CIRP RA Summer News 2017

Editorial

Dear CIRP colleagues,

Welcome to the new issue of the CIRP Research Affiliate Newsletter! This issue provides information about the upcoming RA activities in 2017, the RA workshop that was held in Toulouse, an introduction to the new RAs and updates from current RAs.

I hope you will enjoy reading this newsletter and look forward to meeting the CIRP community again at our next meeting in Switzerland.

Best regards from CIRP-RA newsletter's Editor,
John Erkoyuncu (Cranfield University, UK)

Words from the RA Steering Committee by Olga Battaia

As you remember, at our Winter meeting in Paris, we have elected the new Chair and Vice Chair for the RA board. John Erkoyuncu (Cranfield University, UK) and I are grateful for your confidence. You can count on our commitment to continuously improving and strengthening the RA network. Once again we would like to thank our previous Chair Petra Wiederkehr for her creative ideas and hard work on bringing us together to the interdisciplinary international collaboration. Due to her efforts, several research projects have started in our community.

For those, who could not join our Winter meeting, we would like to introduce ourselves in short words:

Olga Battaïa (Chair) is currently a Full Professor, responsible for Industrial Engineering Program at one of the most prestigious engineering schools in France and the first aerospace engineering school in the word, ISAE-SUPAERO (https://www.isae-supaero.fr/en/). You can found more details about her research activities at https://personnel.isae-supaero.fr/olga-battaia/

John Erkoyuncu (Vice-Chair) is currently a Lecturer in Simulation and Visualisation at Cranfield University. His research focuses on data analytics and visualisation within a manufacturing and maintenance context. He is the Course Director of the MSc in Through-life System Sustainment and the Deputy-Director of the Through-life Engineering Services Centre. For further details please visit https://www.cranfield.ac.uk/people/dr-john-ahmet-erkoyuncu-702215

We are also happy to inform you that our multi-skilled secretary **Taner Tunc** was recently appointed as Assistant Professor at the Composite Technologies Centre of Excellence, Sabanci University in Turkey.

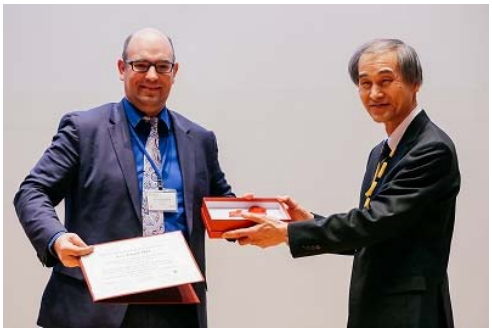
The members of the RA Steering Committee are looking forward to meeting over a hundred RAs from over 25 different countries in the following months rich in RA events. The first one for the new board was our Annual Workshop hosted at ISAE-SUPAERO, Toulouse, France on the 3rd and 4th of July. The topic of this workshop was "How can we enhance the impact of the RA group?" The results of our recent survey were discussed by the participants. The workshop also included a range of technical presentations, discussions about the direction of the CIRP RA activities, Airbus Final Assembly Line visit and lab tours. The following pictures are from the participants at the Workshop.

The CIRP General Assembly in Lugano, Switzerland (https://www.cirp.net/meetings-conferences/about-cirp-events/general-assembly.html) will offer two RA meetings on the 20th and 26th of August where the outputs of our Annual Workshop will be presented. Further details about the agenda of these meetings will soon be published on the CIRP website.

We are looking forward to meeting you in person at our upcoming events and we hope you will enjoy your RA experience with the new board,

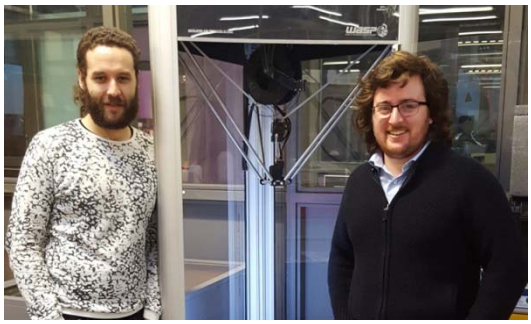
Olga Battaïa, Chair of RA on behalf of John and Taner

Dr. Karel Kellens wins the best papers award at the 24th CIRP Life Cycle Engineering conference



