GEAR
Summer 2013 REGS Projects

Project Supervisor	Project Location	Project Title	Project Description	Dates	Number of positions available
Tony Pantev tpantev@math.upenn.edu	University of Pennsylvania	Geometric criteria for regularity of real Higgs bundles	Let G is a real form of a complex semisimple Lie group G^C. Given a smooth complex projective curve X, consider the moduli stack of everywhere regular L-twisted G- Higgs pairs $Higgs_{reg,L}$(G). We can define a Hitchin map, endowing $Higgs_{reg,L}$(G)with a gerbe structure over Hitchin base B_L. In the abelian case, the band is a sheaf of abelian groups over the base B_L. In order to describe it explicitly, a similar approach as the one found in Donagi and Gaitsgory's work should be possible. Namely, there should be a codimension one subset in B_L over which the band admits an easy description determining it over the full base. I propose for this GEAR Summer Reg is to study whether this is indeed the case, and find the exact condition. As for the non abelian case, the band does not determine inertia on the fibers. There is evidence that the fibers may be categories of bitorsors over X, as in spite of inertia not descending, its center and outer automorphisms do; furthermore, the descended sheaves map to the central an outer part of a short exact sequence 0-->ZC-->C-->Aut C-->Out C--> where C is a descended sheaf of centralisers of semisimple elements. Time permitting, we may attack this problem.	July 30-Aug 18, 2013	1
Jean-Marc Schlenker jmschlenker@gmail.com	University of Luxembourg	Regularity of minimal Lagrangian extensions	A quasisymmetric homeomorphism *h* of the circle has a unique quasiconformal minimal Lagrangian extension to the hyperbolic disk, which can be considered as an analog of the Douady-Earle extension. The goal of the project is to explore the regularity properties of this minimal Lagrangian	May 15-July 10, 2013 (approximately)	1

			extension under different regularity assumptions on *h*. It might be necessary to use tools from anti-de Sitter geometry.		
Ser PeowTan mattansp@nus.edu.sg	National University of Singapore	Identities and moments on hyperbolic manifolds	Several identities have been discovered in the last couple of decades for hyperbolic surfaces and manifolds, notably those of Basmajian, McShane, Mirzakhani, Bridgeman and Luo-Tan, some of these have found important application in the study of Teichmüller space. In a recent preprint, Bridgeman and myself interpreted some of these identities in terms of moments of a random variable obtained by considering the time it takes under the geodesic flow for a unit tangent vector o the manifold to hit the boundary. In particular, this puts the Basmajian and Bridgeman identities into a common framework and also gave the average hitting time on a hyperbolic surface with boundary. The Luo-Tan identities differed from the others in that they were obtained for closed surfaces and it would be intriguing to investigate if there was an analogous moment generating function in this case. This project explores this, and also other possibilities of generalizing the Bridgeman-Tan framework to other identities. The Luo-Tan and Bridgeman-Tan preprints are available on the Arxivs.	July 1 - 31, 2013	1
Francis Bonahon fbonahon@math.usc.edu	University of Southern California	Representations of the quantum Teichmüller space of a punctured surface	The quantum Teichmüller space for a surface S is a quantization of the space of homomorphisms from the fundamental group of S to the Lie group SL(2,C). A quantized homomorphism is a representation of the quantum Teichmüller space. Physicists usually consider representations valued in a Hilbert space, but mathematicians often prefer finite dimensional vector spaces. One type of such representations is called a local representation. The goal of the GEAR REGS project is to determine the decomposition into irreducible components of these local representations of quantum Teichmuller space.	Aug 15-Sept 15, 2013	1