EURAXESS Korea Quarterly Newsletter Issue 22 Q3 2023

Dear Readers,

I am delighted to present the third Quarterly Newsletter, dedicated to shedding light on Latvia, a hidden gem in the Baltic region that beckons researchers with its rich academic landscape and vibrant cultural tapestry. Nestled between Estonia and Lithuania, Latvia stands as a beacon of research opportunities, boasting a thriving ecosystem that encourages interdisciplinary exploration. From the historic streets of Riga to the unspoiled beauty of its natural landscapes, Latvia provides an inspiring backdrop for scholars seeking both academic and personal enrichment.

As we celebrate Latvia, we also navigate the currents of the Industry 5.0 era, a paradigm shift marked by the fusion of digital technologies and human-centric approaches. Our newsletter explores how researchers and industries all over the world are steering towards this industrial revolution, emphasizing collaboration, sustainability, and the convergence of cutting-edge technologies. Industry 5.0 is not only about efficiency and productivity, but also about human-centricity, sustainability, and social value. We will share with you some of the insights and best practices from experts and practitioners in the field of Industry 5.0.

I hope you enjoy reading this newsletter and find it useful and informative. As always, I welcome your feedback and suggestions for future topics and events. Please feel free to contact at korea@euraxess.net. Thank you for your continued support and interest in EURAXESS Korea.

Best regards,

Tomasz Wierzbowski.

- *Tomasz Wierzbowski,* EURAXESS Korea Representative

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Contents

EURAXESS – Researchers in Motion is an initiative of the European Research Area (ERA) that addresses barriers to the mobility of researchers and seeks to enhance their career development. This pan-European effort is currently supported by 43 countries, each of which will be profiled in our quarterly e-newsletters.

In this edition, we will zoom on Latvia.

EURAXESS members in focus: LATVIA

opportunities for research and cooperation with a sea view

Latvia is a country located in the Baltic region of northern Europe. It has a diverse research and development landscape and is generally considered an attractive space for researchers.

Latvian scientists have recorded a number of scientific accomplishments that are highly valued in the country and well-recognised abroad. There is exceptional progress in certain sciences, including medicine, pharmacy, and material science. New discoveries are announced on a regular basis, contributing to Latvia's high growth potential. For example, in 2012 a new and significantly faster method for quantum algorithms was discovered and a novel quantum interference application in nano-electronics was developed by Latvian researchers Andris Ambainis, Dr Vyacheslav Kascheyev, Aleksandr Belovs, Jana Timoshenko et al. In the same year, Liga Berzina-Cimdina and Janis Locs from RTU Riga Bio-material Innovations and Development Centre successfully proved that their co-developed synthetic bio-material effectively attaches to bone – it is now used for implants in dentistry and cosmetic surgery. An active anti-cancer substance, called Belinostat, which was synthesised in Latvia, has been approved for use in the USA in the treatment of T-Cell Lymphoma. This substance was developed by Dr Klara Dikovska, Ivars Kalvins and Dr Einars Loza alongside the Latvian Institute of Organic Synthesis.

Facts and figures

The research system in Latvia is being developed as part of the European Research Area (ERA) in line with the systems and best practices pursued by the European Union, its Member States, and international standards. The key issues addressed by Latvian science policy are the need to increase investment in research and development (R&D), to promote the renewal of research human capital and knowledge-creation in all branches of science, and to develop research infrastructure aimed at increasing research and innovation capacity. Latvia invests around 0.74% of its GDP, or EUR 249 million, in R&D. A quarter of companies are highly active in the innovation field. The research landscape in Latvia is well governed and represented; there are 64 research institutions, 22 of which are funded by the state.

Since 2015, science policy in Latvia has been developed in line with the country's Smart Specialisation Strategy (RIS3). The Strategy targets research according to sectoral growth priorities, facilitates knowledge and technology transfer, and stimulates social and economic transformation towards more efficient use of resources and the creation of new, higher value-added products and services. These specialisations described under Latvia's RIS3 are:

- Knowledge intensive bio-economy
- Biomedicine, medical technologies, and biotechnology
- Advanced ICT

The **Republic of Latvia** is a country in the Baltic region of northern Europe. It borders Estonia to the north, Lithuania to the south, Russia to the east, and Belarus to the southeast, and shares a maritime border with Sweden to the west. Latvia covers an area of 64,589 km2 (24,938 sq mi), with a population of 1.9 million.

