



Periods and Motives Feynman amplitudes in the 21st century

June 30 – July 25, 2014
ICMAT, Madrid, Spain

Summary

The theory of motives originated from Grothendieck's "universal cohomology theory". It is a vibrant area of current research in modern mathematics. One may describe motives as an intermediate step between algebraic varieties and their linear invariants (cohomology). As such the theory of motives provides a conceptual framework for the study of periods.

Feynman amplitudes date back to the early days of perturbative quantum field theory. They are highly intricate integrals over a large number of variables, and appear as coefficients of power expansions. The efficient calculation of Feynman amplitudes is of foremost importance for theoretical predictions in high-energy physics. Thanks to the path-breaking work by Bloch, Connes, Esnault, Goncharov, Kreimer, Marcolli, and others, a beautiful relation between Feynman amplitudes and periods has emerged.

By bringing together leading expositors of the field, the school aims at training a new generation of graduate students and young researchers in the state of the art techniques behind these deep and important results.

Main Lectures

This school will consist of three weeks of lecture courses supplemented by exercise and problem sessions. The aim of these courses is to provide a pedagogical introduction to the field as well as introducing advanced tools and techniques necessary to play an active role in current research.

Mini-Courses

The courses of the fourth week of this school aim at a higher level. In five mini-courses experts will present topics of great future promise as well as outline some open problems under current investigation.

Graduate and Postdoctoral Funding

Graduate students and postdoctoral fellows within 7 years of receipt of their PhD may apply for funding. Standard support amounts will include funds for local expenses and accommodation plus economy travel.

For more information go to:

www.icmat.es/summerschool2014/

Application Deadline

March 28, 2014

Main Lecture Courses

Lectures on the mathematics of Feynman amplitudes
Spencer Bloch (University of Chicago, USA)

Motivic multiple zeta values
José I. Burgos Gil (ICMAT-CSIC, Madrid, Spain)

l -adic Galois representations of function fields over finite fields
Hélène Esnault, Lars Kindler, Kay Rülling (FU Berlin, Germany)

Feynman integrals, periods and motives
Matilde Marcolli (California Institute of Technology, USA)



Organized by

José I. Burgos Gil (ICMAT-CSIC, Spain)
Kurusch Ebrahimi-Fard (ICMAT-CSIC, Spain)
David Ellwood (Harvard University, USA)
Dominique Manchon (CNRS, France)
Juanjo Rué Perna (FU Berlin, Germany)
Nicholas Woodhouse (CMI, Oxford, UK)