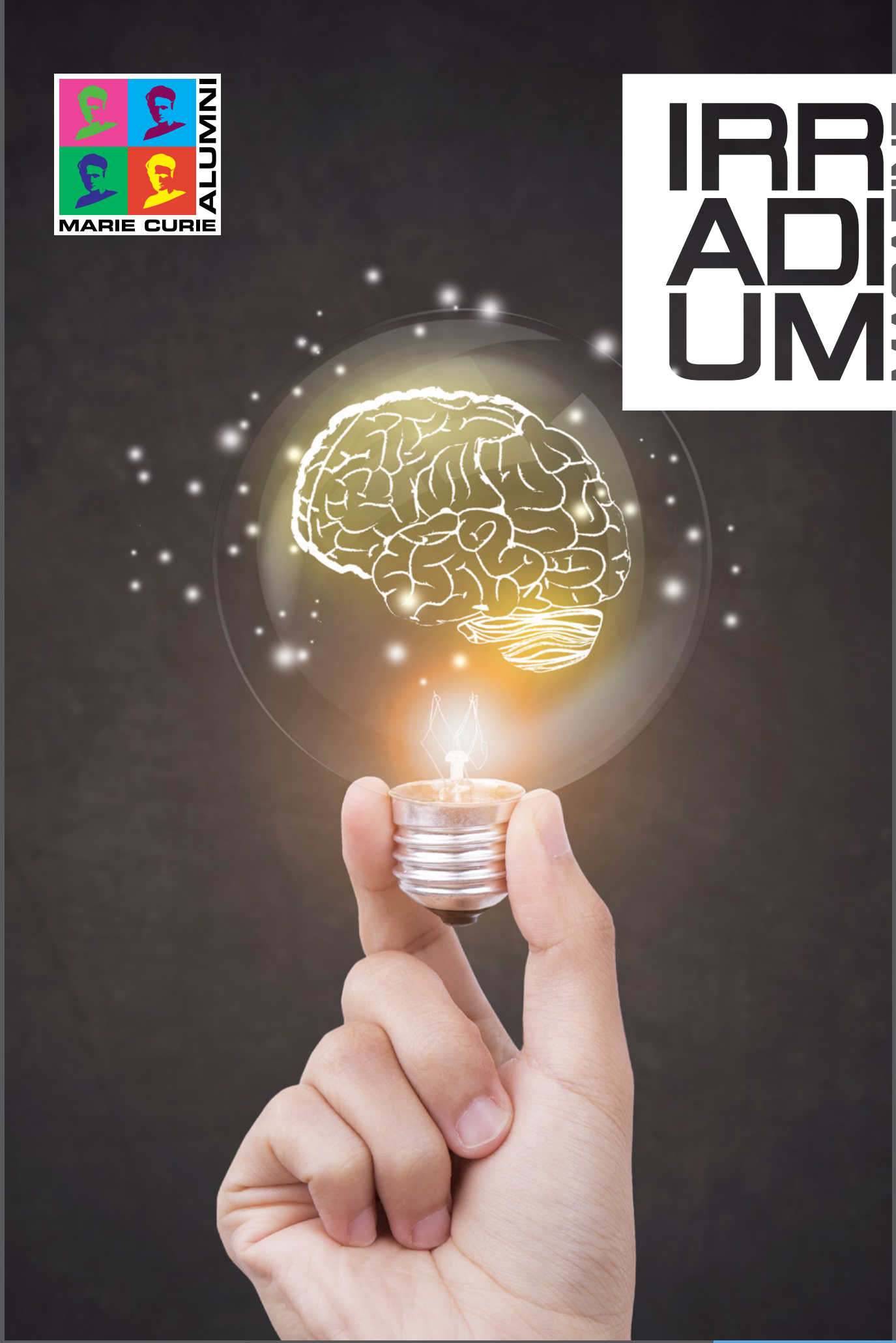
MARIE CURIE ALUMNI

IRRADIUM MAGAZINE



January 2019

Contents

Chairman's Letter

Over the past year, I have had the privilege of being part of a dynamic, inspiring and dedicated team of volunteers who make up the core of the MCAA leadership, including Board Members, Chapter Chairs, Working Group Chairs, and Ordinary Members who contribute to our organisation's activities.

During this time, I have taken on countless roles. I have travelled to conferences to serve as ambassador for MCAA. I have sat with policymakers to advocate for the benefit of researchers and their careers. I have led meetings to help define the roadmap for MCAA. I have met with partners to negotiate their support for MCAA. And I have met with many of our members at various events.

Hardly a day goes by when I don't receive an email or another message about something related to MCAA. Being Chair of MCAA Executive Committee is an honour and a privilege, but it's also a lot of work.

But it is work that I am still proud to do because I continue to see the value in our organisation – to give researchers around the globe, regardless of nationality, discipline or beliefs, a community which defines their shared experience as a mobile researcher.

Mobility defines Marie Curie alumni. Whether we move to a new country or a new field of research, or both, the experience of leaving our comfort zone can lead to frustration, loneliness and vulnerability. But the experience as mobile researchers changes us and opens

© Alessia Peviani

our minds to perspectives we never would have experienced if we had never taken the risk.

I hope that our accomplishments over the past year help to make MCAA a lasting organisation which brings researchers together and gives us a platform for outreach, advocacy and success amongst our members.

This edition of IRRADIUM is just a glimpse of some of the things our members, and our association, are doing. I hope you can be inspired by these stories, and that you have the opportunity to share your own with our global community.

I can think of no better way to close this message than with the words of Marie Skłodowska-Curie herself:

> "Nothing in life is to be feared, it is only to be understood".

Matthew DiFranco
MCAA Chair

Top sessions at the MCAA General Assembly and Annual Conference

Hello, my name is Mostafa Moonir Shawrav. I am a current Vice-Chair of MCAA and leading the organisation of the sixth MCAA General Assembly & Annual Conference in Vienna. More than 24 parallel sessions have been planned for this year's event and I am pleased to share some of these with you. I hope this will encourage you to check out other sessions from the website and to join the event.

CAREER PATHS FOR RESEARCHERS

As a researcher, you often pick up valuable transferable skills that are essential for jobs outside academia. This session, as well as the planned panel discussion, will inspire participants to develop transferrable skills for future jobs.

DIFFERENTLY ABLED RESEARCHERS

The session will delve into the needs and strengths of differently abled researchers. It will shed light on their daily and exceptional efforts, and emphasise the important role that institutions, such as local and national associations, can play. The necessity of legislation to secure compensation and provide the means for inclusion will also be stressed. The session will underline how im-

portant it is to disseminate information on this issue in order to allow and promote awareness and inclusion in society. There needs to be dialogue and exchange and efforts made from both sides to define the key steps of successful inclusion.

BEHIND THE SCENES OF A BUSINESS VENTURE

Spinning from academia to entrepreneurship can be exciting and stressful at the same time. During this session, MCAA members who have made the move will share their experiences. They will also provide helpful tips to help those who are thinking about embarking on a business Odyssey of their own.

WORKPLACE HARASSMENT

Recently, we have witnessed different types of harassments in academia. For example, sexual harassments and bullying can have a long-term negative impact on one's career and life. This session will discuss the recent issues and what can be improved at the policy level to combat and prevent harassment.

THE MENTAL HEALTH OF RESEARCHERS

Different academic entities, including MCAA, have found out through major surveys that the mental health of researchers is an issue that needs to be urgently addressed. This session will explore how to deal with this challenging issue. The focus will be on how to become aware and implement different strategies to overcome this issue.

SCIENCE DIPLOMACY

In today's conflicting world, science can play a crucial role to establish diplomacy or initiate dialogue between countries and vice-versa. The term is quite new, but there are already quite a few success stories of science diplomacy. This session will give an overview of the basics of science diplomacy as well as what are the future challenges and how to tackle them.

Behind the thematic "Research and Innovation beyond the Information Age"

Almost half of our members are young researchers dealing with novel innovation and the most significant new challenges of science and technology. At the same time, we are fortunate to have more than 3,500 members' experiences of scientific research and its impact. Therefore, we can often utilize the input on the most significant or relevant issues (or both) in science to choose a theme from. We have 11 board members who discussed and decided upon a theme for the next GA.

In relevance to our event theme, looking at the contemporary research and innovation that can become game changers, we expect a paradigm shift. Over the last few decades, the introduction of information and communication technology in every part of scientific and innovation research has accelerated this transformation. We believe we have reached a point where this advancement will be elevated beyond our computational and communicative competencies. As for the future, this development must be planned, budgeted, executed and evaluated in a timely manner.