This year the 24th CIRP Life Cycle Engineering conference took place at Kamakura, Japan (http://cirp-lce2017.jspe.or.jp) with the working title "Next stage of sustainable manufacturing in IoT Era". Research Affiliate Karel Kellens and colleagues from KU Leuven in Belgium won the best paper "LEO" award for their contribution "*Environmental Impact of Additive Manufacturing Processes: Does Am Contribute to a More Sustainable Way of Part Manufacturing?*" (http://www.sciencedirect.com/science/article/pii/S2212827116313130). The "LEO" award was instituted at the 18th CIRP LCE conference in Braunschweig (http://cirp-leo-award.net) and relates to the first name of Leo Alting, the founder of the CIRP LCE conferences, from DTU in Copenhagen where also the next CIRP LCE conference will take place from 30th April till 2nd May 2018 (http://www.lce2018.dk).

Dr Shane Keaveney is named by UCD Engineers as JCI Internationals Ten Outstanding Young People for Ireland 2017



UCD engineers and 3D printing advocates Dr Shane Keaveney and Colin Keogh have been jointly named as one of Ireland's Ten Outstanding Young People by Junior Chamber International Ireland. Junior Chamber International (JCI) is a non-profit organisation of people aged 18-40 who are active and engaged in helping their communities. The JCI Ten Outstanding Young People awards recognise those who excel in their field and create positive change.

In 2014, the UCD duo founded the Rapid Foundation to bring 3D printers, low-cost electronics like Arduino, Raspberry Pi and virtual reality technologies to people and communities around the world. The Rapid Foundation currently supplies technology and training to communities in Mexico, Rwanda, Uganda and India. Once the training is complete, communities are given open access to the equipment, allowing them to invent, design and create solutions to issues affecting them. This work previously was awarded the 2014 IMechE Fritz Schumacher Award, which is intended to recognise individuals for their outstanding contribution to alleviating poverty in the developing world through innovative, simple and sustainable engineering and technology solutions.

Dr Keaveney is a post-doctoral researcher at the University College Dublin Medical Device Design Group. He completed his PhD at the UCD School of Mechanical and Materials Engineering

in 2013 and is a research affiliate with CIRP. Colin Keogh is a research engineer undertaking a PhD in Inclusive Design and Creative Technology at University College Dublin. In January, he was named by Forbes on their 30 Under 30 Europe list of people "who will impact Europe for the next 50 years." They both are involved with numerous engineering professional groups including the IMechE, Engineers Ireland and European Young Engineers.

A new PhD project in Technical University of Denmark (DTU) in collaboration with Chinese University of Hong Kong

By Yang Zhang, Matteo Calaon, Technical University of Denmark

A new Ph.D. project titled "*Integrating micro and nano structures on steel surfaces – Process chain implementation and validation*" is starting in August 2017 at the Technical University of Denmark within the framework of MADE Digital. The Ph.D. project aims at developing and implementing a complete process chain for the establishment of micro-nano structures on the surface of steel moulds.

Research affiliate Yang Zhang and Matteo Calaon will participate as co-supervisors in the project. Part of this PhD project is to investigate the replication quality of micro and nano structures from the metal insert to polymer replica by injection moulding. Initial tests show that the injection moulded polymer samples reflecting different colors when viewed at a certain angles (Figure 1). The feasibility to transfer these submicron-scale periodic structures from the master mold to plastics will be investigated and studied. The proposed research attempts to develop a structural coloration technique for plastic products without using any chemical or additives. As a potential option for the metal structuring research affiliate Ping Guo from the Chinese University of Hong Kong will be the contact person for testing the manufacturing of the micro gratings on inserts. DTU tasks comprise:

- Development of tooling process chains for the establishment micro/nano structured surfaces on mould steel for enhanced tool performance (lifetime and replication capability)
- Development of the precision moulding technology the manufacture of precision plastic components with micro/nano structured surfaces for enhanced part performance (optical and functional properties)
- Development of traceable methods allowing for metrology and tolerance verification across several length scales on both tools and moulded components.

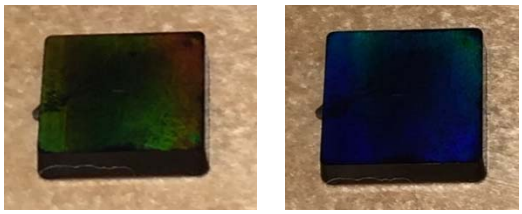


Figure 1 polymer samples produced by injection moulding using inserts with gratings 1000 nm. They showed different color when the cameral was at different angle or lightning condition.

