Final Report for CDC Support

Title of the school :

Combinatorics meets Algebra, Geometry, and Optimization - ECCO 2018

Dates : June 5-16, 2018

Location : Barranquilla, Colombia

I. Summary

General presentation of the event with an emphasis on achievement of goals.

This is a report of the CIMPA research school "Combinatorics meets Algebra, Geometry, and Optimization - ECCO 2018" held during June 5-16, 2018 at Universidad del Norte in Barranquilla, Colombia. The school featured mini-courses by four international experts, collaborative problem sessions, research talks and posters by students, open problems presentations, mentoring sessions, and several social activities.

The school had 154 participants coming from Colombia, neighboring countries, USA, Canada and Europe. Among these, 27 participants were financially supported for travel and accommodation expenses, and received afternoon meals at the University cafeteria during the active days of the school. Breakfast was also included at the hotel. The distribution of financially

supported participants by country is as follows:

Colombia: 15

Mexico: 4

Argentina: 3

Cuba: 2

Brasil: 1

Uruguay: 1

Venezuela: 1

The organization and development of the school was very smooth. By now, the series of ECCO

summer schools has gained a great international visibility, and is highly recognized as an enthusiastic inclusive event which strongly focuses on a fruitful and enjoyable interaction between participants regardless of their career stage. Two blog posts by participants of ECCO describing their experience during the school can be found at:

https://blogs.ams.org/mathmentoringnetwork/2018/06/22/mathematics-combinatorics-the-colom

bian-way-ecco-2018/

http://thecaligarmo.com/blogs/math/2018/07/02/ecco-2018/

The summer school had a great impact on local research. One important point to highlight is that three of the organizers/scientific committee members have been hired as permanent professors at local universities in Colombia:

- Rafael Gonzalez. Universidad Sergio Arboleda. Bogotá, Colombia.
- Carolina Benedetti. Universidad de los Andes. Bogotá, Colombia.
- Camilo Sarmiento. Universidad del Norte. Barranquilla, Colombia.

As a result, the representation of the combinatorics community in Colombia is increasing its visibility, and is expanding its connections not only in Colombia but in Latin America and abroad.

As an example, three other organizers/scientific committee members have now tenure-track positions in North America and Europe:

- Laura Escobar, Assistant Professor at Washington University in St. Louis, USA.
- Alejandro Morales, Assistant Professor at UMass Amherst, USA .
- Felipe Rincon, currently a postdoc at U. Oslo and moving for a permanent position at Queens Mary University of London in the UK.

ECCO has also promoted the development of many scientific and political activities:

- New joint seminar of four different universities in Bogota:
"Seminario Sabanero de Combinatoria"
https://sites.google.com/view/ssabenorocombinatoria/p%C3%A1gina-principal
- Creation and development of the "Comunidad Colombiana de Combinatia"
(Combinatorics Colombian Community)
https://sites.google.com/site/carobenedettimath/cococo

The formal foundation and establishment of this community will allow us to apply for funding at the governmental level in Colombia.

- Organization of "Dias de Combinatoria 2019", which will serve as preparation of the next summer school ECCO 2020.

II. Scientific content

Minicourses:

1. **Vic Reiner, University of Minnesota** . Reflection groups and enumeration
2. **Rekha Thomas, University of Washington** . Polynomial optimization
3. **Lauren Williams, University of California Berkeley** . Introduction to total positivity and cluster algebras
4. **Günter Ziegler, Freie Universität Berlin** . Polytopes - Extremal examples and

combinatorial parameters

Computer Software Presentations:

1. **Viviane Pons, Paris-Sud University, Orsay.** SageMath Sessions

Plenary Talks:

1. **Sara Billey, University of Washington** . Patterns in Standard Young Tableaux

2. **Mauricio Velasco, Universidad de los Andes** . The Pythagoras numbers of projective varieties

Contributed Talks:

1. Ayah Almousa, Cornell University. Properties of Binomial Edge Ideals.

2. Christopher Borger, Otto-von-Guericke-Universität Magdeburg. Defectivity of families of full-dimensional point configurations

3. Giulia Codenotti, Freie Universitaet Berlin. On f-vectors and h-vectors of relative simplicial complexes.

4. Steven Collazos, University of Minnesota - Twin Cities. Orbit-Counting in Polyhedra, Fundamental Domains, and Order Cones.

5. Jessica Gatica, Pontificia Universidad Católica de Chile. Pieri rules for Jack polynomials in the superspace.

6. Zachary Hamaker, University of Michigan. Involution words-a survey.

7. Olga Kuznetsova, Aalto University, Finland. Private Information Retrieval from Coded Databases with Colluding Servers.

8. Fernando Martin, Universidad de Buenos Aires. Cohomology of combinatorial species via hyperplane arrangements and Salvetti's complex.

9. Jacob Matherne, University of Massachusetts Amherst. Singular Hodge theory of matroids.

10. Jorge Alberto Olarte, Freie Universität Berlin. The Erdős-Ko-Rado property on pure flag simplicial complexes.

11. Julian David Pulido Castelblanco, Universidad Nacional de Colombia. Geometry of Unipotent Polytopes.

12. Simon Soto, Universidad de los Andes. Uniform Ideals.

13. Azucena Tochimani Tiro, Universidad de Valladolid. Seeking algebraic properties of an edge ideal in the structure of a graph.

14. Amy Wiebe, University of Washington. Slack ideals of polytopes.

Poster, Open Problems, and Panel:

1. A session for poster presentations by participants.

2. Two open problem sessions, where experienced mathematicians shared and motivated open problems with the younger participants.
3. A panel to discuss professional and personal issues, such as choosing an advisor or research problem, applying for jobs, work/life balance, issues of gender and motivation.