What this means is that MCAA members should try to find solutions through research and innovation for the same problems that society faces as a whole. Moreover, MCAA has committed itself to support its members in career, network, policy and entrepreneurship as an integral part of this process.

As such, this year's theme is relevant for our members, as well as human civilisation as a whole, in various capacities.

MOSTAFA MOONIR SHAWRAV
MCAA VICE-CHAIR

The development of students' identities as knowledge builders

Yotam Hod is working on the SIKB project which aims to prepare school students to successfully take part in the new knowledge society. Funded by the Horizon 2020 framework programme, Yotam shares some insights from his research.

Yotam Hod, In his own words

My name is Yotam Hod. I'm an assistant professor at the University of Haifa, Israel. My research – in the field of learning sciences – is primarily concerned with examining human learning in classroom environments that are designed as learning communities. Classroom learning communities are a model for teaching and learning that position students as active, collaborative learners who learn through their direct experience as inquirers.

The technology is usually in their hands, instead of the teacher. This conception is a sharp departure from the structure of traditional classrooms, which need to transform given new societal demands as well as opportunities that have come about in the age of technology.

Research in this area is vital to advance teachers, develop educational technologies and new learning spaces, and of course guide policy and wide-scale change. My research deals with these aspects of the future of education through the prism of learning communities.

THE SIKB PROJECT

The SIKB project aims to examine how grade 5 students studying science within knowledge building communities (a specific type of technology-enhanced learning community) develop their identities as they participate in the learning process.

Acquiring knowledge has and should be a goal of education. But we are doing much more than this in classrooms. We are developing students' lifelong scientific practices, or the way they interact with knowledge, scrutinise it, build on it, collaborate with others etc.

When students participate in a classroom learning community, they must bring in their own personal experiences and interests to advance their knowledge. Some students are very successful at doing this, while others have a hard time either getting started or persevering through the challenges that they face. How they approach knowledge building is thus a matter of one's

practices and identity. The more we know about it the better we can support students to develop and become more successful knowledge builders.

WE ARE ALL 'KNOWLEDGE BUILDERS'

A knowledge builder is a person who engages in an endeavour aimed to advance theories or ideas about a particular topic. In their everyday life, people are knowledge builders in different contexts. A mother and father negotiating how to raise their children, a parent joining a Facebook group to discuss how to cook healthy food, and a brother and sister putting together a Lego structure while consulting a manual. These are all acts of knowledge building.

It is important to recognise the public nature of this process as people advance the state of knowledge – in either very small and subtle ways such as in these examples, in classrooms like those that I research where this is designed to happen, or in professional scientific communities that aim to make big discoveries.

SPECIFICITIES OF STUDENTS' IDENTITIES

We are all knowledge builders in that we all face and react to knowledge in all aspects of our lives, and do so in routinised ways. Just as no two fingerprints are the same, no two people build knowledge the same way. So it is a very individualised and personal story. Still, we can see patterns in the way people build knowledge, and can identify more successful practices.

For example, becoming aware of other people's knowledge is vital for the next step of building on and advancing an idea. Therefore students need to be good, active listeners. Other examples include sharing knowledge instead of keeping it private, seeking out help in the face of challenges or setbacks, and clarifying then following one's own interests.

These types of practices (that form people's knowledge building identities) are often hard to change in people, as they sit deeply within people's belief systems, understandings, feelings, and attitudes.

EXPECTED RESULTS OF THE PROJECT

Learning is too often viewed from a classroom-centric perspective – students are measured based on external standards and this basically ignores their interests and how they use what they learn as part of their everyday lives.

The expected results of this study will provide us new ways to examine learning by taking the perspective of students as lifelong, lifewide, and lifedeep knowledge builders. Having this perspective should help to re-frame how classrooms can be organised so that what students learn is better connected and relevant to their lives.

YOTAM HOD

When MCAA meets Kazi

The Marie Curie Alumni Association has partnered with the Antwerp-based human resources technology company, Kazi, to help bridge the expectations gap between candidates and potential employees in Flanders.

COMING TOGETHER

In 2017, Zsofia Buttel, the Chair of the MCAA Financial Affairs Working Group, and Guilherme Serodio, from INOVA+ represented the MCAA at the PhD Career Fair in Ghent. It was here they met with representatives from Kazi.

"From that initial contact, the MCAA and Kazi formulated a proposal for funding from the Flemish government under the title 'Bridging the expectations gaps between PhDs, postdocs and industries in Flanders region'," noted the MCAA members who contributed to the project: Bala Attili, Esther Volz, Zsofia Buttel, Sara Johansson and Matthew DiFranco.

THE EXPECTATIONS GAP

There was a much-needed demand for this collaboration. The Flanders government see talent retention, or 'brain drain' as a major issue affecting their economic well-being. Despite having excellent doctoral programmes in Flanders, there is a real struggle to retain researchers to complete their PhD in the region.

SOLVING THE ISSUE

To address this, the MCAA and Kazi are working on a project 'Bridging the expectations gaps between PhDs, postdocs and industries in Flanders region' with an added emphasis on work values and team roles. The project aims to activate PhDs, postdocs and industrial employers to respond to a questionnaire provided by Kazi which is designed to 'tag' the expectations gap. The responses will then be used to provide analysis and insights into the specific labour market which can potentially be utilised to inform future policy in Flanders.

Kazi is providing MCAA with its proven timeline for this project, and with prototype deliverables in terms of activation ad communication. "MCAA's objective is to create a

branded communication that will reach PhD holders and candidates who could benefit from the project outputs. Similar communication will be addressed to companies offering jobs to these candidates," the MCAA group outlined. Kazi has offered to take the lead in communication towards industry while leveraging MCAA's connections.

THE IMPORTANCE OF THE PARTNERSHIP

The MCAA has partnered with other associations, but the agreement with Kazi is unique. It's the first-time it has received external funding and is working in tandem with a private company where their combined strengths are essential for the overall success of the project.

"The MCAA is mobilising its network of members in the Benelux region to gather valuable feedback on this expectation gap," explained the group. Furthermore, it is using its broader, global reach to disseminate the project's methodology and findings to industry and academic stakeholders.

"We hope this project gives us insight into how we can leverage our diverse, highly skilled global network of over 12,000 members to achieve significant results with a societal impact, which will be further useful for researchers, industries, universities and governments," explained the group.

ACKNOWLEDGEMENTS

"The MCAA is extremely grateful for the support from the Flanders government, and for the opportunity to work with Kazi on this project. We see the potential in being able to replicate this methodology for other local, regional or national governments. At its heart, MCAA is a global network of researchers with a mission to improve the quality of researcher careers, and our relationship with Kazi is definitely helping us in that mission," the group said.

GETTING INVOLVED

Researchers, including those not from the Flanders region, who would like to take part in the questionnaire can find more information here: https://www.mariecuriealumni.eu/kazi.

It is important to note that while Industry representatives can also participate using the above link, they will need to be located in the Flanders region.

To contact the MCAA about the project, email: kazi@mariecuriealumni.eu

Vienna BioCenter

Vienna BioCenter

The Vienna BioCenter is a leading life sciences campus in Europe, offering a unique combination of research, education, and companies in a single location.

RESEARCH

The Vienna BioCenter hosts over 1,400 scientists, with a focus on molecular biology and biomedicine. The heavy-weight research is carried out by four academic research institutes:

- Gregor Mendel Institute of Molecular Plant Biology (GMI)
- Institute of Molecular Biotechnology (IMBA)
- Max F. Perutz Laboratories (MFPL)
- Research Institute of Molecular Pathology (IMP)

EDUCATION

Education is one of the pillars of the Vienna BioCenter. The four research institutes offer different training opportunities under the motto “Empowering Curious Researchers”, including an international Summer School and PhD programs. All trainings are multidisciplinary, entirely in English and offer fully-funded positions.

BIOTECH

The biotech scene at the Vienna BioCenter is growing rapidly. Currently there are more than 20 companies on campus, mainly in the areas of vaccine development, immunology, and disease diagnostics. Several biotech companies are spin-offs from the research and educational institutions on site, while others have chosen to relocate to the Vienna BioCenter for its unique location, services, and atmosphere.

CAREER OPPORTUNITIES

If you are passionate about life sciences, the Vienna BioCenter offers a fantastic environment for growth, both professionally and personally. There are multiple opportunities for scientists at all levels of their careers.