CIRP Design Conference 2017

The 27th CIRP Design Conference was held at Cranfield University between the 10th -12th of May 2017. The conference covered a number of key topics including:

1. Complexity management in design
2. Design theory
3. Design methodology, methods and tools
4. Design for X
5. Design of X
6. Design and production informatics
7. Creativity and emotion in design
8. Design education
9. Case studies and industrial experiences
10. Emerging issues

There were over 90 papers presented at the conference and over 130 people attended. The Keynote presentations were delivered by representatives from organisations such as Rolls-Royce, Airbus, and Carnegie Mellon University, USA. The Conference also offered a number of tutorials including:

- Tutorial 1: Axiomatic Design: An Introduction and Perspectives with Recent Advances (Professor Christopher A. Brown, Worcester Polytechnic Institute, USA)
- Tutorial 2: An Introduction to the Basic Tools and Ideas of TRIZ (Dr. Tom H.J. Vaneker, University of Twente, The Netherlands, Board member of the European TRIZ Association)
- Tutorial 3: Application of Augmented Reality in Complex Industrial Settings (Dr. John Erkoyuncu, Cranfield University)

For more information, please visit https://www.cranfield.ac.uk/events/events-2017/cirp-2017

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CIRP Design Conference 2018

Next 28th CIRP Design conference will be hosted in Nantes, France from 23 to 25 May 2018. Nantes had already hosted the 20th CIRP Design conference in 2010, the 64th CIRP General Assembly in 2014, it will be a pleasure to welcome you for next 28th CIRP Design conference in 2018.

Ecole Centrale de Nantes & LS2N laboratory will organise it with the support of the French CIRP community and moreover of the French Design community.

« We are all designers and we have the power to design and produce a better world. » [John Hockenberry, journalist and author]

The main topic of the 28th CIRP Design conference will be "Design for smart products, process and organisations". Objectives are to *share and to compare scientific and industrial points of view, to highlight link between products, process and enterprises focusing on user-centered design, multi-materials, multi-process…*

Abstract Submission are welcome before the 15th September 2017 and full paper submission before the 1st December 2017. The deadline for Early Bird Registration is the 1st April 2018.

For more information, please visit https://cirpdesign2018.ec-nantes.fr

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Trinity College Dublin establish major new 3D Printing Additive Manufacturing (3DAM) centre of excellence by Dr. Rocco Lupoi

Trinity College Dublin have established Ireland's first 3D Printing Centre of Excellence, with a focus on additive manufacturing (AM), having received almost €4 million in funding from Science Foundation Ireland (SFI). The new project group is funded by AMBER (Advanced Materials and BioEngineering Research), an SFI funded centre providing partnership between leading researchers in materials science and industry. AMBER is jointly hosted in Trinity College Dublin by CRANN and the Trinity Centre for Bioengineering, in collaboration with University College Cork and the Royal College of Surgeons in Ireland.

The new centre, known as 3DAM, will host the international 3D-PRINT (Defining ADDitive PRocess Material INTeractions) project, headed by Dr. Rocco Lupoi, Dr. Garret O'Donnell, and Dr. Daniel Trimble. The project team also consists of a number of research fellows and a PhD student, with the potential for further additions as the project matures. The project is being conducted with industrial partners in the biomedical sector, and will focus on the 3D printing of Titanium implants via an AM method known as selective laser melting (SLM).

SLM works by melting and fusing micron sized particles of metal via a focused high power-density laser. Similar to other deposition methods of manufacture, SLM works by first 'slicing' a 3D CAD model into layers anywhere from 20 to 100 μm thick. These slices are then successively built layer-by-layer by melting powdered metal with a fine laser beam, which is directed by a set of high precision mirrors and lenses. Although the technology is relatively young, it is currently receiving a lot of attention internationally from both academia and industry. This is because SLM technology enables the formation of complex and near-net shape parts with no impact on production time, therefore it is an ideal candidate for highly intricate and bespoke parts, meaning it is also perfectly suited for fully useable prototype production. Although the potential utilisation areas for the technology are vast, there remains many challenges which must be overcome to enhance final build quality, particularly for parts destined for dynamic loading applications.

