# Final report on CIMPA-ICTP school on Artin L-functions, Artin's primitive roots conjecture and applications Nesin Mathematics Village, Şirince, Turkey. May 29 - June 9 2017



The CIMPA-ICTP research school "Artin L-functions, Artin's primitive roots conjecture and applications" was organized by CIMPA and ICTP in conjunction with the Nesin Mathematics village. It was held at Nesin Mathematics village from May 29 to June 9. The website of the school with updated information is located at

#### http://www.rnta.eu/Nesin2017/

The classes were given by eleven lecturers from six different countries including two from Turkey, two from France, four from Italy, one from the Netherlands, the Unite States of America and the United Kingdom; there were four female lecturers which is 40% of the total number of lecturers.

There were 42 participants from 15 countries including 19 from Turkey and 23 from other countries: four from India, three from Iran, two from Kurdistan region/Iraq, Morocco, and Tunisia and one from Armenia, Colombia, Egypt, France, Israel, Lithuania, Nigeria, Pakistan and Sudan, the last participant was representative of CIMPA coming from France. Among participants, there were 25 males (13 from Turkey and 12 from other countries) and 16 female (7 from Turkey and 9 from other countries). The female participants were 39% of total participants. The list of participants is included.

The school obtained generous supports from CIMPA, ICTP, the commission for developing countries of the International Mathematical Union (IMU-CDC), Number Theory Foundation (NTF), G.N.S.A.G.A research group of Istituto Nazionale di Alta Matematica, Leiden Universiteit, and the Consulate General of France.

The school started on May 29th. The opening ceremony took place on the morning of May 31st, with the participation and speeches of the Italian consul in Izmir and of representatives of the General Consul of France, CIMPA, ICTP and the Nesin village. A representative of the consul of the United States of America visited the school on June 1st. The school ended on June 9th.



Classes of the first week were of an introductory nature, some of the students already knew most of the stuff, but a number of them learned a lot during that week. The classes of the second week were more advanced but all the necessary material has been introduced previously for allowing the participants to understand the more advanced courses. The level of the participants covered a large range, some of them did not know representation theory nor elliptic curves, some others had already a good background on these topics. All of them learned something, depending on the participants some courses were more popular than others, but altogether it seems that all courses were at the right level for the students: the speakers all made a great effort to give clear talks, and they succeeded very well.

Over the weekend two excursions took place: on Saturday a visit to the Greek-Roman city of Ephesus and on Sunday a visit to the KuşadasıMilli Park. Both excursions were very well organized, very interesting and brought participants closer together, complementing the intense atmosphere in the school.



Participants and lecturers were all accommodated in the village and all meals were taken together. The Nesin village is an ideal place for hosting a CIMPA school, beside being located in the beautiful hills near Şirince (80 km south of Izmir), the structure of the village is perfect for doing mathematics.

Not only there are several lecture halls (some of them open air covered only by a pergolato) and a library with a good collection of books and abundance of desk space, but also blackboards are placed in almost every common area and you can find a beautiful patio with couches and two blackboards just around the corner.

The communal, informal lifestyle made it easier for participants to establish contacts between them and with the lecturers.

The local organizers, especially Ayhan Dil, Cihan Pelhivan and the staff of the Nesin Village, have done a superb job. Everything run smoothly, including the transfers from and to the airport. I strongly recommend the Nesin Village for future CIMPA schools.

## Organization

### Scientific Committee

- Anne Quéguiner-Mathieu (Université Paris 13)
- Marina Monsurrò (Università Europea di Roma)
- Francesco Pappalardi (Università Roma Tre)
- Fernando Rodriguez Villegas (ICTP, Trieste)
- Valerio Talamanca (Università Roma Tre)

### Local Organizing Committee

- Ayhan Dil (Akdeniz University, Antalya)
- Ayhan Gunaydin (Mimar Sinan Fine Arts University, Istanbul)
- Ekin Ozman (Bogazici University, Istanbul)
- Cihan Pehlivan (Atılım University, Ankara)
- Emre Alkan (Koc University, Istanbul)
- Ali Ozgur Kisisel (Middle East Technical University, Ankara)

### Lecturers

- Marina Monsurrò (Università Europea di Roma)
- Ekin Ozman (Bogazici University, Istanbul)
- Francesco Pappalardi (Università Roma Tre)
- Anne Quéguiner-Mathieu (Université Paris 13)
- Cihan Pehlivan (Atılım University, Ankara)
- Fernando Rodriguez Villegas (ICTP, Trieste)
- Adriana Salerno (Bates College, Lewiston, USA)
- Peter Stevenhagen (Universiteit van Leiden)
- Valerio Talamanca (Università Roma Tre)
- Paul Voutier, London
- Michel Waldschmidt (Université Pierre et Marie Curie)

