EURAXESS Korea Quarterly Newsletter Issue 11 Q4 2020

Dear Friends and Colleagues,

Without any question, 2020 has been a difficult and challenging year with many ups and downs. Nevertheless, researchers and scientists worldwide have done tremendous work to address and cope with the most urgent problems.

In this edition of EURAXESS Korea newsletter, we explore one of the most attractive locations for mobile researchers – Germany. The excellent infrastructure, a wide variety of disciplines, well-equipped research facilities, and competent staff attract scientists and researchers to Germany from all over the world. Furthermore, we look into findings of The EURAXESS Worldwide study published on 26 November, called '*Researcher mobility in a changing world*', which casts fresh light on how international researchers have been coping during Covid times, and what impact it has on their ability and willingness to pursue research and studies abroad. Lastly, we delve into the status and direction of research on Artificial intelligence research.

I also use this opportunity to wish you health, happiness, and prosperity in 2021!

Tomasz Wierzbowski.

- *Tomasz Wierzbowski,* EURAXESS Korea Representative

Sign up here to become a member of the EURAXESS Korea community

Web: korea.euraxess.org

Mail: korea@euraxess.net

Twitter: @EURAXESS_Korea

Address: #302, Main Building HUFS, Seoul Campus, 107, Imun-ro, Seoul, 02450

Edited by Dr. Tomasz WIERZBOWSKI
EURAXESS Korea Representative

Content in this quarterly newsletter includes pieces produced by EURAXESS Worldwide Team

Contents

EURAXESS – Researchers in Motion is an initiative of the European Research Area (ERA) that addresses barriers to researchers mobility and seeks to enhance their career development. This pan-European effort is currently supported by 42 countries, each of which will be profiled in our quarterly e-newsletters.

In this edition, we will zoom on Germany

EURAXESS members in focus: Germany

Germany is one of the most attractive locations for mobile researchers. The excellent infrastructure, wide variety of disciplines, well-equipped research facilities and competent staff attract scientists and researchers to Germany from all over the world.

Research-performing institutions and organisations

In Germany, research takes place in a number of different settings including universities and centres for applied sciences, non-university research institutions, in companies and at institutions run by federal or state (Länder) authorities.

There are close to 400 higher education institutions (HEIs) offering a wide range of academic disciplines, including 120 universities, 213 centres of applied sciences and 57 colleges of music and art. Unique to the German higher education system is the close link between learning, teaching and research – a principle which goes back to Wilhelm von Humboldt, the founder of the Universität zu Berlin in 1810, which is today the Humboldt University in Berlin. The Research Map of the German Rector's Conference details the key research priorities of HEIs in Germany.

Other important research-performing organisations in Germany include the Fraunhofer-Gesellschaft (FhG) which currently operates 74 institutes and research institutions within Germany, the Helmholtz Association (HGF), Germany's largest scientific association with about 7,000 foreign scientists working at Helmholtz Centres, the Leibniz Association (WGL) which connects 96 research institutions that address issues of social, economic and ecological relevance, and the Max Planck Society (MPG), Germany's most successful research organisation, as 20 Nobel laureates have emerged from the ranks of its scientists since its establishment in 1948.

Known for their innovation, German companies collaborate closely with universities, science institutions and non-university research organisations. Germany's industry carries out and funds at least two-thirds of research and development (R&D) activities. The automotive sector, followed by the electrical engineering and mechanical engineering sectors make the largest investments. Companies such as Volkswagen, Siemens and Bayer are known for their high R&D spending.

Since January 2020, companies that are active in R&D and taxable in Germany can benefit from a tax incentive for research. The new R&D allowance for enterprises conducting research is 25% of eligible expenses. The goal behind the tax is to enhance Germany's competitiveness in innovation and to stimulate more R&D activities, particularly by small and medium-sized enterprises, which employ 16 million people in Germany.

