

Algèbre, géométrie et physique : une conférence en l'honneur de Maxim Kontsevitch

The conference Algebra, Geometry and Physics dedicated to 50th Birthday of Maxim KONTSEVICH took place in June 2014 at IHÉS.

The contributions of M. KONTSEVICH to modern mathematics are immense.

In the past few years the fundamental structure of the homological mirror correspondence was enhanced by several major theoretical breakthroughs:

- The development of a non-commutative geometry framework for HMS and the laying of the foundations of the associated Hodge theory;
- The algebraic description of Fukaya and Fukaya-Seidel categories in terms of explicit generators, Lagrangian skeleta, and crossed simplicial groups;
- The advance of local to global methods in symplectic topology: recollement of Fukaya categories and the SYZ mirror symmetry for complements of anticanonical divisors;
- The mathematical theory of tropical quantum corrections, non-archimedean models for mirror categories, and the Gross-Siebert program.

These directions were only recently fleshed out into full edged theories. The completion of this massive foundational work in modern mathematics and physics was no doubt due to powerful leading ideas of M. KONTSEVICH.

The conference Algebra, Geometry and Physics served as a perfect opportunity to celebrate these contributions.

The conference included 25 speakers. We highlight here some of the notable foundational talks.

The talks by Yuri MANIN, Nikita NEKRASOV, Anton KAPUSTIN, Sergei GUKOV and Alain CONNES were dedicated to direct applications to physics.



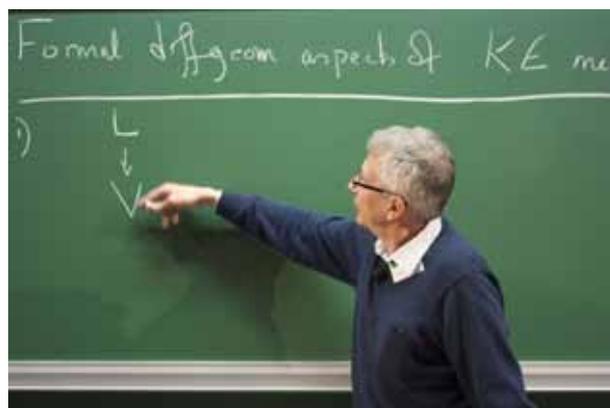
Don ZAGIER

The talks by Don ZAGIER, Yuri TSCHINKEL and Richard THOMAS reveal new developments in enumerative geometry and number theory.

The talks by Mohammed ABOUZAIID, Denis AUROUX, Paul SEIDEL, Mikhail KAPRANOV outlined some recent developments in symplectic geometry.

The talks by Tony PANTEV, Alexander EFIMOV and Bertrand TOËN outlined recent developments in derived algebraic geometry.

The talks by Simon DONALDSON, Shing-Tung YAU and Claire VOISIN highlighted some spectacular achievements in modern Kähler geometry.



Simon DONALDSON

The talks by Anton ZORICH, Carlos SIMPSON and Alexander GONCHAROV were dedicated to direct applications to physics.

The talks by Graeme SEGAL, Thomas WILLWACHER and Kevin COSTELO have outlined some recent developments in TQFT and quantization.

The cutting edge results reported by the speakers require dissemination and this conference gives a perfect opportunity. Proceedings are being prepared. The subject is incredibly active and we expect results and publications to follow directly from the activities and exchanges during the conference. The output of this conference will be aided by a vast network of international collaborators, with whom our relationships have strengthened over the past several years. The conference was a huge success and has attracted more than hundred participants.

Broader Impact

Our project has three components contributing to a broader impact:

1) Dissemination of results and encouragement a wave of young, early career researchers to join these projects. The wide range of topics appearing in modern geometry research necessitates venues for the open exchanges of ideas in order for graduate students and early-career researchers to stay afloat on current topics. The subject has developed extremely rapidly in recent years, and this conference encouraged the engagement of young researchers.

2) This facilitated the interactions between US based researchers and EU mathematical communities. The wide range of topics were present and made it of truly world-wide interest. The selection of speakers allowed for an exchange of ideas between representatives of many mathematical communities, resulting in international collaborations. This was particularly beneficial for participating graduate students. In addition we expect increased interest and participation from early career researchers.

3) The conference has lead to strengthening bonds between mathematics and theoretical physics, and creating a reciprocal exchange of ideas. The early history of mirror symmetry required the mathematical elucidation of new physical ideas. Recent years have seen increased activity in the other direction: physicists drawing inspiration from new ideas in HMS. This conference has greatly enhanced this exchange.

General Outcome

Today in the second decade of the 21st century modern geometry and theoretical physics are more intertwined than ever before. The convergence of ideas from mathematics and physics is accelerating at the same time as elementary particle physics is on the cusp of a profound revolution to be brought about by the new experimental results coming out of the Large Hadron Collider (LHC). These will serve to identify among the multitude of theoretical possibilities currently open, which ones best address quantum field theory at the high energy scale. At the same time, a lot of mathematical work remains to be done to provide a suitable framework for the new physical theories that are being proposed. The geometric objects which we investigate today are the foundations for such a framework.

The new avors of geometry in which categorical structures play a primordial role, will certainly continue to play a fundamental role in 21st century theoretical physics. Developing of these kind of structures was the main outcome of the conference

Denis AUROUX, Ludmil KATZARKOV



Shing-Tung YAU

Organisers would like to thank the Clay Mathematics Institute and FMJH for their support to this conference.



Alexander GONCHAROV

Plus d'informations

