

PRESS EVENT ZURICH – AGENDA

**THE EDGE OF TOMORROW:
QUANTUM AND AI SHAPE THE FUTURE**

DAY 1 – Quantum & Exploratory Science – 13:30-18:10

Location: The Belvoir Hotel, Säumerstrasse 37, 8803 Rüschlikon

NETWORKING LUNCH – 13:00-13:30

WELCOME / OPENING REMARKS – 13:30-13:35

Video of Dr. Dario Gil, SVP & Director of IBM Research, visiting the lab – 2 min

**Dr. ALESSANDRO CURIONI, Vice President Europe and Africa –
INTRODUCTORY KEYNOTE – 13:37-13:45**

AFTERNOON SESSIONS – Quantum | Qubits: The Power of Small

**1. Keynote on Quantum: The Eagle, Quantum System Two, and the Future
13:45-14:00**

Presenter: Dr. Heike Riel, Quantum Lead Europe and Africa, IBM Research
Europe – Zurich

15 min

2. Panel discussion: Are we ready for the benefits of quantum computing? **14:00-14:30**

Panelists:

- Dr. Heike Riel (Quantum Lead Europe and Africa, IBM Research Europe – Zurich)
- Dr. Alberto Di Meglio (Head of CERN OpenLab)
- Arunima Sarkar (AI Lead, Centre for Fourth industrial Revolution, World Economic Forum – *via a video link*)
- Dr. Lidia del Rio (physicist, ETH)
- Dr. Hannah Vetzl (Head of the Office of the Competence Network Quantum Computing, Fraunhofer Institute – *via a video link*)

Moderator: Katia Moskvitch

Abstract: With the quantum technology maturing – Quantum System One being installed around the world, how can the world get quantum-ready today?

In this session, you'll hear about the necessary future regulations around this emerging technology. We'll debate on the need for quantum computing to remain open access, about the necessary infrastructure for this technology to truly flourish, about education and awareness raising – not just when it comes to physics and computer science graduates, but also high schoolers and workers from diverse, very diverse fields.

30min

3. Fireside chat: Unlocking the power of quantum algorithms for the financial industry **14:30 – 14:50**

Presenters:

- Dr. Stefan Woerner, IBM Quantum Applications Research & Software Lead and a Principal Research Staff Member, IBM Research Europe – Zurich
- Dr. Christa Zoufal, Research Staff Member, Quantum, IBM Research Europe – Zurich

Moderator: Leonid Ariosa

Abstract: We have developed new quantum algorithms that could enable risk analysis of investment portfolios in nearly real time. Today, such analyses can take many hours to perform, so an immediate reaction on changing circumstances is impossible.

Other applications where quantum algorithms may benefit the financial industry include pricing options and portfolio optimization, as well as the detection of credit card fraud, to just name a few. In this session, we will cover the main use cases and discuss the latest developments from our collaborations with financial institutions.

20 min

4. Presentation: A deep dive into the Eagle 127-qubit IBM Quantum Eagle processor

14:50-15:10

Presenter: Dr. Zaira Nazario, theory, algorithms, and applications Technical Lead at IBM Quantum, IBM Research – Yorktown (*via a video link*)

Abstract: We now have 127 qubit processor – but what does it mean, really?

In this panel, we will dive into this newest quantum hardware, IBM's new 127-qubit processor, Eagle. Eagle is IBM's first quantum processor to break the 100-qubit barrier and represents a significant milestone on IBM's roadmap towards reaching Quantum Advantage. We will assess the overall quantum computing performance as measured by three key metrics: scale, quality, and speed. We will focus on the advances at IBM that enabled scaling superconducting quantum computers from 27 qubits to 65 to 127 – and, soon, beyond.

Finally, we will see how we can combine these increasingly more capable systems with new ways to exploit classical computers. The aim: extending the computational reach of quantum and accelerate our path to quantum advantage. Once we get there, there is no turning back.

20 min

5. Presentation: The Future for AI & Quantum for Accelerated Discovery **15:30-16:00**

Presenters:

- Dr. Pauline Ollitrault, researcher, quantum, IBM Research Europe – Zurich
- Dr. Teodoro Laino, distinguished researcher, manager, IBM Research Europe – Zurich

Moderator: Leonid Ariosa

Abstract: This session will dive into the different ways RoboRXN and new quantum software tools such as the Qiskit application modules for chemistry, both developed by IBM researchers mainly at the Zurich Lab, are putting materials discovery on the fast track. These technologies should help us develop better batteries, among other things – improving their storage capacity and addressing sustainability.