Fun facts about Germany

Capital: Berlin

Government: Federal Parliamentary Republic

Population: 81 million

Language: German

65% of the highways (Autobahn) in Germany have no speed limit

University is free for everyone

City of Tuebingen, Source: DLR

Germany's federal ministries fund 40 R&D institutions that conduct research in almost all areas. An example is the Robert Koch Institute (RKI) in Berlin, which is the government's central scientific institution in the field of biomedicine. Research and prevention of infections is one of RKI's classic fields of work, and the Institute has played a prominent role in the current Covid-19 pandemic.

On the state level, the 16 German *Länder* act as research funding bodies and operate over 160 institutions that conduct research on a broad range of areas. One example is the German Research Centre for Artificial Intelligence.

Germany's federal ministries fund 40 R&D institutions that conduct research in almost all areas. An example is the Robert Koch Institute (RKI) in Berlin, which is the government's central scientific institution in the field of biomedicine. Research and prevention of infections is one of RKI's classic fields of work, and the Institute has played a prominent role in the current Covid-19 pandemic.

R&D strategies and policy framework

Germany's research and innovation policy framework document, the High-Tech Strategy (HTS), was first introduced in 2006 and has since been renewed and developed further. The latest version, HTS 2025, consolidates R&I funding across all ministries and concentrates on three crucial fields of action: 1) tackling major challenges for society, 2) strengthening Germany's future competencies, and 3) establishing an open innovation and risk culture. The HTS 2025 strives for concrete goals through 12 missions which require the science community, the private sector as well as civil society to join forces.

Bonn University, Source: DLR

Building on the Federal Government's Internationalisation Strategy of 2008, under the leadership of the Federal Ministry of Education and Research (BMBF), a new Strategy for the Internationalisation of Education, Science and Research was developed and adopted in 2017. The Strategy focuses on five target areas such as "strengthening excellence through global cooperation" and "developing Germany's strength in innovation on the international stage".

The Pact for Research and Innovation, first adopted in 2005, was recently extended and will now run for ten years. Until 2030, the Federal Government and the Länder will grant the individual research organisations (DFG, MPG, FhG, HGF, WGL) an annual increase in funding of 3%, giving them long-term financial planning security.

The Excellence Strategy, which was adopted in 2016, builds upon its predecessor programme – the so-called Excellence Initiative which ran from 2007 to 2017, and is planned for the long term. The Strategy aims to strengthen cutting-edge research at universities in two funding lines: 'clusters of excellence' and 'universities of excellence'. Since 2018, the Federal Government and the *Länder* have provided funding of €553 million

annually to support cutting-edge research at ten universities of excellence, one excellence network and 57 clusters of excellence.

R&D spending

Germany has invested more funds in R&D in recent years than ever before. In 2018, a total of €105 billion was invested in R&D by the Federal Government and the private sector. This represents 3.13% of Germany's gross domestic product (GDP). Germany accounts for 31% of all R&D expenditure in the European Union (based on the EU28). For the year 2025, the Federal Government has set the ambitious target of investing 3.5% of the GDP in R&D.

Innovation aspects

Germany is one of the leading innovation countries, which is also reflected in the European Innovation Scoreboard, produced by the European Commission, which places Germany in the group of 'strong innovators'. The Global Innovation Index also puts Germany among the most pioneering countries. Germany is a leader when it comes to patent applications. Almost 400 patents relevant to the world market per million inhabitants were filed in 2017 from Germany.

Funding tools/opportunities

There are various organisations in Germany funding research projects as well as individual researchers.

The largest funding organisations are the Deutsche Forschungsgemeinschaft (DFG), the German Academic Exchange Service (DAAD) and the Alexander von Humboldt-Foundation (AvH).

There are also a number of foundations which support research projects, research institutions as well as individual researchers, such as the Robert Bosch Stiftung, the Volkswagen Foundation or the German Federal Environmental Foundation (DBU), among others.