# **School Program**

## Courses

**Distribution of primes** Francesco Pappalardi

Elliptic curves Valerio Talamanca

Algebraic Number Theory Adriana Salerno

**Groups and Representations** Marina Monsurrò and Anne Quéguiner-Mathieu

**Introduction to the Riemann zeta function** MICHEL WALDSCHMIDT

**Introduction to L-functions** PAUL VOUTIER

L-functions and Motives Fernando Rodriguez Villegas

**Lang-Trotter Conjecture for Primitive Points** Peter Stevenhagen

Artin Conjecture, Hooley's Theorem and the Quasiresolution CIHAN PEHLIVAN

**Chebotarev Density Theorem** Ekin Ozman

On Thursday of the second week a few participants presented their research in a half hour seminar. The following is the list of seminars:

Çetin Ürtiş : Integral representations of L-functions

Ayberk Zeytin : Combinatorics of relative quadratic extensions

Ezra Waxman : Angles of Gaussian primes

Marine Rougnant : Mildness property and quadratic extensions of Q

Moni Kumari : Simultaneous non vanishing and sign changes of Fourier coefficients of modular forms

Enis Kaya : Iwasawa Theory for elliptic curves

### **Financial Report**

### Funding

We received supports from the following agencies :

Organizations	Amount (in EUR)
CIMPA	9530.32
ICTP	6789
IMU-CDC	2000
NTF	1910
Nesin Village	4022
Turkish Mathematical society	1240
French Embassy in Turkey	1000
G.N.S.A.G.A	500
Personal grants of speakers	2000
TOTAL	28981.38

CIMPA's funds were used to pay for meals and accommodation of 14 international participants, 8 lecturers and CIMPA's representative, as well as Michel Waldschmidt's ticket. Lodging and meals for the last two lecturers (Anne Quéguiner-Mathieu and Michel Waldschmidt) were funded by the French embassy in Turkey. ICTP's funds were used as follows: 4289 euro to cover the travel expenses of 12 international participants, while 2500 where used to support lodgings and meals for 7 Turkish student. IMU-CDC contribution was used to support the travel, lodging and meals for two international participants, as well as pay for the transfers Izmir Airport-Nesin Village and Nesin Village-Izmir airport for all the international participants from developing countries. Funding from NTF was used to pay for lodgings and meals of four international students and to partly fund the excursions. The Nesin village supported the participation of 10 Turkish students. The fund from the Turkish mathematical society were used to fund the participation of two Turkish student as well as cover some of the organizational costs. The personal grants of speakers and funding from G.N.S.A.G.A. were used by the speakers to cover their travel expenses.

On the behalf of the scientific committee

Valerio Talamanca

## List of Participant

Abdelaziz El Habibi, Morocco; Adriana Salerno, U.S.A.; Ahmet Muhtar Güloğu, Turkey; Alp Bassa, Turkey; Aslam Adnan, Pakistan; Ayberk Zeytin, Turkey; Ayhan Dil, Turkey; Çağatay Altuntaş, Turkey; Çetin Ürtiş ,Turkey; Cheraghi Ali, Iran Cihan Pehlivan, Turkey; Duygu Özden Bilici, Turkey; Eda Kırımlı, Turkey; Ekin Özman, Turkey; Enis Kaya, Turkey; Erman Işık, Turkey; Esfandiari Mohammadreza, Iran; Ezra Waxman, Israel; Fernando Rodriguez Villegas, Italy; Frances Odumodu, Nigeria; Francesco Pappalardi, Italy; Harun Kır, Turkey; Hasan Suluyer, Turkey; Hoyam Hassan, Sudan; Idriss Jerrari, Morocco; İlkiz Bildik, Turkey;

Jorge Cely, Colombia; Kammoun Rania, Tunisia, Khurana Suraj Singh, India Kübra Kaytancı, Turkey; Kumari Moni, India; Laima Kaziulyè, Lithuania; Manmi Kawa, Iraq; Marc Aubry, France; Marina Monsurrò, Italy; Marine Rougnant, France; Mbarki Khadija, Tunisia; Mehmet Eren Durlanık, Turkey; Memarian Sorkhabi Soheil, Iran; Michel Waldschmidt, France; Mohamed Anwar, Egypt; Mustafa Andam Ali, Iraq; Neslihan Girgin, Turkey; Nihal Bircan, Turkey; Özgür Kişisel, Turkey; Paul Voutier, U.K.; Peter Stevenhagen, The Netherlands Rabia Gülşah Uysal, Turkey; Sharma Ritika, India Valerio Talamanca, Italy Vanlalngaia Ramdinmawia, India; Yelena Apresyan, Armenia.