RESEARCH STATEMENT

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Broadly speaking I work in geometry-topology, with much of my work exploring interrelations of algebraic topology with differential geometry, and in particular symplectic geometry via Floer, Gromov-Witten theory, Fukaya categories, Hofer geometry and in part dynamical systems.

My recent research is along four distinct lines.

(1) In symplectic geometry I have been working on developing the global Fukaya category. Here the basic object is a symplectic manifold (M, ω), ω a closed non-degenerate differential 2-form. And this has a fascinating infinite dimensional transformation group of Hamiltonian symplectomorphisms $Ham(M, \omega)$, with a natural bi-invariant Finsler norm called the Hofer metric. One culmination of my program is the proof, [2], of one sense of a conjecture of Teleman on existence of natural "continuous" action of the group of Hamiltonian symplectomorphisms $Ham(M, \omega)$ on the Fukaya category of (M, ω). In particular this leads to new invariants of smooth manifolds, new Chern-Gauss-Weil type curvature bounds for singular connections, and other applications, [3].

(2) Also in symplectic geometry I am working on development of the theory of locally conformally symplectic or *lcs* manifolds, which suitably generalize both symplectic and contact manifolds. The idea is to use tools like (pseudo)-holomorphic curves, to find "rigidity phenomena" in *lcs* geometry analogous to, for example, the Gromov non-squeezing theorem, and the Weinstein "conjecture" in symplectic/contact geometry. Here my main contribution is toward developing the statement and partial verification of an analogue of the Weinstein conjecture dubbed "conformal symplectic Weinstein conjecture", [7]. This has an intriguing connection with the theory of elliptic curves of complex algebraic geometry, see also [1]. I have also studied the non-squeezing problem in *lcs* geometry in [5].

(3) At the intersection of algebraic topology with differential geometry, I have introduced and developed the notion of a "smooth simplicial set", which in particular leads to a solution of a long-standing problem of the construction of the universal Chern Weil homomorphism for Frechet Lie groups (under the condition the group have the homotopy type of CW complex), [6].

(4) Finally, I have been fascinated for many years by some problems in logic. I have learned the subject in large part by email correspondence with the philosopher-logician Peter Koellner [1]. My contribution here has been the first generalization of the (crucially) second incompleteness theorem of Gödel to stably computably enumerable formal systems, strictly generalizing the classical setting of computably enumerable formal systems, [4].

[1]Whose kindness has been astonishing.

References

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[4] Y. Savelyev, *Incompleteness for stably computable formal systems*, arXiv:2208.04752, http://yashamon.github.io/web2/papers/stableincompleteness.pdf.
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