Habilitation Thesis "Topology of compact symplectic manifolds" by Hông Vân Lê

Reviewed by Jan Slovak, Masaryk University, Brno, August 3, 2009

The work represents a collection of six papers by Hông Vân Lê and a few collaborators. They all represent an advanced approach to research in geometry and geometric topology, based on very elaborate and demanding theories in fairly active areas of differential geometry.

A half of them have been worked out together with the most prominent collaborator, Kaoru Ono, and they are devoted to fundamental questions and invariants related to the topological properties of symplectomorphisms, in particular the number of their fixed points. This research is related to famous Arnold's conjecture and the approach combines very advanced and recent techniques developed by the leaders in the area of symplectic topology. Notably, generalizations of Floer homology theory, Novikov homology, Gromov-Witten invariants etc, are exploited to formulate and prove new results.

The first paper of the collection, "Symplectic fixed points, the Calabi invariant and Novikov homology", published in Topology in 1995, has attracted quite a lot attention (10 citations registered at Math Reviews, without self-citations) and was further exploited by other authors later. For example, in the paper [Stelling, Luisa D, Fixed points of non-Hamiltonian symplectomorphisms, J. Geom. Anal. 11 (2001), no. 4, 693—716], some of proofs of lemmas and certain details are referenced to this paper. Another very qualified citation to the second paper in the collection, "Cup-length estimates for symplectic fixed points, published also together with K. Ono, is in the paper [Schwarz, Matthias, A quantum cup-length estimate for symplectic fixed points. Invent. Math. 133 (1998), no. 2, 353--397], which generalizes some of the results in the original paper. The third paper is quite recent.

The first paper of the other half of the collection is devoted to the study of various structures on symplectic manifolds, while the remaining two are devoted to realizations of homology classes through fundamental of submanifolds.

The submitted thesis proves that the author is a widely educated and ambitious mathematician, ready to touch the hot items of the current research in symplectic geometry and topology. The thesis itself does not reveal what was the author's input in the co-authored works, but the entire collection provides enough evidence that scientific originality, width and depth of the research of Hông Vân Lê has reached the level of an associated professor years ago.

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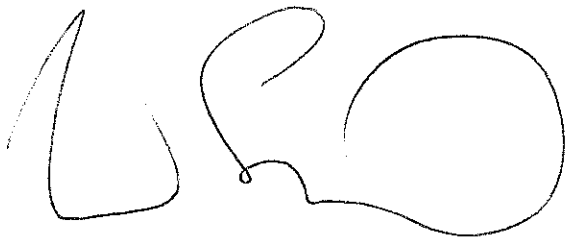
I conclude that the conditions on the scientific quality and extent of the research by Hông Vân Lê required for the habilitation have been fulfilled and I recommend awarding the appropriate title from this point of view.



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