Latvia's capital Riga (population 605,802) is set on the Baltic Sea at the mouth of the river Daugava. It is considered a cultural centre and is home to many museums and concert halls. The city is also known for its wooden buildings, art nouveau architecture and medieval Old Town.

- Smart materials, technology, and engineering
- Smart energy

The main research policy priorities in Latvia for the period 2021-2027 are:

- Increase R&D as a percentage of GDP (GERD) to 1.5% and improve public support for emerging private R&D investments
- Achieve sustainable growth in R&D human capital needed to foster economic transformations (at least 8,000 FTE research personnel)
- Achieve success on the international stage through a diverse and competitive research system (i.e. underwritten by Horizon Europe)

EURAXESS Latvia provides information and support to mobile researchers through this portal, and with the support of national EURAXESS Centres.

EURAXESS Latvia has more than 20 service centres that are ready to provide you a range of services and any information concerning your arrival and stay in Latvia.

Latvia is striving to be a welcoming place for incoming researchers and their families. Its compact size and location make Latvia a very comfortable place to conduct and advance research projects. Research infrastructure and institutions are in close proximity to each other and easily accessible, so commuting times are lower, which is a premium for attaining a good work-life balance. Everything is reachable and most of the research institutions are based or at least have offices in Riga, the biggest city in Latvia which is known be a cosy place to live.

Some countries focus on stimulating innovation in the private sector, others encourage scientific entrepreneurship more broadly, while some concentrate more on securing grants and funding opportunities for institutions, but Latvia takes a more classic approach to science. Researchers are highly valued professionals and given every incentive to pursue a lengthy career in academia if they so choose.

The main research universities

University of Latvia (UL) is the largest in the country. In addition to research in the natural sciences, humanities, social sciences, technical sciences and medicine, UL provides diverse types and levels of higher education opportunities for both Latvians and people from other countries. The university's scientists have developed important research that has contributed to the competitiveness of the national economy and improved quality of life in society. The opinion of the University of Latvia is essential for decision-making in public administration. Read more

Riga Technical University (RTU) conducts fundamental and applied research in engineering with the aim of analysing and solving technical and social problems. RTU conducts interdisciplinary research in six scientific fields: Energy and Environment (research on sustainable energy supply, electricity, heat and transport fuels); Cities and Development (environmental and heritage conservation, housing, mobility and infrastructure provision, employment and social issues); Information and Communication Technologies (electronics, control software and data transmission); Transport (improving transport safety and energy efficiency, solving various transport infrastructure problems); Materials, processes and technologies (research ranging from the synthesis of nanoparticles to the calculation of large structures with practical applications,

structural strength testing and durability prediction; extraction and research of nano-fibres, composites and biomaterials for applications in medicine, electronics, photonics and alternative energy; optimisation and improvement of technological processes for materials research); Security and Defence (interdisciplinary research in areas related to individual and national security). Read more

RTU Rūdolfs Cimdiņš Riga Biomaterials Innovation and Development Centre conducts biomaterials research and develops implant materials for medical applications. Since 2020, funding from Horizon 2020 has been granted to the Baltic Biomaterials Centre of Excellence (BBCE). The RTU Centre for High Energy Particle Physics and Accelerator Technology is responsible for Latvia's international cooperation with CERN, and its main tasks are to promote the development of high-energy particle physics in Latvia, to participate in research on high-energy particle physics and particle accelerator technology, and to establish an international Master's and PhD programme within the CERN Baltic Group. Read more

Riga Stradiņš University (RSU) conducts research in three scientific fields: Medicine, Public Health, and Social Sciences. Medical research covers major disease groups and virtually all the basic sciences of medicine – molecular aspects of disease, genetics, epidemiology, prognosis and treatment, impact on quality of life, treatment goals and outcomes. Read more