The following databases are recommended when searching for research funding opportunities:

DAAD Scholarship Base

EURAXESS Germany: Jobs & Funding

Contact details and list of important links

Germany is a part of the European initiative EURAXESS. Currently, 91 German EURAXESS centres advise international mobile researchers on mobility-related questions.

National Coordination Point at the German Aerospace Centre, DLR Project Management Agency, European and International Cooperation

Felix Beckendorf, Vitaliy Bondarenko & Christina Witt:
info@euraxess.de

DLR Project Management Agency

EURAXESS Germany

Federal Ministry of Education and Research (BMBF), Education and Research in Figures 2020

German Rector's Conference (HRK), Higher Education Institutions in Figures 2020

German Centre for Higher Education Research and Science Studies (DZHW) / German Academic Exchange Service (DAAD), Wissenschaft weltoffen kompakt 2020 English edition

Research in Germany

HOT TOPIC: Covid-19 and researcher mobility in a changing world, new study

Bright news on the international vaccine research front is cast against continuing uncertainty for international researchers in general. Will they soon be able to get on with plans to study and work abroad? New findings published this month in a EURAXESS Worldwide study suggests it takes more than a pandemic to put them off.

The world is breathing a sigh of relief at the news that international teams of scientists have developed, trialled and will soon gain approval to start distributing novel vaccines against the Covid-19 virus. There is hope that the massive disruption the pandemic has caused to lives everywhere will come to an end by Spring 2021 or earlier. But for international researchers whose plans to study and work abroad have been in a state of suspended animation, there is a sense that even that will not be soon enough.

The EURAXESS Worldwide study published on 26 November, called '*Researcher mobility in a changing world'*, casts fresh light on how international researchers have been coping during Covid times, and what impact it has on their ability and willingness to pursue research and studies abroad.

It is clear from the study that they are largely undeterred in their plans to carry on with a stint abroad as soon as conditions open up. Over 85% of the nearly 1224 researchers surveyed said that international mobility was a "must" or "very helpful" as a career building block and the vast majority (75%) said their preferred destination remains unchanged.

Despite the many varied Covid-19 restrictions facing international researchers, very few have completely dropped their plans to further their research and career abroad. Most want to carry on even if it means potentially long delays, and Europe has become more attractive as a host destination, compared with pre-pandemic conditions.

All regions of the world are represented in the study, but the highest share of responses came from Europe, and in particular the Slovak Republic, Italy, Germany and Denmark (n=126, 115, 73 and 55 respectively). Outside Europe, India (85) and Vietnam (51) returned the most completed surveys.

A quarter of the respondents' nationalities does not correspond with where they list as their work location. "Obviously this means they are currently not working in their home countries," the report's authors helpfully explain. Of the 788 respondents with at least one previous research stay abroad, again Europe was the most popular destination, followed by North America.

According to the study team, a large majority of the respondents say their motives for international mobility involve the pursuit of long-term career objectives in academic research. In fact, the vast majority of responses were

provided by researchers from universities and research institutes and their long-term career objectives not surprisingly orientate around “academic research”. More than half listed their age as between 20 and 35, which is a strong correlation to earlier career stages and over 78% possess a Master’s degree or below.

Towards EU-centric mobility

Chapter 3 of the study report drills down to possible avenues for improving EU-centric mobility in the context of Covid-19. These include reinforcing the financial and political commitment to tackling the pandemic and, presumably, others like it, which the EU Recovery Plan and dedicated Covid-19 ERA Research Calls under Horizon 2020 as well as the ERAvsCovid Action Plan’s ten priorities all clearly seek to achieve.

An unequivocable outcome of the Covid-19 pandemic, according to a majority of researchers is that they expect “profound changes” in how their work will be organised in the future and what conditions they will need to succeed.

The findings also point to the need to explore new formats for making research communication truly interactive and “live”, and to address the specific needs and interests of different researcher categories within EURAXESS Worldwide target groups, both regional and sectoral. The importance of extended interactive dialogue with these groups of researchers is also stressed in the study. This translates into a need for more creative use of media and communications tools, and more targeted follow-up with universities, research institutions and policy-makers.