More information: www.viennabiocenter.org

10 REASONS TO WORK AT THE VIENNA BIOCENTER

1. The Vienna BioCenter institutions are **global leaders** in their fields: the research institutes excel in molecular biology and the biotech companies are experts in vaccines and immunology.
2. Some of the **best scientists** in the world perform their **research at the Vienna BioCenter**. Excellent scientific track record of **key discoveries** and two Breakthrough Prizes among our alumni: Emmanuelle Charpentier (CRISPR/Cas9) and Kim Nasmyth (chromosome segregation).
3. **Competitive funding**: national and international funding sources include FWF, FFG, WWTF, aws, Vienna Business Agency, EMBO, HFSP, and the European earned **49 ERC Grants** in total, which amount to €85 million.
4. **State-of-the-art scientific facilities**: the **Vienna BioCenter Core Facilities (VBCF)** and additional scientific services in the research institutes provide technology, infrastructure, and support beyond expectations.
5. **Publication record**: 350 publications in peer-reviewed journals per year.
6. **Intensive scientific exchange**: 200 renowned **speakers** per year and a community of 1,400 scientists create fantastic collaboration and networking opportunities.
7. **International atmosphere**: 70 nationalities from six different continents. 40% of the staff at the Vienna BioCenter come from abroad and English is our working language.
8. **Collaborative culture**: dedicated and enthusiastic researchers provide for a flexible and collaborative **work environment**. Open-door culture, curiosity, flexibility, flat hierarchies, and academic freedom are our core values.
9. **Kindergarten**: there is a child care center on campus for children between 3 months and 6 years of age at a very competitive fee.
10. **Location**: The Vienna BioCenter is centrally located in the world’s number one **most livable city**. Excellent connections by public transport (bus, tram, suburban train) to the city center (10 min) and to the airport (20 min).

The upcoming revolution of Open Science

Open Science is all about an ongoing transition in how research is performed and how knowledge should be shared. We met Gareth O'Neil, president of the European Council of Doctoral Candidates and Junior Researchers (Eurodoc), to find out more about how researchers can take part in this upcoming revolution.

WHAT'S AT STAKE?

Open Science aims to open up the research cycle via digital tools and platforms (including the processes and outcomes of research) in order to validate and share research with researchers and society. There are several practices under Open Science:

- Open Access to open up research publications;
- Open/FAIR Data to open up and make research data findable, accessible, interoperable, and reusable;
- Open Education to open up research training materials for trainers and students;
- Open Source to open up the programming code behind research;
- Citizen Science to involve citizens in research.

Eurodoc fully supports Open Science and in particular advocates for more awareness raising as well as adequate training and support for researchers in Open Science at institutions. Traditional science has involved keeping research closed to some extent, so a cultural shift is needed in academia to move to Open Science.

WHAT'S PLAN S?

A radical new plan from a coalition of national research funders called 'Plan S' is aiming to speed up the transition to Open Access and give full and immediate Open Access to research publications by 2020, as explained here.

Eurodoc, together with the Marie Curie Alumni Association (MCAA), and the Young Academy of Europe (YAE) released a joint statement supporting the 10 principles behind Plan S with some critical recommendations on implementing the plan from the perspective of researchers.

Plan S sets some radical limitations on publications which are important for researchers funded by a coalition member: researchers must retain copyright under an open licence; there must be immediate access without any embargo period; there must be full access with restrictions on hybrid journals; and there will be a cap on the fee which can be spent per publication to publish Open Access. A research publication must adhere to all these limitations to be compliant and be funded under Plan S.

MIXED REACTIONS

Our joint statement was submitted to the coalition members and our three organisations had a meeting with Robert-Jan Smits (Special Envoy on Open Access at the European Commission) and Stephan Kuster (Secretary-General at Science Europe) to discuss our recommendations for Plan S.

The coalition members have since released a detailed implementation guidance for Plan S and have taken some of our recommendations into account (https://www.coalition-s.org/feedback).

The reaction from the broader research community has been mixed. Some researchers started a petition against Plan S, worried it focuses too much on journals charging fees for Open Access and that it restricts their publishing options and their freedom to choose where to publish.

Other researchers started yet another petition in support of funder mandates for Open Access and indirectly for Plan S. And the universities via the European University Association (EUA) have also come out in support of Plan S. The plan has succeeded in making Open Access a hot topic and is now being discussed across the whole research community.

WHAT'S NEXT?

An online consultation on the details of the implementation guidance for Plan S was open to all research stakeholders until 1 February 2019. Eurodoc, MCAA, and YAE are now in the process of drafting a joint response to the implementation guidance with our members and will submit this statement to the coalition members within the deadline.

Our goal will be to make sure that our recommendations are taken into account and ensure not only that Plan S is a success for Open Access, but that Plan S is a success for researchers.

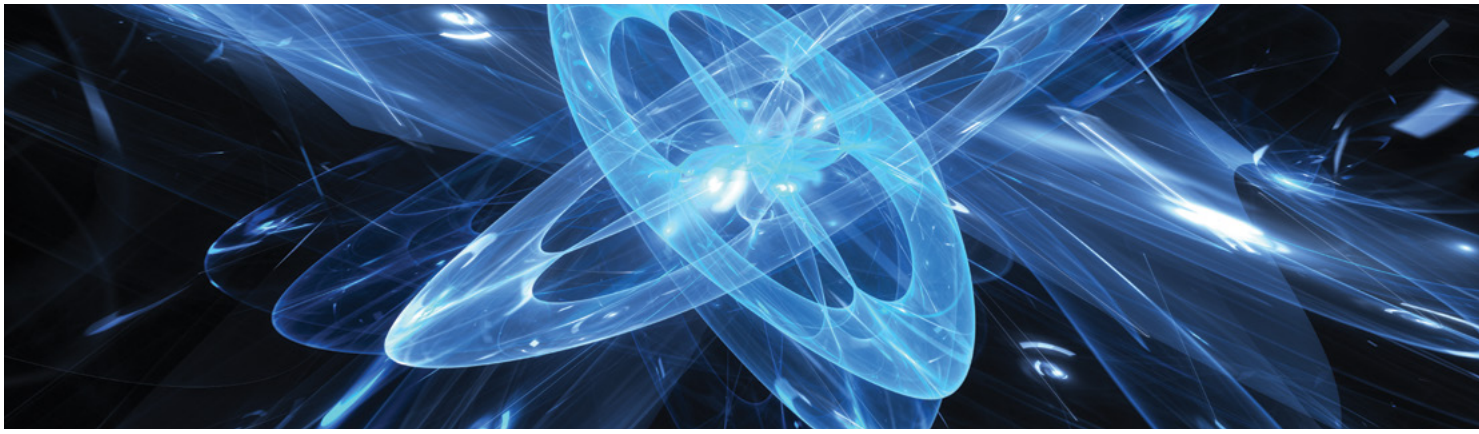
We note that implementing the principles of Plan S will not be enough to change the culture of limited access to research publications. The current research and career evaluation system is unfortunately based, to a large extent, on publishing in high-impact journals which are often not Open Access and charge high fees for Open Access and are thus not compliant with Plan S. The coalition members will themselves need to change their own research evaluation system so that researchers are positively rewarded for other research activities and publishing in Open Access.

Read more about the project at:
https://www.coalition-s.org/

GARETH O'NEIL

Quantum technologies

We are currently in the midst of a second quantum revolution, according to Jonathan P. Dowling and Gerard J. Milburn in Quantum Technology: The Second Quantum Revolution. The first quantum revolution gave us new rules that govern physical reality. The second will take these rules and use them to develop new technologies. What's at stake and what is the European Commission's strategy?



A NEW REVOLUTION IS COMING

We are now actively employing quantum mechanics to alter the quantum face of our physical world, according to Jonathan P. Dowling and Gerard J. Milburn in Quantum Technology: The Second Quantum Revolution. Specifically, they note: "We are transforming it into highly unnatural quantum states of our own design, for our own purpose. For example, in addition to explaining the periodic table, we can make new artificial atoms – quantum dots and excitons – which we can engineer to have electronic and optical properties of our own choosing. We can create states of quantum coherent or entangled matter and energy that likely existed nowhere else in the Universe."

EUROPEAN QUANTUM TECHNOLOGIES FLAGSHIP

CONTEXT

Since 1998, the European Commission's Future and Emerging Technologies (FET) programme has provided around EUR 550 million of funding for quantum research in Europe. In 2018, the Commission launched officially the first Quantum Technologies Flagship Coordination and Support Action.

