Plenary Sessions
Conférences plénières

LOUIGI ADDARIO-BERRY, McGill University
Heights and diameters of random trees and graphs

Fix a finite set S of graphs, and let U be a uniformly random sample from S. We ask the question: what is the statistical behaviour of diam(U), the greatest graph distance between any two vertices in U? Many variants of this question have been asked, including for branching process trees (starting with the work of Kolmogorov 1938) and regular graphs (starting with the work of Bollobás 1982).

Two natural and very general settings for this question are when S has the form

S_1=T is a rooted tree with vertex set V(G)=1,...,n and vertex degrees (d_1,...,d_n) or S_2=G is a graph with vertex set V(G)=1,...,n and vertex degrees (d_1,...,d_n)

We explain how to answer such questions, and to prove tight diameter upper bounds, in both cases. One of the challenges in proving the results for S_2 is that in general we know neither how to approximately enumerate nor to efficiently sample from sets of the form S_2.

Time permitting, I may also discuss diameter lower bounds.

I will also discuss the social and political roles and responsibilities of professional and learned societies.

Based in part on joint works with Serte Donderwinkel, Gabriel Crudele, and Igor Kortchemski.

MONICA VISAN, University of California, Los Angeles (UCLA)
Well-posedness and the method of commuting flows

Completely integrable partial differential equations are regularly used as effective models for a wide array of phenomena seen in nonlinear optics, magnetohydrodynamics, Bose-Einstein condensates, and for both surface and internal waves in fluid mechanics. These equations exhibit a wide range of physical behaviors, most notably the elastic interaction of solitary waves and the soliton resolution phenomenon. While these behaviours were first witnessed in the completely integrable settings, they are robust enough to also be observed in non-integrable analogues.

Because of their significance, much effort has been devoted to the development of a complete well-posedness theory for completely integrable models. This is the question of the existence and uniqueness of solutions, as well as the continuous dependence of the solution on the initial data. Surprisingly, unlike their non-integrable cousins, completely integrable PDE have stubbornly resisted such a complete theory. In this talk I will introduce several completely integrable models, outline why they have proven so recalcitrant, and discuss recent breakthroughs on the well-posedness question that employ the method of commuting flows.