Indeed, in an increasingly interconnected world, through its information and services EURAXESS Worldwide offers researchers an unrivalled opportunity to interact on a global scale. As a networking tool it supports researchers working outside Europe who wish to connect or stay connected with Europe. Through networking, information-sharing and ‘happenings’, researchers can help to boost European research and scientific cooperation with the rest of the world.

According to the team, the survey findings will help EURAXESS Worldwide to communicate more effectively with researchers, especially with those contemplating an international stint. The results will also signal where changes may be needed to strategies and policies aimed at addressing the special conditions facing researchers today, and how the Network can better serve the deepening and widening ambitions of the European Research Area.

More information

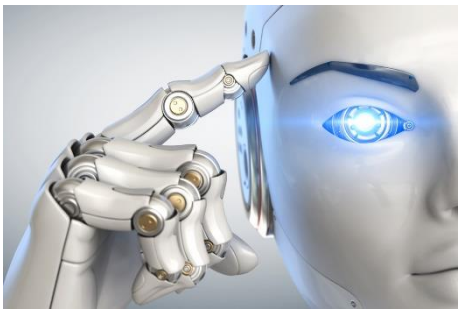
Learn about the ‘Researcher mobility in a changing world’ survey process.

Consult the final report on the EURAXESS Worldwide web-site.

Read the Communication (COM(2020) 628 final), 'New ERA for Research and Innovation'.

The report's findings are also being disseminated throughout the EURAXESS Worldwide's regional hubs: ASEAN (focusing on Singapore, Thailand, Indonesia, Malaysia, and Vietnam), Australia and New Zealand, Latin America and the Caribbean (focusing on Brazil, Argentina, Chile, Mexico, and Colombia), China, India, Japan, Korea, and North America (USA and Canada).

EURAXESS Worldwide wishes to thank Dr Michael Braun (EURAXESS Worldwide ASEAN Regional Representative for Vietnam and Thailand), with the collaboration of MINH DANG BUI - MRES - Economics - FBE- Macquarie University (Vietnam) for their contributions to the study and report.



IN FOCUS: Artificial intelligence research – status and direction

In the year 1950, with a simple question mathematician Alan Turing triggered a debate which led to a new scientific discipline: 'Can machines think?'. His paper 'Computing machinery and intelligence' [1] established the first foundations for a vision of artificial intelligence (AI). Since then, research and application of AI have developed dramatically. Initial research focused on proving its feasibility and on developing "… algorithms enabled by constraints, exposed by representations that support models targeted at loops that tie thinking, perception and action together …"[2]

As computer and software performance grew, this initial research direction was enlarged rapidly towards making AI applicable, reflected in the following definition: "AI is a computer system able to perform tasks that ordinarily require human intelligence...Many of these artificial intelligence systems are powered by machine learning, some of them are powered by deep learning and some of them are powered by very boring things like rules."[3] Today, AI is becoming increasingly a part of our everyday life, for example when we use smart assistants (like Siri, Alexa or Cortana), follow song or TV show recommendations on YouTube, Spotify or Netflix or make medical appointments with a chatbot. AI-powered social media monitoring tools protect us from dangerous content or fake news and soon autonomous, driverless cars will be available to all of us. AI is also at the core of 'smart manufacturing' in Industry 4.0, of 'smart agriculture' and 'smart cities'.