The flagship is a research initiative that brings together research institutions, industry and public funders. It aims to foster the development of a competitive quantum industry in Europe, making the results of quantum research available as commercial applications and disruptive technologies.

BUDGET AND DURATION

The Flagship will run for 10 years, with an expected budget of EUR 1 billion.

IMPACTED AREAS

From October 2018-September 2021, it will provide EUR 132 million of funding for 20 projects in:

- Quantum communication;
- Quantum simulation;
- Quantum computing;
- Quantum metrology and sensing.

LONG-TERM VISION

The Flagship aims to develop in Europe a 'quantum web', where quantum computers, simulators and sensors are interconnected via quantum communication networks.

More information about the Flagship

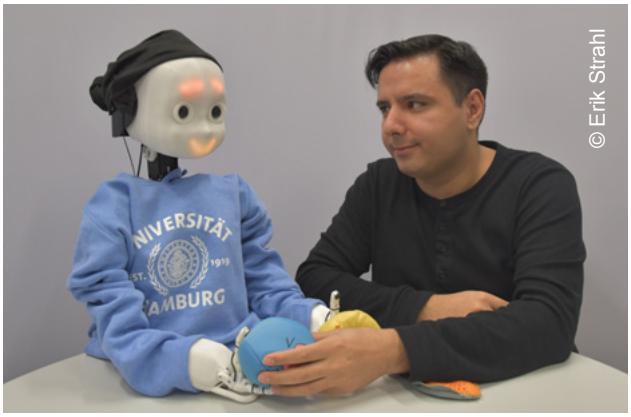
European approach to Artificial Intelligence: Challenges, developments and uptake

In 2018, the European Commission proposed an approach to capitalise on the opportunities presented by artificial intelligence (AI) and to address the new challenges it brings. The three-pronged approach aims to boost public and private investments, prepare for socioeconomic changes due to AI and ensure a suitable ethical and legal framework.

MCAA member Mohammad Ali Zamani and Marie Sklodowska-Curie Individual Fellow Jia-Jie Zhu share their thoughts on AI with us.

Mohammad Ali Zamani

I was born in Iran and completed my Bachelor's degree in electrical and control engineering at the University of Tehran. Passionate about AI and robotics, I pursued a Master's in computer science at Ozyegin University. Then, I joined the Knowledge Technology Group at the University of Hamburg to work on cognitive robotics.



© Erik Strahl

Dr Jia-Jie Zhu

I grew up in Shanghai, and studied mathematics for my undergraduate at Fudan University and applied mathematics and statistics for my PhD at the University of Florida. I work at the Max Planck Institute for Intelligent Systems in the areas of optimal control (using optimisation to control and make decisions) and reinforcement learning (an AI subject), with a focus on robotics applications.


© Jia-Jie Zhu

AI is transforming our world. What new challenges does it present that Europe should meet?

Mohammad Ali: Data is generally very expensive to collect, both time- and cost-wise, and might risk individual privacy. Moreover, one big challenge is that even trained systems may still struggle in novel situations or generally in real-life conditions. Such malfunctions may lead to mistrust among AI users, especially the less experienced ones. This needs to be addressed in better AI systems.

Additionally, for active types of AIs like robots, interacting with a novel environment is also challenging. For example, in the robotics field, although there are robots that manoeuvre in very real-life conditions, manipulation of new and unknown objects is still a challenging topic.

Perception has improved due to the large quantity of data that's easily available nowadays. However, there's no data for a particular robot and an environment unless the robot starts to interact with the environment and collect data. So, a robot learning how to act in the real world is a much more complicated problem. Even solutions for one robot may not be directly deployable on another type. Therefore, I think that improving the robustness of AI algorithms is critical, which is possible through mechanisms like self-learning algorithms.

Jia-Jie: One particularly tough challenge is how to attract global talent. Obviously, Europe has a hurdle to overcome in that much AI talent, even European scholars, choose to work in North America. Traditionally, Europe has been a force in basic scientific research such as physics and mathematics, but it's playing catch-up to North America when it comes to the technology sector. The education system isn't particularly focused on applied research such as computational science. But we've been witnessing amazing progress recently such as Max Planck and ETH Zurich.

Rather than challenges, I see more opportunities for Europe. For example, boosting manufacturing with robotics and automation, self-driving cars and innovation in other sectors like finance and investing.

How will advances in AI influence the scientific field?

Mohammad Ali: In the future, we expect AIs that are close to human-level perception, analysis, and more importantly, intelligence. It will be far from a replication of a human but, I think, it would be good enough to solve basic tasks. With such abilities, we can assume that AI can be applied as a tool for analysis, diagnosis and decision-making in other scientific fields.

Jia-Jie: The study of AI, particularly machine learning, will bring new tools to many scientific fields. The ability to process and draw conclusions on large amounts of data makes a key difference in fields such as biology and medicine. In robotics, a lot of times, learning becomes a necessary tool. Robot learning is gaining popularity. It applies AI and machine learning techniques to robotics in order to solve problems that traditional methods have difficulties in doing. AI has also been at the forefront of many good scientific practices, such as double-blind peer reviews and close collaborations with industry.

Europe has world-class researchers, laboratories and start-ups in AI. It wants to be at the forefront of AI developments, but competition is fierce. The European Commission is proposing an approach to make the most out of the opportunities offered by AI. In your opinion, how can the Commission boost AI uptake across Europe?

Mohammad Ali: I think AI solutions that perform well without bias and violating privacy will eventually be commonly used. Besides supporting research in bias and privacy, in the long run, we need algorithms that are more data-efficient and explainable. Data-efficient algorithms will suppress the urge for more data, and individual's privacy remains respected. Also, explainable AI gains public trust by clarifying for its users why a decision has been made. To boost uptake, I believe the Commission can support researchers by focusing on methods that are data-efficient and explainable.

Jia-Jie: One concrete solution is to create jobs for the young who are or will be entering the job market, especially in academia and basic research. Without job prospects, it's hard to imagine that researchers will choose to work here. I myself choose to be at Max Planck because of the research topic fit, reputation and personal preference for a European lifestyle over an American one. But I also watched as many young researchers left Europe after they did their PhD/post-doc. Language is also an issue. In many countries, the local language is a must to be a tenured professor, which prevents many international researchers from staying.

The EU GDPR: A game changer for scientific research and health science

The General Data Protection Regulation (GDPR) rules started to apply on 25 May 2018. They will fundamentally reshape the way data is handled across every domain, particularly health science.

Declan Kirrane is Chairman and Managing Director of Intelligence in Science (ISC), a Brussels-based advisory firm specialising in science, technology, R&D research and policy. After the GDPR entered into force in 2016, ISC organised an influential seminar that mainly gathered experts, EU policy- and decision-makers, and representatives from research organisations, industry and advocacy groups. They explored possible implications of the GDPR on the operation of R&D and science, and on collaborative EU research.

ISC organised "The Impact of the General Data Protection Regulation (GDPR) on collaborative science in Europe" seminar. What were the main outcomes?

The main result was a better appreciation of the enormous complexity in understanding GDPR's impact on science. Initially, its impact wasn't considered a priority during the proposed Regulation's concept stage. Of course, most people understand that the GDPR's impact will just be on the use of sensitive personal data, for example in health research. Very few people realise that for instance location data is personal data, too.

Specifically, the outcome of the meeting was a realisation that for any organisation to be compliant with the GDPR, they would in principle have to abide by a code of conduct. Article 40 states that Member States, supervisory authorities, the Board and the Commission shall encourage the drawing up of codes intended to contribute to GDPR's

proper application. They will take into account the specific features of the various processing sectors and needs of micro-, small and medium-sized enterprises.

There's also the question of monitoring and enforcement. The issue of monitoring bodies arises in Article 40(4) and then 41, i.e. whether a monitoring body is a mandatory requirement in order for a code to obtain approval. The current position is that this will be the case. A second issue that's linked is the accreditation of a monitoring body, and this is another area that needs to be resolved. However, there appears to be some flexibility amongst data protection authorities on this issue. Perhaps a less stringent approach may be posited that will consider a pragmatic view to appropriately accommodate the variety and composition of associations that may be interested in drafting and seeking approval for their code both at national and European levels. This in turn may balance out the mandatory requirement of having one in the first instance.