As such, the 3D-PRINT project has two distinct research avenues: SLM process development to optimise the material characteristics of the manufactured part, and an emerging field known as design for additive manufacturing (DFAM), which aims to harmonise the current knowledge centres of part design, process knowledge, and bioengineering.

Speaking about the project, Dr. Lupoi says "This is a challenging technology to master, but AM is the fastest growing sector in manufacturing, and with this new centre we intend to be at the forefront of the technical innovations required to unlock its full potential and ensure its continued adoption within industry". Dr. O'Donnell adds "with the development of the 3DAM

lab, we now have the infrastructure and expertise to complete all stages of the AM process in-house, from initial part design and optimisation, to fabrication and post-processing, to full sample preparation and analysis"

In addition to two metal SLM printers, the new centre is also home to several other printers of varying technologies capable of printing both polymers and ceramics with resolutions ranging from 20nm to 150 µm and a state of the art high resolution CT scanner.

Introductions from new RAs

Anas M. Atieh

I received my PhD from University of Calgary, Canada and I'm currently an assistant professor of industrial engineering, Director of Accreditations and Quality Assurance at German Jordanian University (GJU). My Ph.D. research was fully supported by the GJU based on a high competitive national scholarship. My success in the academic performance (both teaching and supervision) was recognized in 2016 with the Certificate of Excellence from the president of the university, I also received several local and six national/international awards; one of them was Bill Timmons Leadership award and 4 research grants.

I would like to use my research affiliate (RA) membership in CIRP to contribute to the knowledge share and increased exchange about various aspects of the state-of-the-art and the future development of production engineering between scholars and researchers from industrial and development countries such as Jordan, facilitating cross-border cooperation and cross-cultural research collaboration rather than divisions along national lines.

Joerg Bauer

My name is Joerg Bauer and I passed my Dr.-Ing. degree in 2016 in the area of Production Science with focus on feed systems for small machine tools. My Dr. Thesis has the name "Hochintegriertes hydraulisches Vorschubsystem für die Bearbeitung kleiner Werkstücke mit hohen Fertigungsanforderungen", in English „Highly integrated hydraulic feed system for manufacturing of small parts with high requirements". In research I focus on machine tools in general, the set-up of modular machine tools made out of intelligent building blocks, their dynamic and static behavior, machine tool feed drives and control systems. For the past years I worked at the Institute of Production Science in Karlsruhe under the tutelage of Prof. Fleischer. Beginning August I will return to industry in the field of special machine design at Robert Bosch. But I will still focus on control techniques and the set-up of modular machines using digitalization technologies. I'm expecting from being a CIRP Research Affiliate close contact with researchers around the world and the exchange of knowledge and ideas in the field of machine tools, their control systems and their set-up in the future. I hope to gather new insides from research and I could provide insights and thoughts out of industry.

Christopher J Cleaver

I'm a research associate at University of Cambridge, UK, working on novel forming processes (STC F) with Prof. Julian Allwood. To date I've focused on a process called Ring Rolling and written two first author papers to the CIRP Annals on ways to extend the range of shapes that can be made. I also run a micro renewable energy business in Kenya.

As a CIRP Research Affiliate I'm aiming to connect with a wider group of people with similar interests: to get new ideas for my research, to keep up to date with the latest research in happening around the world and hopefully meet friends and colleagues whom I'll stay in touch with throughout my career.

Roy Damgrave

Currently I work as an assistant professor at the laboratory of Design, Production and Engineering, part of the Engineering Technology faculty of the University of Twente. I have many teaching activities for the bachelor and master study of Industrial Design Engineering.

My research is mainly focussed on the use of Virtual and Augmented Reality in product development processes. With the aim on determining when, how and why to use what kind of VR and how to implemented it in line with the used methodology in a multi-stakeholder setting, in order to realize the most appropriate Synthetic Environment. At June 8th 2017 I defended my PhD thesis on this subject.

My ideas on my expectations/interests from being a RA:

- Nice discussion/meetings with colleagues
- Work collaboratively on research and teaching
- Find common interests
- Have a nice time together

Lamice Denguir

I have obtained my PhD from École Nationale Supérieure d'Arts et Métiers, France in 2016. I would like to mention two important research projects I was involved in. One of them sponsored by CEA Valduc concerned the surface integrity induced by machining and its impact on the functional performance and life of the components. I conducted experiments concerning material characterization for constitutive modelling (plasticity and damage) and created numerical models (FE models in 3D environment using both Lagrangian and ALE formulations).