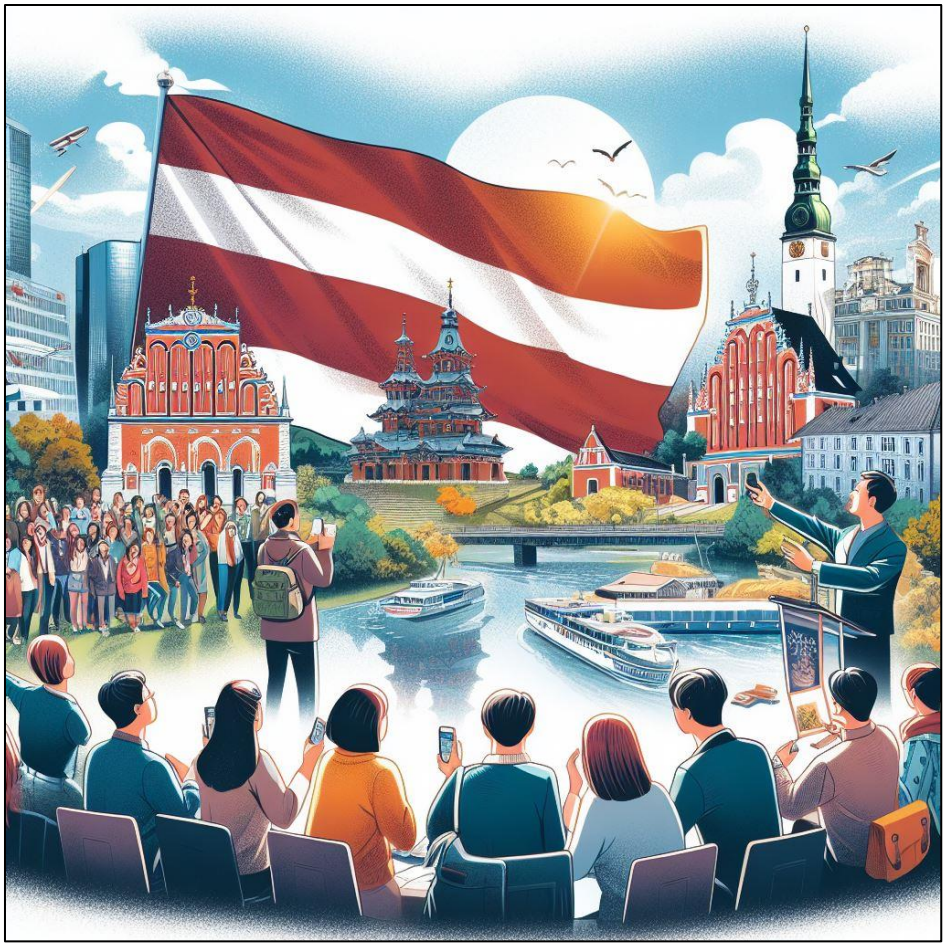
Latvian University of Biosciences and Technologies (LBTU) offers interdisciplinary higher education aimed at building the knowledge needed for sustained environmental and social development. To ensure excellence in research and studies, LBTU has established a science university ecosystem – a unified framework of commercial companies, scientific institutions, educational institutions, and other organisations working under the direction and supervision of the university, including the LBTU APP Institute of Horticulture and APP Institute of Agroresources and Economics. Read more

Different research fields are covered by various scientific institutes, such as the Latvian Institute of Organic Synthesis; Baltic Studies Centre; Institute of Electronics and Computer Science; Institute of Solid State Physics; Latvian State Institute of Wood Chemistry, etc.

Science-business relations

It is still a struggle for almost all EU countries to translate innovation inputs into outputs efficiently. Latvia is no exception. It ranks 41 on the Global Innovation Index 2022. While it is working to overcome remaining barriers, there are strong signs that Latvia is learning valuable lessons and making the most of its opportunities as a small Member State. The country is focused on creating a balanced and efficient innovation ecosystem.

This is thanks in large part to Latvia's science policy framework and the work of its Investment and Development Agency, which is recognised for its efforts in bringing a wide range of science and investment opportunities together.



EURAXESS Latvia is a one-stop shop for all incoming researchers. We strongly believe that people come to people, and we try to do our best to make your journey and stay in Latvia comfortable and pleasant.

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HOT TOPIC: A glimpse at the 'smart social factory' of the future

Digital entrepreneurship and the journey to Industry 5.0

EURAXESS Worldwide takes a closer look at the nexus between innovation, industrial (r)evolution, the digital economy, and the journey to Industry 5.0. We explore what it means for the EU's Global Approach to research and innovation policy and developments in terms of new industrial patterns but also wider societal and environmental challenges (sustainability, ethics, impact, etc)

The immutable relationship between innovation and entrepreneurship is long and powerful, driving fundamental developments for millennia. It works quite simply and elegantly: see a problem or gap, think of a way to fix, or fill it, assemble the resources, and then deliver the solution – whether a physical good, service, tool, or trade.

The principles of digital entrepreneurship – making and selling 'soft' and intangible wares including data, information, and communication technologies – have not vastly changed from those practiced by early traders supplying mostly 'hard' or physical wares. It is still all about the market.