Kirrane works very closely on GDPR issues with Kurt Zatloukal, an authority on the subject. Zatloukal, MD, is a professor of pathology at the Medical University of Graz and head of the Diagnostic and Research Center for Molecular BioMedicine. He coordinated the preparatory phase of the European biobanking and biomolecular research infrastructure (BBMRI-ERIC), and is now director of its Austrian national node. BBMRI-ERIC provides access to human biological samples and associated medical data. GDPR is of key relevance to BBMRI-ERIC, which has been involved as a stakeholder in its development. BBMRI-ERIC is currently working on a code of conduct for implementation in biomedical research. Zatloukal is a member of the scientific board for genetic testing and human gene therapy at the Austrian Ministry of Health, and a member of the Austrian Standards Institute, CEN and ISO technical committees. He's also a project leader for several European and ISO standards for pre-analytical processing of tissue samples for molecular diagnostics.

What is the GDPR's impact on scientific research overall, and health science in particular?

GDPR is a great opportunity for Europe. It's one important part in developing this common European data space according to the Single Digital Market strategy. You need a defined and secure environment to share data. Without such an environment, you can't share. GDPR was a major step towards developing this common European space for sharing data. I think the end result is a good compromise for protecting the privacy and interests of data subjects, but at the same time giving

enough flexibility for the research we need. GDPR definitely strengthens the rights of the data subject in terms of giving rights to know which data is using this process, the right to receive, to correct and delete data. This is very important, especially in medical research.

By the way, this also opens completely new innovation business fields in the context of health and health services because medicine today really relies on using different types of data. Without data, you can't diagnose a disease or treat a patient. When patients don't have access to their disease and health-related data, they can't seek independent advice or a second opinion. As a result, they can't choose the most appropriate care. So this right is key for opening the health market to citizens. Without this power to access your own data, you can't exercise these rights and the autonomy of free healthcare choice. This of course provides entirely new opportunities for new products, new services and so on, so this has major implications.

On the classical research side, the GDPR's Article 89 created a common basis for research in Europe and in the health domain, as well as research requiring access to sensitive data. The good thing is it's now a common European basis. It gives some freedom and flexibility because it explicitly foresees that research can be performed even without specific consent which sometimes isn't possible or affordable, and would undermine the scientific goals of a project. However, in this case we have to take proper measures to protect the data subjects' privacy and interests. This is done by anonymising data and/or removing identifiers as early as possible in the research process, and setting up the technical and governance safeguards to protect such privacy and interests. If you do it properly, then you have the freedom. The downside of this is that Article 89 gave some freedom to Member States to further define how it gets implemented and aligns with national laws. As a result, we're observing different implementation, and this to some extent counteracts and undermines the common basis which was a major goal and achievement of GDPR. So it's good to have a common basis, but the drawback is that some important issues were delegated to Member States in the end. Here we see again a new level of heterogeneity in this European framework.

What is a major GDPR challenge ahead for the EU, and how can we overcome it?

A challenge for the future is data access. The way we analyse data will be very important for driving research, innovation, health and the economy. Without these capabilities, one can't participate in this development. I see here a very heterogeneous global landscape. I think it will be a challenge for Europe, first of all to provide data in a standardised way because if data isn't standardised, if you can't define data quality, it's essentially rubbish. Particularly personalised medicine, you can't compensate rubbish with massive data because this will completely hide the distinct features of an individual disease that's key to personalised medicine. Therefore, data quality is absolutely crucial, and we need to standardise our procedures and establish criteria on how to define data quality. Next, when we have data, we need the capacity to analyse it. This is where I see a global imbalance when it comes to the capacities of large-scale data analysis. The big companies aren't in Europe.

The "lost generation" of academic scientists

Sara Ricardo, MCAA Board member, led a session at ESOF 2018 dedicated to a phenomenon called "the "lost generation" of academic scientists". We interviewed her to find out more and to discuss how to improve the future of scientists and researchers.

Sara Ricardo

Sara has been a Career-Track Principal Investigator in Cell and Developmental Biology in Barcelona since 2011. She is also an independent public funding consultant, working with foundations, companies and academic institutions. Experienced in managing teams, projects and budgets and developing partnerships and collaborations with non-governmental organisations and academic institutions. Sara was awarded a PhD by the University College London (UCL), followed by post-doctoral work in the NYU Langone Medical Center in New York. Her work has dealt with basic questions of Cell Biology, such as tissue organisation and cell motility, within the 3D complex and dynamic in vivo embryonic system. Within MCAA, apart from currently serving on the Board, Sara has been a co-chair of the Portugal-Spanish chapter and is an active Policy WG member.

What's the "lost generation" of academic scientists?

The "lost generation" of academic scientists refers to the mid-career scientists and researchers who, after completing many short-term contracts and temporary positions, find themselves largely excluded from research careers due to lack of opportunities for permanent positions.

The term "lost generation" was first coined by Gertrude Stein to identify writers coming of age during World War I to whom pre-war values were no longer valid. We thought that this was a good term to represent the mid-career academics cohort that

were caught in the middle, in an age in which the old rules that governed the scientific enterprise, and by extension research careers, no longer applied and have been suffering the consequences of that.

Can you tell us about your session at ESOF?

I think the session went very well, we had good speakers and it got a good attendance in terms of number, variety of people and ages. I especially liked that it was interactive, and people were able to voice their doubts, questions and suggestions. I am also happy with the news coverage that it got, as it allowed the subject to be made aware outside that room at ESOF. Of course, this is just a drop in the ocean and much more should or could be done but I am content with this first step.

Universities and other institutions should track and provide data on how many academic jobs are available at each level. Do you think this is something that all stakeholders would do?

Honestly, although they could, all stakeholders may not be willing to do it. I think some may but some most likely won't. But it is something that if it is pushed, namely at the level of the university and research institutions associations (e.g. EUA, LERU), it may happen, at least initially in smaller groups. If these small groups are influential then maybe it can grow. But, realistically, moving several stakeholders is not an easy task.

In the article published by the Angle Journal, you mentioned recommendations that have been done both in the US and in Europe. Could you tell us about both recommendations?

'The European Commission should study and possibly fund a tenure-track model for Europe and encourage national governments to open up traditional career paths to new possibilities, removing unnecessary legal barriers'

This is a complex answer, but I will try to summarise some of the most important points here. Firstly, one of the main difficulties that Europe faces in terms of researchers' careers policies is that it consists of a very diverse group of countries, in which several academic models exist. That may be one of the reasons why in the US it is simpler to advance with specific recommendations (although not necessarily putting them into practice).

In the US, there have been proposals at the different career steps: 1) Better postdoctoral skill training and mentorship 2) Transition independent grant schemes to aid scientific independence of postdocs 3) Funding (e.g. R01 grant) for all new investigators, grant support for investigators in non-tenure track positions and job security measures for the stabilization of junior research leaders (e.g. bridge financial support).

It has also been proposed that data collection on the scientific workforce and programme evaluation be improved. It has also been noted that tenure-track positions will not increase, so the recommendations focus on other ways to improve the quality of training and foster other opportunities for independence (e.g. investigators in larger teams and staff scientists).

In Europe, it has been recommended that universities and research institutions: 1) create a more stable and established tenure-track model, 2) allow the creation of a uniform European tenure-track model, toward a reliable and consistent system that would provide researchers with an interchangeable and efficient career path across Europe, taking care that a competitive system does not lead to loss of European talent, 3) provide

continuous guidance and support of tenure-track awardees, paying special attention to those that have not been awarded tenure; National Governments should grant universities and research institutions the autonomy and financial means to experiment with the tenure-track process, supporting clarity and transparency; the European Commission should study and possibly fund a tenure-track model for Europe and encourage national governments to open up traditional career paths to new possibilities, removing unnecessary legal barriers.

