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Preface

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Joël Bellaïche passed away suddenly on the 30th of May, 2022, at the age of 48. This special volume of Tunisian Journal of Mathematics contains 13 original articles by some of the best experts on topics dear to Joël, including two unpublished articles by Joël himself. They are dedicated to his memory and are a tribute to his mathematical work.

Joël Bellaïche was born in Paris on the 20th of September, 1973. After secondary studies at the lycée Louis-le-Grand in Paris, he was a student at the École Normale Supérieure of Paris from 1993 to 1997. In 1995 he did his Diplôme d'Études Approfondies thesis (the old name for a Master 2 thesis) at Orsay University — now Paris-Saclay University — with Laurent Clozel on Ribet's celebrated article “A modular construction of unramified p -extensions of $\mathbb{Q}(\mu_p)$ ”. He went on to complete a PhD thesis under Laurent Clozel's direction entitled “Congruences endoscopiques et représentations galoisiennes” which he defended at Orsay University on the 7th of January, 2002. From 1997 to 2001, he was also an Agrégé préparateur, that is to say a student tutor, at the École Normale Supérieure. After his PhD thesis, he was a postdoc at the University of Warwick, the University of Padua and the Institute for Advanced Study in Princeton. Then he was briefly a Maître de conférences at Nice University, until he decided to accept a Ritt Assistant Professorship at Columbia University in New York in 2004. In 2008 he obtained a permanent position at Brandeis University, where he remained and where he eventually became a full professor. Joël was the advisor of 9 PhD students from 2009 to 2021 (all at Brandeis University).

Joël Bellaïche's mathematical work includes numerous fundamental articles on automorphic forms, Galois representations and their deformations, the geometry of eigenvarieties and its applications to Selmer groups and (families of) p -adic L -functions, analytic number theory, and more. They appeared in some of the best mathematical journals, including *Inventiones*, *Duke*, *Compositio*, *Annales Scientifiques de l'ENS*, *Math. Annalen*. He also wrote two important books: the very influential *Families of Galois representations and Selmer groups*, with Gaëtan Chenevier (Astérisque 324, 2009), and the very nice reference work *The eigenbook* (Birkhäuser, 2021). See the next article for much more about Joël's mathematical achievements.

Joël Bellaïche was fully active in research when he left us, with several projects or articles in progress, some of which were almost completed. The editors of Tunisian Journal of Math. are pleased to publish two of these articles in this volume, thanks to the help of Joël's family, friends and colleagues.

Keywords: Joël Bellaïche.

This volume

This special volume brings together 13 articles written by prominent mathematicians, all containing new mathematical results or new proofs of existing results. Twelve articles are strongly related to the mathematical work of Joël. The thirteenth is a short unpublished article by Paul Monsky who was a colleague and friend of Joël at Brandeis University. Among these 13 articles, two are due to Joël himself. Specifically, here are the further contents of the volume.

Joël Bellaïche (1974–2022) by John Bergdall, Gaëtan Chenevier, Laurent Clozel, Henri Darmon, Samit Dasgupta and Anna Medvedovsky

Formes modulaires spéciales modulo 2 by Joël Bellaïche (edited by Anna Medvedovsky and Jean-Pierre Serre)

Lettre de Jean-Pierre Serre à Jean-Louis Nicolas du 19 septembre 2009 by Jean-Pierre Serre

Lettre de Jean-Pierre Serre à Joël Bellaïche du 29 septembre 2013 by Jean-Pierre Serre

On certain Cohen-Macaulay modules by Joël Bellaïche (edited by Christophe Breuil, Laurent Clozel and Mladen Dimitrov)

A p -adic adjoint L -function and the ramification locus of the Hilbert modular eigenvariety by Baskar Balasubramanyam, John Bergdall and Matteo Longo

Eigenvariety for partially classical Hilbert modular forms by Mladen Dimitrov and Chi-Yun Hsu

Elliptic Stark conjectures and exceptional weight one forms by Henri Darmon, Alan Lauder and Victor Rotger

On the central value of Rankin L -functions for self-dual algebraic representations of linear groups over totally real fields by Laurent Clozel and Arno Kret

Theorem XI of Selmer's *Acta Mathematica* opus: a short proof by Paul Monsky

Critical Λ -adic modular forms and bi-ordinary complexes by Francesc Castella and Carl Wang-Erickson

Iwasawa invariants and residually reducible Hida families by Robert Pollack and Preston Wake

The equivariant Tamagawa number conjectures for modular motives with coefficients in Hecke algebras by Olivier Fouquet

Patching and multiplicities of p -adic eigenforms by Eugen Hellmann, Valentin Hernandez and Benjamin Schraen

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(on behalf of the editors of TJM)