics, 147. An excellent textbook describing instanton Floer homology of 3-manifolds (Floer’s original 3-manifold invariant.) Good reading

for anyone who wants to master analytic technicalities of any flavour of Floer homology.