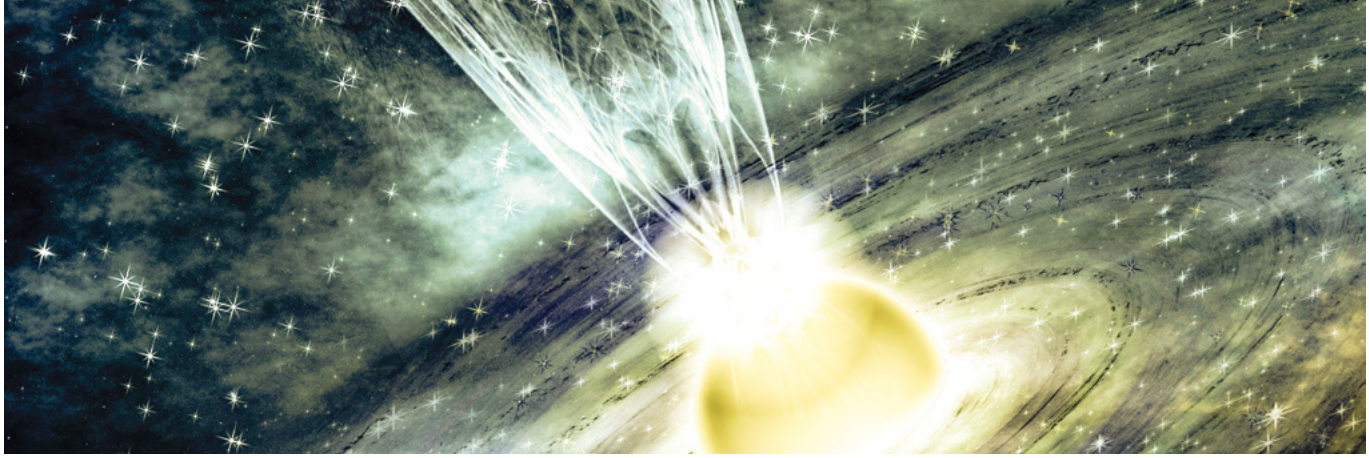
Is industry the future of scientists?

'Industry is one career option but there are others (e.g. government, NGOs, entrepreneurship)'

I'd say that the future for scientists is different than before. Industry is one career option but there are others (e.g. government, NGOs, entrepreneurship). Also, academic scientists will not disappear.

What we are seeing is that there are more and better options than before and hopefully there will also be more career flexibility and fluidity than before. Scientists may want to consider all options as the academic job market saturates and keeps changing. Also, I think it would be important to remove ourselves from a "one job, one track" mind-set as it is very unlikely that that will be the future of jobs in our society.

I am of the opinion that the skills of scientists are very applicable and valuable more broadly in society (one would even wonder if more than in academia, for example) but it requires that we, as scientists, show pro-activity, adjust to the changing landscape and learn how to show our skills and talents outside of our most immediate professional environment.



The dawn of gravitational wave science

In a handful of observatories in Europe and the US, scientists have been waiting and listening. Their quest was to detect gravitational waves - a rhythm of stretch and compression in the space-time fabric.

GRAWITON, funded under the FP7 Marie Curie Actions, has been a wonderful initiative that introduced a team of young researchers into the gravitational wave research. The initial training network contributed to groundbreaking discoveries that allowed them to see and hear the spectacular collision of neutron stars and of black holes.

This marks the first time that cosmic events have been viewed in both gravitational waves and light. Perhaps one day we could also see and hear other sounds of the Universe such as the frantic final moments in the life of other massive stars or even the remnant rumble of the Big Bang itself.

EINSTEIN'S UNFINISHED SYMPHONY

Powerful events involving massive accelerating objects, just like detonating stars or colliding black holes, disrupt space-time in such a way that waves of distorted space seem to be radiating from the source at the speed of light. These ripples alternately stretch and squeeze space, causing the distance between objects to expand and contract.

They permeate everything from the emptiest spot to the densest core of any object in the sky without requiring air or some other material to carry them. By the time they reach Earth, they are so faint that picking them out of the surrounding noise is comparable to noticing the removal of a single grain of sand.

These vibrations in space-time or gravitational waves are the last prediction of Einstein's general theory of relativity. They had been, until recently, his unfinished symphony, waiting nearly a century to be heard. Given the scant experiments available at the time of its conception, general relativity had been side-lined from mainstream physics and largely became a theoretical curiosity. But from 1960s onward, evidence had grown for a Big Bang that set the Universe expanding and for black holes – two of Einstein's key predictions.

FORTUNE FAVOURS THE BRAVE

The area of gravitational waves has been therefore one of those areas of astronomy research that has had a number of quiet times and rebirths. "The GRAWITON initiative was proposed at a time that gravitational waves used to be a research topic that had almost been pushed aside by most astronomers and had only been investigated by a small fraction of the global physics community – especially those involved in the US-based Laser Interferometer Gravitational-Wave Observatory (LIGO) and the Europe-based Virgo detector," notes project coordinator Michele Punturo.

Within two years, these detectors had made crucial discoveries that opened a new chapter in the workings of the Universe. Thirteen early-stage researchers involved

in GRAWITON have been part of this epochal change in the history of astrophysics by making immense contributions to the detection of gravitational waves.

NETWORK CORE ACTIVITIES

Researchers stemming from France, Germany and Italy contributed to the data analysis and technological developments necessary for the breakthroughs. In particular, they had the opportunity to engage with complex optical apparatuses, high-power and low-noise lasers, highly reflective coatings, and simulation and modelling work.

Given that gravitational waves is a new and still unexplored field, they worked on simplifying data analysis methods. They used what they call 'matched filters' for detecting and analysing the presence of known signals, or templates, in unknown signals.

For modelling poorly known astrophysical sources, they resorted to other techniques; for example, they searched sources of excess energy with certain frequency behaviour. Yet, they left plenty of room for improving models for completely unknown sources of gravitational waves or more complex phenomena that are still not possible to be accurately described. New data analysis methods were also developed for coalescing binary black holes where templates are quite poor.

Furthermore, researchers received advanced training in the cutting-edge technologies that will be implemented in future gravitational wave detectors such as the Einstein telescope – a proposed third-generation ground-based gravitational wave detector, currently under study by some institutions in the EU. New lasers of a different wavelength and new laser injection optics developed by GRAWITON will be crucial to testing the general theory of relativity in strong gravitational field conditions and realising precision gravitational wave astronomy.

WHY GRAVITATIONAL WAVES MATTER

"The detection of gravitational waves has been much more than a simple confirmation of Einstein's prediction. These ripples in the space-time fabric are revealing a Universe invisible to other messengers: the black-hole Universe," notes Punturo. This has been invisible to scientists who have relied almost exclusively on electromagnetic radiation to study objects and phenomena in the Universe.

The observations of ten stellar-mass binary black hole mergers that have been confidently detected to date are posing new questions on gravitational wave astronomy that will help explore some of the greatest questions in physics: How do black holes form? Is general relativity a valid description of gravity so that it can rule out other theories that are often introduced to replace the role of dark matter and dark energy?

The gravitational waves observed from the neutron star collision gave a sense of what a neutron star might look like in its core. The information also helped researchers narrow down the possible origin of the Universe's most powerful electromagnetic events – the short gamma ray bursts. Importantly, the observation solved a longstanding mystery about the origin of heavy elements such as gold and platinum.

The extreme weakness of all these sought-for effects demanded detection sensitivity of dazzling capabilities. "LIGO and Virgo interferometers can sense motions at the level of one-hundred-thousandth of the radius of a proton. The next generation of detectors will be ten times more sensitive," notes Punturo.

NEXT STEPS

The next LIGO-Virgo observing run will commence in March 2019. Estimates suggest much more binary black-hole mergers and, hopefully, a few more binary neutron-star detections. Improving the distance along the arms of the interferometers should exponentially increase the number of detected cosmic events.

Once significant progress will be made on this, the next main issue will be to have enough human and computational resources to analyse all gravitational wave signals. Then, there will always be a possibility to discover something unexpected, such as exotic sources of gravitational waves (micro black holes), that will revolutionise how we will view the Universe and our place within it.

Inspiring participations at the Fringe Festival

Have you heard about the Fringe Festival? Every August for three weeks, Scotland's capital city of Edinburgh welcomes this very important event. At the latest session, the MCAA was represented by Yana Wade and Valerie Bentivegna, our new Communication Working Group Chair. In case you're thinking about attending the next festival, here's a sneak preview of what you might expect!

Valerie Bentivegna, in her own words

I'm a Belgian-American hybrid and my studies are a bit of a mix as well. I've studied bioengineering, nano-technology and most recently completed a PhD in Life Sciences at the University of Dundee, Scotland. At the moment, I've switched fields again and am currently working as a research associate for a chemical engineering start-up company in Seattle. I also enjoy combining scientific research with science communication and science education, so I've just started teaching a LEGO-robotics class once a week.