Another one entitled “Characterizing and modelling surface integrity induced by finishing machining of OFHC copper and its impact on corrosion resistance” was jointly sponsored by CEA Valduc and IC ARTS and led by both LaBoMaP - Arts et Métiers Cluny and ICB - Université de Bourgogne – Franche-Comte. A particular case of finishing machining of oxygen free high

conductivity copper (OFHC) and its impact on the surface integrity and corrosion resistance was studied. Firstly, a comparative experimental study between turning and orthogonal cutting was performed. Then, due to its simplicity, we continued with the orthogonal cutting. A numerical model was developed to predict the surface integrity induced by the cutting process. It used a new constitutive model for OFHC copper taking into account microstructural transformations and the state of stress in the work material. Finally, the results issued from experimental studies and the numerical simulations were statistically treated in a multi-physical analysis with the objective of establishing the relationship between corrosion resistance, surface integrity and cutting physics.

By becoming an RA member I expect more research collaborations and networking, meeting the specialists and sharing knowledge with them, international visibility, and access to the community shared database.

Saurav Goel

I joined Cranfield University in 2016 as a Lecturer after having worked at Queen's University Belfast for three years. I completed his PhD from Heriot-Watt University, Edinburgh in 2013. My current research interest spans over the area of ultra-precision machining, material characterisation and multiscale simulations including the element of both FEA as well as molecular dynamics simulations. Over the next couple of years I'm wishing to establish a strong presence in the area of material removal processes by using a range of robust machining methods which may include beam based machining processes as well.

After having acquired expertise in multiscale simulations, ultra-high precision manufacturing and nanotribology, I'm looking forward to having close association with the CIRP network to tap in collaborative working opportunities in STC-C, STC-G and STC-P in particular and others in general to be benefitted from a range of interactions with other fellow colleagues from round the globe. The CIRP network being a forum of both experienced and new academics provides or is expected to provide future research guidelines to make an informed decision of conducting appropriate research activities in the early days for the RA of CIRP to eventually get to the Fellow status.

Ivan Iovkov

I studied mechanical engineering at the TU Dortmund University with a focus on machine technics. I am working at the Institute of Machining Technology (ISF Dortmund, Germany) under the leadership of Prof. Biermann for more than ten years, firstly as a student and since November 2009 as a research assistant. For more than five years now I am the head of the division machining technology. In September 2016 I graduated (summa cum laude) with a PhD thesis in the area of deep hole drilling using minimum quantity lubrication. I expect an intensive exchange within the RA group and interesting discussions on current topics in the field of machining technology, additive manufacturing, machine tools etc.

Umut Karagüzel

From September 2016 onwards, I have been working at Isik University, Istanbul as an Assistant Prof. Dr. and giving lectures on manufacturing engineering, heat transfer and material science. I

have received my PhD degree in Mechanical Engineering from Istanbul Technical University in August 2016. My PhD study is on geometric, force and thermal modeling of turn-milling operations. Turn-milling operation basically combines the fundamentals of turning and milling operations in the same process. In order to characterize and improve the efficiency of turn-milling operations, first, the uncut chip geometry is modelled by means of geometrical and kinematical relationships. By using the uncut chip geometry, the cutting forces and temperatures are modelled. Additionally, during my PhD study I studied on temperature modelling and measurement of interrupted cutting operations such as turn-milling and conventional milling, on which I still carry on doing research.

My major expectation from being a RA is to direct my current research by sharing what I have done and my future plans and taking recommendations from other researchers. Also I think that it is a big opportunity to follow the state of art in manufacturing by being a part of CIRP Community.

Joseph Owen

My name is Dr. Joseph Owen. I am an Assistant Research Professor at the University of North Carolina at Charlotte. I completed my PhD in Mechanical Engineering with Dr. Matthew Davies. My research focuses on ultra-precision diamond machining of complex optics. This includes freeform optics, infrared materials, micro-structures, and most recently the grinding of silicon carbide. My responsibilities at UNC Charlotte include teaching and mentoring undergraduate students, directing a team of graduate researchers and procuring research funding.