Maybe the hottest topic in the days of the coronavirus crisis might be 'smart health', where AI-based tools are expected to make major contributions to controlling virus dissemination, creating efficient diagnostics and developing vaccines or medical treatment. AI researchers are working on tools for disease mapping and prediction, helping pathologists to make quicker and more accurate diagnoses, delivering optimised, personalised healthcare treatment and for faster and more efficient vaccine and drug design and development. UK-based Exscientia, an innovative company focusing on AI applications in drug development, founded 2012 as a spin-out from the University of Dundee, estimates that the use of AI in drug design shortens the pre-clinical drug discovery stage by at least three-quarters, thus

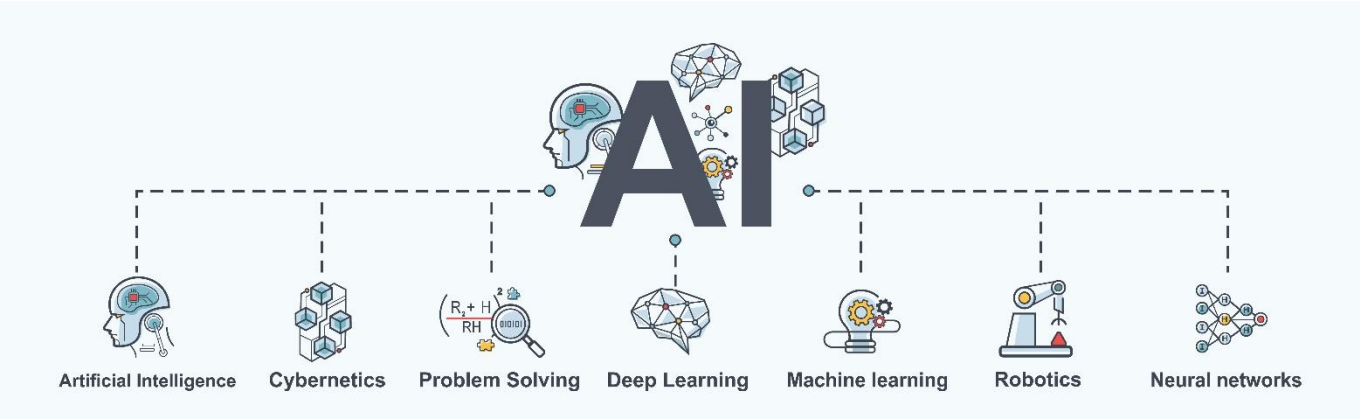
1 A. M. Turing (1950), Computing machinery and intelligence. *Mind* 49: 433-460.

2 Patrick Winston, MIT Ford Professor of Artificial Intelligence and Computer Science, https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-034-artificial-intelligence-fall-2010/lecture-videos/lecture-1-introduction-and-scope/, retrieved 21 March 2020

3 Jeremy Achin, CEO of DataRobot, Keynote Address at the 2017 AI Experience Conference Japan, https://www.youtube.com/watch?v=ZChA63CpX5o

substantially accelerating the availability of new drug treatments to patients worldwide.

Our editors in the EURAXESS ASEAN office put together some reflections on AI and related developments for researchers.



What's in it for researchers?

The highly dynamic AI research as well as its high degree of internationalisation and global networking create a multitude of opportunities for researchers to work on exciting projects in international collaborations. The example of medical AI applications illustrates this. Since 1998, the number of AI-related scientific publications has grown exponentially; most of the papers (65.0% Scopus papers, 97.7% Web of Science papers) were published in the period 2008-2018.[4] A high share of all these papers (in general more than 30%) were co-authored by international teams; several European countries stand out here with shares of plus-50% (Belgium 66%, France 63%, Netherlands 59%, Italy 55%, Germany 53%). This opens a wide field of opportunities for international researchers wishing to cooperate with peers in Europe and other parts of the world.