Yana Wade, in her own words

I'm from Russia. I earned a doctoral degree in Biology from Lomonosov Moscow State University, which is considered the leading scientific institution in Russia, and I've been working as a researcher ever since. During my career, I was awarded two prestigious Individual Research Fellowships, from the Federation of European Microbiological Societies and the European Commission (EC) Horizon 2020 Programme. Additionally, I have received six travel awards from independent funding agencies that have enabled me to present my research to a variety of audiences. I have comprehensive experience on a broad range of research topics, having changed fields a few times. I recently completed a Marie Skłodowska-Curie Fellowship at the University of Bath in laboratory-based multidisciplinary research, comprising elements from Synthetic Biology, Microbial Engineering, Biochemistry, Bioinformatics, and Applied Microbiology. I joined the MCAA in 2016 and have greatly enjoyed the experience and have been active in the development of the association, subsequently.

© Davide Ferro

UNFORGETTABLE PERFORMANCES

Yana and Valerie both share the same enthusiasm when speaking about their performance on stage.

"I sang a few different songs inspired by my academic career," says Valerie. "I sang a song about how being a 'nerd' is considered 'cool' nowadays (if only I'd known when I was a dorky teenager!), about the ups-and-downs of doing a PhD, and finally a song about surviving the lab as a clumsy researcher. For the last song, I got the audience to sing along, which was an amazing experience!"

According to Yana, she devoted her performance at the festival to her research on enhanced alcohol production

using bacteria at high temperatures. “I focused on set tasks and making people laugh at serious subjects was not so easy, but audiences did respond to my jokes and this was extremely rewarding,” she recalls.

THE IMPORTANCE OF HUMOUR IN SCIENCE COMMUNICATION

‘Humour has a positive influence on learning processes’

Both alumni understand how much humour matters in science.

“Humour has a positive influence on learning processes,” explains Yana. “So given all this, why can’t we use humour in science communication? Prior to my performance at the Edinburgh Festival Fringe, I had already tried myself in the role of stand-up science communicator by participating in number of Science Slams, in Leuven, London and Wolfsburg. I believe scientific knowledge mixed with humour make a good marriage and am certain this type of outreach activity is memorable for the audiences.”

For Valerie, humour helps “humanise” researchers. On a personal level, she adds that “it is a way to cope with the ups and downs of academic life. Science is hard, and it is important to keep seeing the funny side of every situation”.

A SPRINGBOARD FOR SCIENCE COMMUNICATION

‘Perhaps I can start up a Bright Club (stand-up comedy for academics)?’

Participating at the Fringe Festival may also be seen as a springboard for future challenges. For Yana, her success at the festival spread fast. “After performing at the festival, I was introduced to a public engagement team in Newcastle-upon-Tyne and I’m expecting to receive an official invitation to perform at the Bright Club there later this year. I also hope MCAA will share their great love for science with the public at the Fringe this summer.”

Valerie is also making plans. She says: “I recently performed at the Science Slam in Seattle and plan to continue singing on stage with Bruno (my blue ukulele). Surprisingly, there is not much of a science comedy scene... Perhaps I can start up a Bright Club (stand-up comedy for academics)?”

One thing is certain, a comedy boom among scientists is in full swing and doesn’t show signs of slowing.

Inspired? Find out how to get involved here

Science in business: become an entrepreneur!

Thinking about creating your own business? Here are a few start-up tips from Mathieu Sacrispeyre, founder of Anovra!

Mathieu Sacrispeyre, in his own words

Hello, I'm Mathieu, co-transformer. I created my business, Anovra, to help start-ups succeed and also help big companies address their innovation and transformation challenges. I really believe in a human-centred approach. Because we are all different, we need an adapted manner.

Depending on the identified needs of the organisation, I combine different activities to inspire (e.g., keynotes and seminars), to give confidence (e.g., training sessions), to coach/mentor intra-entrepreneurs or to advise (e.g., strategy, develop, manage innovation).

Formerly, as the CEO of Intesens, a start-up, I gained a very intense and useful experience: several national start-up prize winner in France, strategic partner of C-level in leading corporates (SNCF, EDF, Oracle, & IBM), in one year we doubled both sales and the team up to 25 people.

Originally, a CS Engineer combined with a master's degree in Innovation Strategy & Management, I have experienced a mindset change from tech/science-driven to usage- and value-driven.

FIVE TIPS TO BECOME A SUCCESSFUL ENTREPRENEUR

Tip1: Human is key in start-up success, so listen to yourself and learn continuously.

Tip 2: Still motivated? Give entrepreneurship a try, you'll learn a lot in any case!

Tip 3: For example, a good balance between start-up methods such as Lean Startup (limited for disruptive innovations) and more conventional approaches using top-down strategic approaches (Blue Ocean).

Tip 4: Define, have in mind and keep iterating on your vision and strategy:

- The vision: What do I want to bring to the world and to my customers with this company? The vision should drive your actions.
  - In start-ups, we are often speaking of a close concept: the problem you want to solve.
- Your strategy: What's the best way to achieve your vision? IP company, markets and market access, partners etc.?
- Your offer: identify the first draft according to your strategy and vision
- The above steps are a similar approach of the Why (vision), How (strategy), What (offer) of Simon Sinek.

Tip 5: Adopt a user-centric mindset:

- Be focused on the users' needs and point of view: What is their need? What value will my product or my service bring to customers? How much can they pay for it to still be of value?
- Science and technologies are fascinating but "only" solutions to problems users are facing. Having the best technology, pattern, invention or scientific method is an important asset, a good start but not enough to create a company success!

YOUR ASSETS AS A SCIENTIST

Scientists have a lot of skills, yet it may require some time to acquire a business and management mindset.

Beyond that, there are several parameters to consider:

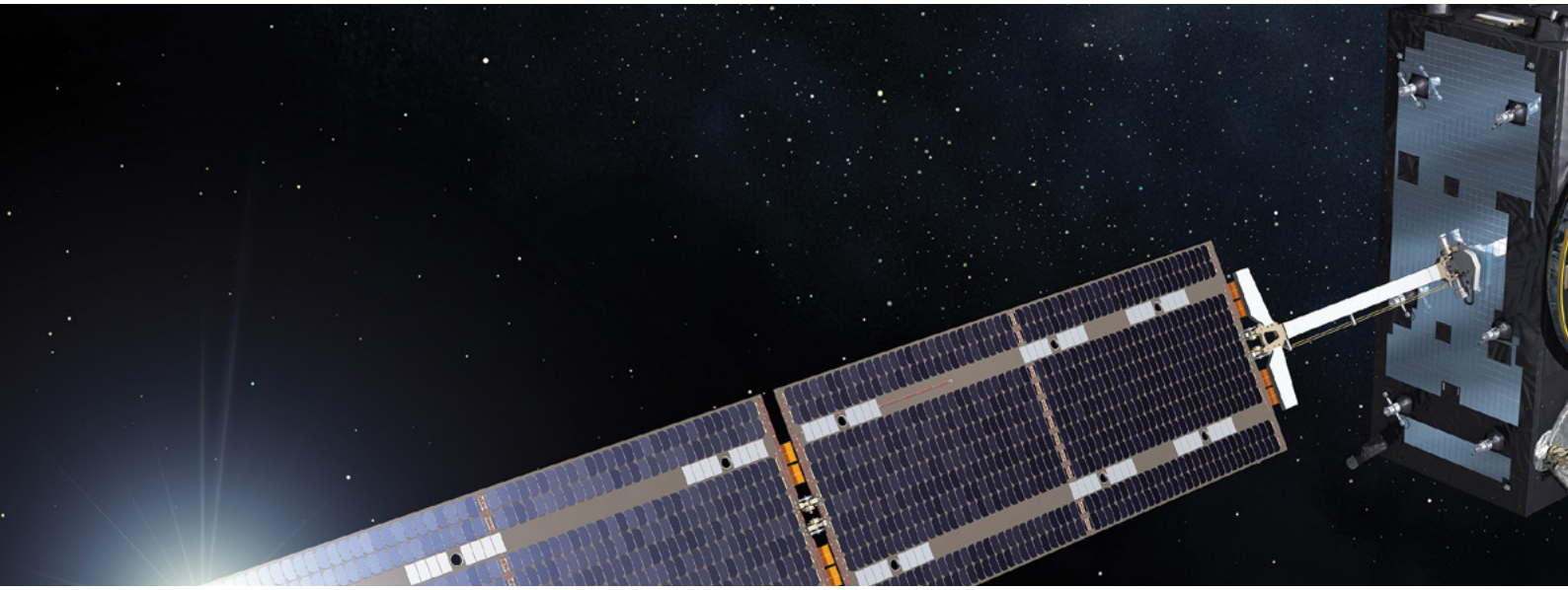
- Who are you? What do you like/dislike? Are you interested in business or mainly in science?
- What's your motivation to create a business? How do you feel about confidence and fears about creating a business?
- What goals do you want to reach with your company? Personal? Financial?
- What is the maturity of the research work used to create the company?