According to a new book called 'Digital Entrepreneurship and the Digital Economy ', published by Routledge and edited by J.M Munoz, the digital economy is expected to bring about some US$60 trillion in revenue by 2025. The authors note that with the rise and proliferation of emerging technologies globally, entrepreneurs have followed their native instincts and "pursued opportunities to leverage skills, abilities, and resources to find innovative revenue streams".

Here, digital and tech giants such as Uber, Apple, Meta, 'X' (formerly Twitter) as well the makers of chips and digital kit like Taiwan Semiconductor Manufacturing Fujitsu, Intel, Siemens, Ericsson, etc. offer tidy examples of the importance of early mover status and how data – and the way it is handled – has emerged as the king-maker in an unchartered and enticing realm.

A growing breed of digital entrepreneurs is now found in everything from artificial intelligence, cloud computing, big data, and block chain to the ubiquitous internet of things and networked applications. These pioneers are taking innovations to market in virtual/augmented reality, gaming, media, and publishing, while developing and fostering content- and digital asset-creation, as well as all manner of middleware needed to produce and deliver value across disciplines and sectors (science, education, health, aviation, energy, manufacturing, etc.).

The only real limit to these vast digital opportunities, say experts, is computing power, the regulatory environment, the imaginations of the inventors, and the foresight of entrepreneurs and their investors prepared to take a punt on innovative ideas.

From industrial to digital… to social

Industry has and will always be vital to both the economy and society. We need fridges, toothbrushes, shoes, seats, and everything else that helps to feed, clothe, and sustain the billions of people on this planet. The rise of the digital world has done nothing to change that reality. But new digital technologies have enhanced and, in many ways, disrupted the way industrial processes take place.

This is the essence of Industrial Revolution (see box) which emerges as the benefits of earlier innovations pave the way for new advances in, for example, machine automation and robotics, cloud computing, and AI. Industries are also quickly learning the value of better exploiting data and digital insights to improve production efficiency and worker safety while reducing waste, labour costs, etc.

Industrial Revolutions, past and present

The original or First Industrial Revolution is remembered as the period roughly between 1760-1840 when production went from a hand-crafted to machine-made processes, spurred on by developments in textiles, mining, engineering, iron-making – later powered by innovations in steam-powered engines. Further advances in manufacturing and production were then made thanks to the introduction of electricity, sparking industrial innovation and greater labour mobility – what would become known as the Second Industrial Revolution.

With the invention of computers and rapid emergence of information and communication technology from the late 20th century onwards, a Third Industrial/Digital Revolution (or Industry 3.0 in today's speak) quickly captured imaginations, allowing ever-greater automation in production processes, and of course giving rise to integrated circuits and the internet.

From around 2010 onwards, a Fourth Industrial Revolution started taking shape. According to experts at UpKeep, the main difference between Industry 3.0 and Industry 4.0 is the rise of interconnected technologies in plant operations thanks to progress in cloud computing and the industrial internet of things (IIoT), with additive manufacturing (3D printing) allowing rapid prototyping. The benefits of Industry 4.0 include real-time data collection, greater interoperability, and more decentralised, secure, and flexible information and applications.

But where to from here? Industry watchers are already talking about the next big Industrial Revolution – building on advances in 'cyber-physical cognitive systems' – which they believe will orient around greater human-machine interaction in manufacturing and have clear

implications on green manufacturing and the pursuit of positive socio-economic impact.

Industry 5.0 sees collaborative robots and smart machines (cobots) working alongside people, but their relationship will go beyond operational/safety objectives. TWI Global explains this: "Where Industry 4.0 focused on technologies such as the internet of things and big data, Industry 5.0 seeks to add human, environmental and social aspects back into the equation."

This brings a whole set of new ideas and processes into business, factoring in corporate social responsibility, new investment models, global resilience, sustainability, and net-zero goals (Sustainable Development Goals and EU's Green Deal Industrial Plan, Global Approach, and Recovery and Resilience Facility).

It also touches on global societal challenges and ethical issues covering worker rights and fair working conditions and wider declarations on universal human rights enshrined within the United Nations.

Today, we are on the cusp of what has been variously called Industry 3.0 and Industry 4.0, and experts are looking at what comes next in the journey to Industry 5.0, which is expected to leverage human, environmental and social aspects into new digital dividends. A world where innovators and entrepreneurs gain competitive advantage while still meeting stricter regulatory requirements, where flexible factories can turn out even personalised products cost-effectively and safely.

Industry 5.0 is "more than just manufacturing goods for profit", explains Amir Adel in an article on the 'Future of Industry 5.0 in Society', originally appearing in Springer Nature and reproduced on PubMed Central. It revolves around sustainability, human-centricity, and resilience.