Such opportunities can be found in fundamental research, contributing to advancing the understanding of the capabilities and limitations of AI technologies, as well as in applied research which seeks to develop AI techniques and their application to various areas. This is illustrated by some examples of current hotspots in AI research:

- For example, in **agriculture** AI can enable enhanced yields and efficiency in farming through predicting and monitoring the time it takes for a crop like a tomato to become ripe and ready for picking,

4 Bach Xuan Tran, Giang Thu Vu, Giang Hai Ha, Quan-Hoang Vuong, Manh-Tung Ho, Thu-Trang Vuong, Viet-Phuong La, Manh-Toan Ho, Kien-Cuong P. Nghiem, Huong Lan Thi Nguyen, Carl A. Latkin, Wilson W. S. Tam, Ngai-Man Cheung, Hong-Kong T. Nguyen, Cyrus S. H. Ho, and Roger C. M. Ho, Global Evolution of Research in Artificial Intelligence in Health and Medicine: A Bibliometric Study. J Clin Med. 2019 Mar; 8(3): 360. Published online 2019 Mar 14. doi: 10.3390/jcm8030360; downloaded from https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6463262/

crop and soil monitoring using new algorithms, and data collected on the field to manage and track the health of crops or agricultural robots.

- In the **health sector**, AI-based neural networks are used as clinical decision-support systems for medical diagnosis; AI-supported interpretation of medical image scans – for example, highlighting conspicuous sections, such as possible diseases, and thus enhancing accurate diagnosis of illnesses like tumours. AI-based tools also can be used for providing or supporting consultations, as well as in telemedicine, predicting the success or lethality of medical treatment or surgical procedures. There are over 90 AI start-ups from research working on AI-applications in health.[5]
- AI applications in **transportation** have huge potential. Already today, cars have AI-based driver-assist features such as self-parking or advanced cruise controls. Researchers and commercial enterprises are now working on developing the technologies for fully autonomous cars. To provide a new dimension of safe, efficient, and reliable transportation while minimising the impact on the environment and communities, such autonomous cars will interact AI-based optimised traffic management applications, which reduce waiting times, energy use, and emissions by as much as 25%. Developing such integrated transportation systems is particularly challenging because of the complexity of systems involving a very large number of components and different parties, each having different and often conflicting objectives. This is a particularly challenging research area, because it requires innovative AI solutions with capabilities which go beyond what is feasible with today's tools.
- AI is also revolutionising many **service sectors**. For example, AI and natural language processing are implemented in automated online assistants that can be seen as avatars on web-pages, where they interact with customers like 'real service staff'. Most advanced systems are now learning to analyse language and behaviour, which enables them even to identify angry customers through their language and to respond appropriately.
- The **financial industry** develops and uses, for instance, 'algorithmic trading', where complex AI systems make trading decisions at speeds several orders of magnitudes faster than any human could do. As support for investment decisions, AI uses 'big data' to analyse correlations between actual events and their impact on asset prices, or to assist people with their personal finances, helping them to

5 From Drug R&D to Diagnostics: 90+ artificial intelligence start-ups in healthcare, *CB Insights* – Blog. 12 September 2019; https://www.cbinsights.com/research/artificial-intelligence-startups-healthcare/, Retrieved 22 March 2020.

optimise spending and savings based on their own personal habits and goals. For this, AI can analyse factors such as monthly income, current balance, and spending habits, then make its own decisions and, for example, transfer money to the person's savings account. Financial lenders are now also considering using machine-learning algorithms to develop credit risk models that predict a consumer's likelihood of default, based on analysis of vast amounts of consumer data.

How can researchers become more engaged in AI research?

- Funding agencies all over the world provide significant funding for AI research. For example in Europe, the European Commission is currently investing a total of €50 million towards the development of AI research networks, funding opportunities for AI research and news about AI in Europe are published regularly (The EU's framework funding programme is currently in transition, from HORIZON 2020 ending this year to HORIZON Europe which is set to begin in 2021). Beyond this, there are also opportunities like the AI-ROBOTICS vs COVID-19 initiative, launched by the European Commission to collect ideas about deployable AI and robotics solutions, as well as information on other initiatives that could help face the ongoing COVID-19 crisis.
- One key to successful international research partnership is to become a member of AI research networks and research consortia. In Europe, there are various potential partners; these can be identified, for example, from the European AI research landscape, or from national AI platforms of EU Member States.
