

CONTEMPORARY MATHEMATICS

571

Regulators

Regulators III Conference
July 12–22, 2010
Barcelona, Spain

José Ignacio Burgos Gil
Rob de Jeu
James D. Lewis
Juan Carlos Naranjo
Wayne Raskind
Xavier Xarles
Editors



American Mathematical Society

Regulators

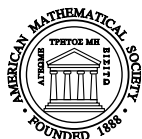
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Preface

In its current incarnation, a regulator is a map from the algebraic K -theory of an algebraic variety to a suitable cohomology theory such as étale cohomology or Deligne cohomology. Regulators come in many different forms, according to the context. For instance, the Borel regulator is the higher-degree analogue of the Dirichlet regulator, considered as a map on algebraic K -theory in degree one. On the other hand, in Riemann surface theory, the regulators might involve Abelian integrals and Jacobians, extending the ideas of the 19th century analytic number theorists and geometers. Over the past 20 years, there has been renewed interest in regulators, stimulated by the trail-blazing works of S. Bloch, A. Beilinson and the more recent revolutionary work of V. Voevodsky. The contributions in this proceedings provide an important snap-shot of the current developments in the field by leading researchers.

In May of 1998, there was an Oberwolfach meeting entitled “Regulators” (organised by S. Bloch, M. Kolster, P. Schneider and V. Snaith), which involved a number of participants working on regulators from different perspectives. The Oberwolfach workshop was regarded as a great success, and from it sprang a series of conferences under the same name. Regulators II (organized by J. D. Lewis and V. Snaith) was subsequently held in December of 2005 at the Banff International Research Station. The atmosphere at that second meeting could best be described as “electric”. Indeed there was a fruitful exchange of ideas that led to numerous interesting developments in the subject.

It was decided that Regulators III would be held again on European soil, in July of 2010 in the city of Barcelona. Each day would center around four high level talks pushing the boundaries of this subject area, with ample time for discussions and collaborations. The end of an intense work day would be tempered by the spectacular backdrop of this scenic city. The feeling one had was one of enthusiasm and inspiration.

Over a glass of wine with colleagues, the discussion turned to where and when to hold the Regulators IV conference. But then our minds would wander back to the present, with a feeling of accomplishment. Indeed this is a conference one is not likely to ever forget!

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Speakers and titles of talks

- Masanori Asakura, *Quintic surface over p -adic local fields with infinite p -primary torsion in the Chow group of 0-cycles.*
- Alexander A. Beilinson, *Remarks on Grothendieck's standard conjectures.*
- Amnon Besser, *The syntomic regulator for K_1 of surfaces.*
- Spencer Bloch, *Motives arising in physics.*
- David Burns, *Congruences between derivatives of Artin L -series.*
- François Charles, *On the zero locus of l -adic normal functions.*
- Xi Chen, *Real regulators on self-products of $K3$ surfaces.*
- Jean-Louis Colliot-Thélène, *Chow groups of codimension two cycles and unramified cohomology in degree 3.*
- Frédéric Déglise, *Relative rational mixed motives.*
- Christopher Deninger, *Regulators, entropy and infinite determinants.*
- Hélène Esnault, *Group actions on affine space and motivic integration.*
- Herbert Gangl, *Regulator maps beyond classical polylogarithms.*
- Thomas Geisser, *Motivic cohomology over finite fields: relating Bass's conjecture and Tate's conjecture.*
- David Hébert, *Weight structure on Beilinson motives.*
- Matthew Kerr, *Mumford-Tate groups of Hodge structures, and algebraic cycles.*
- Francesco Lemma, *A norm compatible system of Galois cohomology classes for $GSp(4)$.*
- Marc Levine, *Motives arising from S^1 spectra.*
- James Lewis, *Hodge type conjectures and the Bloch-Kato theorem.*
- Steve Lichtenbaum, *Comparing special values of Dedekind zeta-functions at negative and positive integers.*
- Paulo Lima-Filho, *Explicit regulator maps for real varieties.*
- Vincent Maillot, *On a conjecture of H. Fang, Z. Lu and K.-I. Yoshikawa (joint work with D. Rösslner).*
- Kumar Murty, *The Euler-Kronecker constant of a number field.*
- Tejaswi Navilarekallu, *L -values and étale cohomology groups.*
- Noriyuki Otsubo, *Regulators of Fermat motives.*
- Wayne Raskind, *p -adic Hodge theory and the Griffiths group.*
- Damian Rösslner, *Arakelov geometry and the classical theory of elliptic units (joint work with V. Maillot).*
- Shuji Saito, *Equivariant weight homology and McKay correspondence (joint work with Moritz Kerz).*
- Takeshi Saito, *An l -adic Riemann-Roch formula (joint work with Kazuya Kato).*
- Jakob Scholbach, *Special L -values of motives.*
- Tony Scholl, *Hypersurfaces and purity.*

Christophe Soulé, *Arithmetic surfaces and successive minima.*

V. Srinivas, *Algebraic cycles on a generic complex Abelian 3-fold.*

Claire Voisin, *Abel-Jacobi map, integral Hodge classes and decomposition of the diagonal.*

Chuck Weibel, *cdh invariants for singularities.*

Jörg Wildeshaus, *Boundary and weights.*

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This volume contains the proceedings of the Regulators III Conference, held from July 12 to July 22, 2010, in Barcelona, Spain.

Regulators can be thought of as realizations from motivic cohomology, which is very difficult to compute, to more computable theories such as Hodge, Betti, l -adic, and Deligne cohomology. It is a very intricate subject that thrives on its interaction with algebraic K-theory, arithmetic geometry, number theory, motivic cohomology, Hodge theory and mathematical physics.

The articles in this volume are a reflection of the various approaches to this subject, such as results on motivic cohomology, descriptions of regulators, a revisiting of a number of fundamental conjectures (such as new results pertaining to the Hodge and standard conjectures), and more.

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