Dates: January - July 2024

MSC classification: 53D - symplectic geometry

First off, I'd like to note the utterly unamusing fact that the mailing of my books and notes was returned to sender by MPIM - despite the administration assuring me upon arrival that they'd make sure it would be received. Thus most of the research projects that I had planned - in particular submitting a number of papers after quick corrections from handwritten notes - were impossible. The only solace is that, after 3 months of fearing invaluable research notes and out-of-print books lost forever, the package did eventually arrive back at UC Berkeley.

I thus decided to focus on a single project - resolving the last remaining roadblock in the construction of the symplectic $(A_\infty,2)$-category, as proposed by my collaborator Nate Bottman. And this is what we in fact managed to do. Below is the abstract from our first talk in which we announced the result.

From works of Weinstein and Ma'u-Wehrheim-Woodward we know to expect a higher categorical structure comprising all (geometrically bounded) symplectic manifolds as objects, all Lagrangian relations as morphisms, Floer chains as 2-morphisms, and structure maps arising from moduli spaces of pseudoholomorphic quilts. In particular, this structure is expected to contain all Fukaya A_∞ categories, and all geometric functors between them.

We are in the process of constructing this symplectic $(A_\infty,2)$-category from the following three building blocks:

- a Gromov-compactification of moduli spaces of pseudoholomorphic quilts including strip-shrinking – in particular a family of quilts called "witch balls" that appear as bubbles;
- a combinatorial structure called "2-associahedra" built from witch balls, which gives rise to the algebraic notion of an $(A_\infty,2)$-category;
- a functional analytic description of the adiabatic limit involved in strip-shrinking, which provides smooth finite dimensional local charts for the moduli spaces of quilts.

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