REPORT

Algebraic Analysis and Geometry with a view on Higgs bundles and *D*-modules

by **André Oliveira***, **Carlos Florentino*** and **Teresa Monteiro Fernandes*****

The international conference on *Algebraic Analysis and Geometry with a view on Higgs bundles and D-modules* took place last June, from 3 to 7, at the Mathematics Department of the Sciences Faculty of the University of Porto.

It was organized by Carlos Florentino (FCUL, CMAFcIO), Teresa Monteiro Fernandes (FCUL, CMAFcIO), André Oliveira (CMUP, UTAD) and Luca Prelli (University of Padova, Italy), with the support of *Fundação para a Ciência e Tecnologia* (FCT), *Centro de Matemática da Universidade do Porto* (CMUP), *Centro de Matemática, Aplicações Fundamentais e Investigação Operacional* (CMAFcIO), *Dipartimento Matemática Università di Padova* (UniPD) and the *Centro Internacional de Matemática* (CIM).

Higgs bundles and *D*-modules are two extremely successful theories, touching an impressive wide variety of mathematical subjects (such as Algebraic and Differential Geometry and Topology or Partial Differential Equations), and which have substantial intersections and interactions. Thus, the main purpose of the conference was to bring together some of the world's leading researchers on both topics to further enhance their interactions and, of course, present their recent work on these topics.

In the particular case of Portugal, there are two main research hubs in these two topics, mostly located and in Lisbon (FCUL) and in Porto (FCUP). Despite the presence of researchers in Portugal in these two topics, the interaction between them has been residual, so this conference was certainly a first step towards a *scientific approach* between these two groups.

The conference consisted of a total 19 talks, of one hour each. The schedule was made in such a way that, on every day, there were basically the same number of talks focused on each of the two main subjects. There was also free time for participants to discuss and freely interact about their research.

The invited speakers came from many different origins: USA, Japan, Italy, France, Spain, Austria, Germany and, of course, Portugal. Here is their list, together with the corresponding talk title:

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** **FCUL [**caflorentino@fc.ul.pt**]**
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D. Alfaya	Automorphism group of the moduli space of parabolic vector bundles
P. Boalch	Stokes decompositions and wild monodromy
A. Castaño Domínguez	Hypergeometric irregular mixed Hodge modules
A. D'Agnolo	Enhanced nearby and vanishing cycles
O. Dumitrescu	Interplay between Higgs bundles and opers
L. Fiorot	Relative regular Riemann-Hilbert correspondence
E. Franco	Torsion line bundles and branes on the Hitchin system
O. García-Prada	Prehomogeneous vector spaces and Higgs bundles
P. Gothen	Examples of higher Teichmüller components via G-Higgs bundles
T. Hausel	Very stable Higgs bundles, the nilpotent cone and mirror symmetry
L. Migliorini	Supports of the Hitchin fibration on the reduced locus
T. Mochizuki	Kobayashi-Hitchin correspondences for monopoles with periodicity
T. Pantev	Shifted symplectic structures on moduli of local systems
T. Reichelt	Hodge theory of GKZ systems
C. Sabbah	Good lattices of algebraic connections
P. Schapira	Towards a functorial filtration on holonomic D-modules
C. Simpson	Higher direct images of parabolic Higgs bundles and Hecke correspondences
K. Takeuchi	Exponential factors and Fourier transforms of D-modules
J.-B. Teyssier	Higher dimensional wild character varieties

There was no registration fee to participants of the event, but there was also no possibility of providing funding to help participants attend the conference. Even so, there were in total around 40 mathematicians attending, coming from many different countries. Among them, there were around 10 PhD students.

The web address of the conference website is https://cmup.fc.up.pt/aga-porto-2019, where more information can be found.