# Calculating the stable homology of families of configuration spaces and other moduli spaces

Series of talks at IMAR ∥ Martin Palmer-Anghel ∥ 2019[*]

**Abstract for the series:**

This will be a mostly expository series of talks on the stable homology of moduli spaces, in a variety of different contexts. There are many interesting situations where one has a sequence of moduli spaces of some kind, indexed by the natural numbers (for example: configuration spaces of $n$ points in a manifold, moduli spaces of surfaces of genus $g$, moduli spaces of branched coverings with $n$ branch-points, etc). One very successful 2-step strategy for understanding the homology of such sequences of moduli spaces is

(1) to prove that the homology of the sequence *stabilises*, and then
(2) to calculate the direct limit of the homology of the sequence.

Often, this direct limit (the *stable homology*) is approachable with the tools of algebraic topology, whereas the homology of the individual moduli spaces is intractable, except in some exceptional or low-degree cases. Together, these two steps compute the homology of the moduli spaces in the *stable range*, i.e. the range of degrees in which homological stability from part (1) holds. As the title suggests, these talks will focus on part (2) of this strategy, i.e. *calculating the stable homology*.

The contexts that I plan to discuss (in varying levels of detail) during the series include:

(a) Unordered configuration spaces on manifolds.
(b) Oriented configuration spaces (with a detour into the *group-completion theorem*).
(c) Mapping class groups of orientable or non-orientable surfaces.
(d) Diffeomorphism groups of higher-dimensional analogues of orientable surfaces.
(e) Automorphism groups of free groups (including for homology with twisted coefficients).
(f) Configuration-mapping spaces, including moduli spaces of branched coverings of the 2 disc.
(g) Moduli spaces of manifolds with conical singularities.
(h) Thompson groups and Jónsson-Tarski algebras.

**Schedule:**

I. **Friday 22 March 2019** (at the topology seminar of IMAR)
This talk focused mainly on points (a) and (b) in the list above. — [abstract]
II. **Friday 26 April 2019** (at the GeMAT seminar, IMAR)
This talk also focused mainly on points (a) and (b) in the list above, including more details of the *group-completion theorem*. — [abstract]
III. **Friday 31 May 2019** (at the GeMAT seminar, IMAR)
This talk focused on point (c) in the list above, describing connections between mapping class groups of surfaces, moduli spaces of Riemann surfaces and related objects. — [abstract]
IV. **Thursday 12 September 2019** (at the GeMAT seminar, IMAR)
Continuing on from the previous talk, this talk will outline the ideas of a proof of the *Madsen-Weiss theorem* (following Galatius-Randal-Williams). — [abstract]
V. **tbc**

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[*]Last updated: 11 September 2019.