Introduction to Research Interests and Projects

Biji Wong
Max Planck Institute for Mathematics

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Research Interests

**Areas I’m interested in include:** 3-manifolds, 4-manifolds, knots and links in 3-manifolds, surfaces in 4-manifolds, and 3-orbifolds.

**Tools I use include:** the various versions of Floer theory (Heegaard Floer, bordered Floer, knot Floer, etc) and Khovanov homology.
In current work with Marco Marengon, we study the $d$-invariants of double branched covers of links that arise from certain plumbing trees, and relate it to information about the links (specifically their signatures).

$d$-invariants are rational numbers that are defined for rational homology 3-spheres (equipped with spinc-structures), using Heegaard-Floer theory.

The links associated to these plumbing trees have double branched covers that are L-spaces.

**Conjecture:** If $L$ is any link in $S^3$ with $\Sigma_2(L)$ an L-space, then $d(\Sigma_2(L), \mathcal{S}) = -\frac{1}{4}\sigma(L, \omega_5)$. 
Satellite knots

In a joint project with Ina Petkova (2020), we used bordered Heegaard Floer theory to study certain topological properties of twisted Mazur pattern satellite knots $P_n(K)$:

- Heegaard Floer thickness,
- 3-genus,
- fiberedness, and
- whether $P_n(K)$ admits cosmetic surgeries.

**Future work:** Use bordered Floer theory to understand when these and other satellite knots bound properly embedded disks in punctured 4-manifolds.