Depending on your answers, you may think and feel whether you prefer to create an organisation alone or with a partner who may complete your skills. Indeed, business and management are probably the two main fields in which a scientist may, usually at the beginning, lack skills to run a successful company. Companies created by complementary partners are more often successful when there is a good fit between them. However, you can still start, see how it goes, how you feel, increase the maturity (shorter time to market) of your offer and eventually look for a partner, if needed.

Inspired? Learn more about Anovra

MATHIEU SACRISPEYRE

Happy birthday Galileo!



2019 is the year of Galileo! The European Union's Global Satellite Navigation System (GNSS), which was launched following a European Commission communication issued in February 1999, will celebrate its 20th anniversary this year.

WHAT IS IT?

Galileo is Europe's Global Navigation Satellite System (GNSS), providing positioning and timing information. Joint initiative of the European Commission, the European GNSS Agency (GSA) and the European Space Agency (ESA), it aims to play a role in applications like:

- The internet of things;
- Location-based services (LBS);
- Emergency, security and humanitarian services;
- Science, environment, weather;
- Transport;
- Agriculture;
- Fisheries;
- Civil engineering;
- A time-reference function.

GREAT EXPECTATIONS

Once operational, the Galileo system will offer four high-performance services worldwide:

- **Open Service (OS):** Galileo open and free of charge service set up for positioning and timing services.
- **High Accuracy Service (HAS):** A service complementing the OS by providing an additional navigation signal and added-value services in a different frequency band. The HAS signal can be encrypted in order to control the access to the Galileo HAS services.
- **Public Regulated Service (PRS):** Service restricted to government-authorised users, for sensitive applications that require a high level of service continuity.
- **Search and Rescue Service (SAR):** Europe's contribution to COSPAS-SARSAT, an international satellite-based search and rescue distress alert detection system.

FUTURE ACHIEVEMENTS

There are now 26 Galileo satellites orbiting the Earth, and the supporting ground station infrastructure is operational. Galileo is now ready to be used!

With the declaration of Galileo Initial Services in December 2016, Galileo officially moved from testing phase to the provision of live services.

Users around the world can be guided using the positioning, navigation and timing information provided by Galileo's global satellite constellation. The system will be fully operational in 2020.

THE MYGALILEOAPP PRIZE CONTEST

Do you have an innovative idea for an application that could benefit from the precise positioning offered by Galileo? Whether it's in the area of augmented reality, geo-marketing, smart navigation, social networking or otherwise – the European GNSS Agency wants to help you take your idea from concept to reality.

The prize is 1m EUR. The deadline for submission is 28 March 2019. Information about the prize is available here.

Interested? Learn more here

The TREASURE project

The TREASURE project is Marie Skłodowska-Curie Actions (MSCA) Innovative Training Network (ITN), funded through the European Union's Horizon 2020 Research and Innovation Programme.

Marcio Aquino, project coordinator, presents this innovative initiative.

FAST FACTS

TREASURE kicked off in February 2017 and its coordinated research sub-projects started between June and September 2017 after the recruitment of its 13 research fellows, each in charge of an individual sub-project.

TREASURE focuses on the emerging area of European GNSS (EGNSS). Collectively, GNSS (Global Navigation Satellite Systems) includes systems such as the well-established US Global Positioning System (GPS) and the Russian GLONASS, as well as the new, under development systems like China's Beidou and most importantly Europe's Galileo.

Galileo is what we call EGNSS and is to be fully operational in 2020. GNSS have a multi-billion Euro worldwide industry – the EC has predicted an annual global market for GNSS of €300bn by 2020. However, GPS has been the frontrunner of all these systems, dominating the market for two decades now - EGNSS (Galileo) is aimed at changing this market unbalance.

The EU's ambition for EGNSS is to strongly impact European industry and society by incentivising the various application segments and creating jobs. Therefore, it is a priority to secure the development of this technology in Europe, and that is why the training of young scientists in this niche area is at the top of the European economic agenda.

Combining GNSS systems to operate together is a new development known as multi-GNSS, which is key to provide instantaneous, high accuracy positioning anywhere in the world. Although GNSS is routinely used in smartphones and in-car navigation with an accuracy of a few metres, it can deliver centimetres in real time if advanced techniques are employed in a multi-GNSS approach. This is the focus of TREASURE, in a bid to boost the use of Galileo worldwide in support of a range of applications and, more importantly, to inspire new ones that can arise when this is fully developed.

To demonstrate the TREASURE vision and its market prospects, the project will also develop a conceptual prototype of a service that can offer the enhanced real-time high accuracy positioning that is desperately needed by markets such in the Agri-Tech and offshore operations businesses, and potentially many others that will become apparent as the project evolves and results are disseminated.

ACHIEVEMENTS

In TREASURE we are studying and modelling all the errors that degrade GNSS positioning accuracy and incorporating these models into specialised high accuracy positioning techniques.

Significant progress was obtained in all fronts of the research through coordinated projects carried out at PhD level by the 13 individual TREASURE ESRs (early stage researchers), who are hosted by the various academic and industrial partners.

Just to mention one example, a key aspect of the research is to mitigate the effects of the atmosphere, in particular related to space weather, which can often create impairing conditions in the atmosphere's upper, ionised layer, the ionosphere. These effects vastly reduce satellite communication and positioning accuracy. Progress in this area has been achieved in TREASURE by improving existing forecasting algorithms and by suitably tweaking the use of a specialised tomographic software. Concurrently, regarding the lower, neutral layer of the atmosphere, a new statistical testing approach has been implemented to counter the effect of severe terrestrial weather events that can also pose a major threat to high accuracy GNSS positioning.

Achievements in the other inter-related research areas have also been significant, including in the development of the new positioning algorithms themselves and in first steps towards our service prototype.

In 2018, two TREASURE teams entered the Farming by satellite competition. The teams were formed to stimulate teamwork and collective thinking among the ESRs. I am proud to inform that both teams were selected for the finals of the contest, with one of the TREASURE teams winning second place in the whole competition!

WHAT'S NEXT?

The project recently underwent its mid-term review by the European Commission and passed with flying colours. Reinforcing the project's relevance, H2020 Space Work Programme 2018-2020 recently opened the call "SU-SPACE-EGNSS-3-2019-2020: EGNSS applications fostering societal resilience and protecting the environment", where one of the challenges relates to "Precision agriculture, mapping and surveying", which are right at the core of the action in TREASURE.

The second phase of the project will see a shift from initial, preliminary model development to the delivery of final solutions, with actual integration into positioning algorithms that will be implemented and tested in real life experiments, for validation in close collaboration with industry. Over the next two years a final and comprehensive market analysis will be completed, and the conceptual prototype of a potential service will be developed.

As coordinator, I am entirely satisfied that the project is on track to fulfilling its expected impact, both with regards to its research and market analysis outcomes, but more importantly in what concerns the career development of the TREASURE fellows.

TURNING POINT FOR GALILEO

By 2020, Galileo will be fully operational and provide positioning data of unprecedented accuracy. Galileo will rival but, crucially, will also be interoperable with GPS, as well as with systems such as Beidou and GLONASS. Clearly, the development of EGNSS and its integration with these other satellite systems, in a multi-GNSS approach, is key for Europe's competitiveness in this market, therefore the interest of the EU in funding projects like TREASURE. We are proud to be part of this effort.

TREASURE focuses on two existing GNSS techniques known as PPP (Precise Point Positioning) and NRTK (Network Real Time Kinematic), which currently mostly use GPS and GLONASS. Some of our industrial partners already offer services that exploit these techniques. It is expected that both techniques will potentially meet future real-time high accuracy positioning demands when Galileo is fully integrated, and TREASURE will definitely make a contribution in this field.

Interested? Find more information here

Want to showcase your research or share your thoughts within the MCAA community? Contribute to the MCAA blog!

Contact: blog@mariecuriealumni.eu

Got a question about the magazine?

Get in touch with:
WG-Com@mariecuriealumni.eu

IRRADIUM is published by the
Marie Curie Alumni Association.

Any request concerning IRRADIUM
should be sent to
news@mariecuriealumni.eu.

IRRADIUM MAGAZINE

MARIE CURIE ALUMNI

https://www.mariecuriealumni.eu/