I am honored to join the Research Affiliates of the International Academy for Production Engineering. I have attended and presented at two general assembles and I can already see the incredible benefits of being a part of the CIRP organization. I am eager to learn more from the vast wealth of knowledge and experience within the CIRP community. As a research affiliate I plan to pursue collaborative research opportunities with other research affiliates, associate members and fellows.

Denys Plakhotnik

I'm a Senior Software Developer at ModuleWorks (Germany), responsible for conducting and managing research projects in CAM simulation (additive and subtractive), toolpath generation, and other topics in virtual machining. Prior to joining ModuleWors, I has obtained a PhD degree in Mechanical Engineering in 2012 from KU Leuven (Belgium) under supervision of Prof. Bert Lauwers. Now, Prof. Fred van Houten from University of Twente (Netherlands) is my RA sponsor.

As part of CIRP RA community, I'm looking for fruitful collaboration and extensive networking activities with other RAs. Since ModuleWokrs is also a CIRP Corporate Member, CIRP RAs may obtain access to ModuleWorks simulation software for research purposes.

Lars Schönemann

I am a PostDoc researcher at the Laboratory for Precision Machining (LFM) under the direction of Professor Brinksmeier. After receiving my Master's degree in Systems Engineering (i.e.

computer sciences, electrical and mechanical engineering) at the University of Bremen, I started working at the LFM in 2008. Due to my interdisciplinary background, my main interest lies in the improvement of (ultra-precision) machining processes via software or mechatronic means. In my dissertation, I focused on a process called Diamond Micro Chiseling, which enables the generation of micro-optics with prismatic shape. Here, I developed my own CAD/CAM software in Matlab that implemented various process optimization steps and thereby reduced machining times considerably. After finishing my dissertation in 2014, I continued to work at the LFM as the head of the internal junior research group "speedUP" and coordinator of the collaborative research unit "Ultra-Precision High Performance Cutting". Since then, my focus is on improving the economic efficiency of ultra-precision machining processes by utilizing automated setup procedures and by applying high speed or high performance machining techniques.

Since 2013 I am also a lecturer at the University of Bremen, teaching engineering Bachelor students about scientific working, literature research and presentation skills. In the summer semester of 2017, I am also responsible for the lecture "machining technology".

From being a CIRP Research Affiliate, I expect to connect with fellow "early stage" researchers in the production engineering community and build a network for further scientific collaborations. Moreover, being an RA allows me to get an insight of the CIRP, one of the most important and well-respected scientific community in engineering. I hope that the collaborative work and fruitful discussion within CIRP colleagues will provide me with new ideas and viewpoints on not only precision engineering, but on production engineering in general.

Nicole Stricker

Currently, I am working as group leader in the field of production system planning at the wbk - Institute of Production Science in Karlsruhe (KIT), Germany. In 2016 I passed my Dr.-Ing. degree on "Robustness of interlinked Production Systems" under the guidance of Prof. Lanza. My research topics are focused on production systems planning, analysis, evaluation and improvement. I am especially interested in the fields of robustness, changeability and performance management. As I am coordination the activities in "Industrie 4.0" at our institute, the current changes by digitalization, data analytics and the vision of autonomous production systems are inspiring to me.

By being a CIRP Research Affiliate I hope to enlarge my network to researchers all around the world and have fruitful and inspiring discussions about good research ideas and the option for common research. I hope to gather new insides and perspectives and have a good time with other researchers in the community.

Names of the New RAs in 2017

Anas M.	ATIEH
Jörg	BAUER
Christopher John	CLEAVER
Roy G.J.	DAMGRAVE
Lamice	DENGUIR
Saurav	GOEL
Ivan	IOVKOV
Xiaoliang	JIN
Umut	KARAGÜZEL

Joseph D.	OWEN
Lars	SCHÖNEMANN
Alborz	SHOKRANI
Nicole	STRICKER
Ray Y.	ZHONG

Names of the RAs whose membership expired in February 2017

Kosmas	ALEXOPOULOS
Suphunnika	IBBOTSON
Daniel	MEYER
Erdem	ÖZTÜRK
Luca	ROMOLI
Islam E.M.	SHYHA

Two of them, Luca and Erdem, became Associate Members as well as Vikram Bedekar. Congratulations!