The article goes on to explore the main challenges and research lines leading to the "smart social factory" of the future. It also provides an overview (table) of research priorities and developments, supported by cases and examples. One such example is a project by Repsol, a Spanish energy company, which is using blockchain and smart robotics to build a guided-automated "cobot" capable of tasks like delivering raw materials and removing waste, while constantly feeding data on safety, efficiency, etc. back into the smart system.

Current challenges to Industry 5.0's progress include lack of skilled workers, time-consuming processes, (data) security and privacy issues, and R&D investment. Any fresh solutions also need to be mindful of current and future industrial regulations concerning intelligent machines and collaborative robots.

The sheer complexity of the machinery and science supporting human-centric Industry 5.0 developments is only half of the challenge, the paper suggests. Greater investment will be needed to train managers and technicians expected to interact with these new technologies.

(Mis)understanding blockchain

As shown above, blockchain technology plays a key role in many Industry 5.0 advances. But it is often misunderstood or misrepresented. Businesses using blockchain are "able to operate in a constantly changing environment, where not only the regulatory environment, but also the attitude of industry and society towards these innovative businesses is still forming and changing", according to a statement from Kaunus University of Technology (KUT), Lithuania in connection with the Routledge publication.

Blockchain technology is a distributed database mechanism that stores data in 'blocks' linked together in a 'chain', as its name suggests. It allows transparent information- and digital asset-sharing and back-ups within a network – private, public or in hybrid forms.

Blockchain technology is perhaps best known today for its role in cryptocurrency developments, acting as a shared digital ledger collecting and storing the trading – buy, sell, exchange – information. The linked and transparent nature of blockchain makes it a catalyst for future digital developments that need to operate globally or in complex environments relying on decentralisation.

The publicised failings of crypto should not be seen as a direct indictment on blockchain, experts say. Jurgita ButkevičienėI from KUT's School of Economics and Business and co-author of a chapter on *Digital entrepreneurs' strategic responses to the incomplete global policy framework for blockchain-based business*, says the problem lies more in "wilful" and "opportunistic" actions of certain players who took advantage of policy and regulatory gaps.

She and fellow researchers surveyed companies that create applications on blockchains, develop blockchain platforms, provide legal advice, and help application developers with sales and other marketing issues. They found that different regulatory approaches and "imperfections in different countries" affect these companies and their responses.

The fact that "transparent business-oriented entrepreneurs were able to successfully develop innovative and global solutions" even in unchartered territory must be seen a positive, the researchers conclude.

A case for a Global Approach to R&I

The positive aspect of crypto's fall from grace is that innovation and entrepreneurship are alive and well. Yet this narrative has focused minds on the value of building a solid understanding of the fundamentals of new or emerging technologies as the basis for good policymaking in complex and challenging fields. It also speaks to the importance of benevolent and transparent cooperation and partnerships among relevant stakeholders.

"The magnitude of current global challenges, such as the climate crisis and the COVID-19 pandemic, stresses the relevance of joining forces worldwide and pooling human and financial resources to facilitate the creation and dissemination of knowledge and innovative solutions for EU research," explains

the European Parliament's (EP) 'Think Tank' in a briefing on the Global Approach to research and innovation.

Excellent, mission-oriented research and innovation feeds turnkey technologies and solutions and underpins EU policies and global sustainable development goals. Horizon Europe's (HE) three pillars, especially those focused on tackling pressing global challenges and European industrial competitiveness (Pillar 2) and promoting greater innovation (Pillar 3), are thus a vital funding instrument for the EU's Global Approach.

The EP's briefing further confirms that "Europe's openness to the world will safeguard EU strategic autonomy, interests and values" even in the face of geopolitical tensions, including the Russian invasion of Ukraine. Intensified international cooperation with like-minded partners signals Europe's bid for better global stewardship in key fields and spanning the whole research lifecycle through to technological development and standardisation.

"European research and innovation players are unambiguously supporting international cooperation for global goods, such as knowledge, the environment and global health," concludes the EP.

Combined with improved communication about the opportunities under HE – as competently supported and empowered by the work of EURAXESS Worldwide regional hubs – this is having a clear knock-on effect in terms of non-EU-based participation in the programme. The latest figures indicate that non-European entities are present in 42.17% of the 5,200 grant agreements signed since HE was launched in 2021.

All of this points to signs that the EU's Global Approach and internationalisation efforts are paying dividends and will play an instrumental role on the path to Industry 5.0 and other major digital advances.

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