ITGP SCIENTIFIC REPORT SHORT VISIT

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This is the scientific report for my visit to Imperial College in October 2012. The purpose of the visit was two-fold: to finish a joint preprint with Michael Thaddeus (Columbia University, on sabbatical leave at Imperial College) and to develop a strategic approach on several long-term joint research projects.

The resulting preprint is entitled *Variations on a Theme of Grothendieck*, authors: J. Martens and M. Thaddeus, 27 pages. It is posted on the arXiv as preprint arXiv:1210.8161, and is submitted for publications. ITGP and ESF are acknowledged in the preprint. The abstract, describing the main results, is:

Grothendieck and Harder proved that every principal bundle over the projective line with split reductive structure group (and trivial over the generic point) can be reduced to a maximal torus. Furthermore, this reduction is unique modulo automorphisms and the Weyl group. In a series of six variations on this theme, we prove corresponding results for principal bundles over the following schemes and stacks: (1) a line modulo the group of nth roots of unity; (2) a football, that is, an orbifold of genus zero with two marked points; (3) a gerbe over a football whose structure group is the nth roots of unity; (4) a line modulo an action of a split torus; (5) a chain of lines meeting in nodes; and (6) a chain modulo an action of a split torus. We also prove that the automorphism groups of such bundles are smooth, affine, and connected.

Besides the work on this preprint several other long-term research project were discussed, in particular the development of a modular compactification of the universal moduli space of bundles on curves. This is a long-term project building on several past joint results, but which will still require significant progress on several technical points. We discussed a number of these, e.g. the need for developing a Vinberg type monoid for loop groups, giving a canonical degeneration for the loop group of any simply connected simple group. Such a Vinberg monoid would be used to give a uniformization for the moduli stack of principal bundles on semi-stable curves, a stable locus of which would provide the desired compactification.