30 min

LAB TOURS – 16:00-17:30

15 min to walk to the lab from the Belvoir hotel, tours start at 16:15 and continue until 17:15, 3-4 groups of 10-12 people:

- **Quantum computing lab** (Dr. Andreas Fuhrer, researcher, Quantum Technology group, IBM Research Europe – Zurich)
- **Photonics lab** (Dr. Thilo Stoferle, researcher, photonics, IBM Research Europe – Zurich)
- **AFM lab** (Dr. Leo Gross, researcher, scanning tunnelling microscopy and atomic force microscopy, IBM Research Europe – Zurich)
- **RoboRXN lab** (Dr. Teodoro Laino, distinguished researcher, manager, IBM Research Europe – Zurich)

Back to the Belvoir – A quick coffee break – 17:30-17:40

LATE AFTERNOON SESSION – EXPLORATORY SCIENCE – 17:40-18:10

**Interactive fireside chat: Making light liquid for optical computing of the future
17:40-18:10**

Presenter: Dr. Thilo Stoferle, researcher, photonics, IBM Research Europe – Zurich

Moderator: Leonid Ariosa

Abstract: Move over, Star Wars. Despite what Lucasfilm wants us to believe, light does not interact with light, and one light beam can cross another without affecting it in any way. To force such interaction, we need matter to mediate it. Such interaction would pave the way to optical computing, replacing electricity with light to greatly speed up our gadgets and lower power consumption. Researchers have been studying it for decades, betting on advances in nanotech, quantum tech, and newly developed materials. And our team has recently reached an important milestone.

We've been able to switch a light beam on and off using the smallest possible quantum of energy, a single photon. The electronic switches in today's gadgets, the transistors, need about 100 times more energy and are still 100 times slower than our light switch.

There is still a long way until this becomes a useful technology though. Our switches need to be supplied with laser power that consumes energy to generate it. We are now investigating the so-called "supercrystals" assembled from tiny perovskite nanocrystals that might help us greatly reduce the energy consumption. The research could lead to the development of new materials and photonic structures able to emit and absorb light extremely efficiently – impacting the development of ever brighter and more efficient light sources and photovoltaics.

30min

END OF DAY 1 SESSIONS

DINNER AT THE BELVOIR

APERRO 18:30-19:00 & DINNER 19:00-21:00

Followed by drinks at the Belvoir bar: 21:00-midnight

DAY 2 – Accelerating Discovery with AI | RoboRXN – 9:00-17:30

NETWORKING COFFEE – 8:15-8:45am

WELCOME SPEECH – 8:45-9:00

MORNING SESSIONS – AI & Cloud | Smart machines to help humans thrive – 9:00 – 11:45

**1. Opening keynote: AI and Hybrid Cloud helping to improve the world
9:00-9:15**

Presenter: Dr. Robert Haas, Head of Cloud, IBM Research Europe – Zurich

Abstract: Accelerated Discovery is only possible when we can weave together very specialized computing technologies and data in a seamless manner, using the hybrid cloud. This supercharged implementation of the scientific discovery method thrives on data. But that works only if data is kept and made available in a timely, cost-effective, and controlled way. It's crucial – and these upcoming sessions will illustrate why.

15 min

**2. Fireside chat: Tape for Hyperscalers
9:15-9:45**

Presenter: Dr. Mark Lantz, manager Cloud FPGA and tape technologies, IBM Research Europe – Zurich

Moderator: Angela Harp

Abstract: Currently we produce [2.5 quintillion bytes of data](#) on a daily basis, mainly due to the continuous rise of the Internet of Things (IoT), the emergence of high-definition 4K/8K videos and AI-based big-data analyses. At the rate we're going, worldwide data is expected to hit [175 zettabytes by 2025, representing 61 percent annual growth](#). One ZB is equivalent to a trillion gigabytes (GB) – the latest cellphones have 256 GB.

So where is all this data being stored? Magnetic tape – a technology more than 60 years old – is making a huge comeback among hyperscale cloud companies for data storage due to its low cost, low power consumption, and its excellent future scaling potential compared to HDD. But developing a high-performance tape library system to meet service-level agreements can be challenging and costly.

In this fireside chat, Dr. Mark Lantz will talk about **a new paper** on tape storage libraries (which won the Best Paper Award at the Mascots conference in Nov. 2021), and the renaissance of tape. He will introduce a novel analytical model that accurately captures the principal aspects of tape library operation to help hyperscalers like OVH and Microsoft better design their tape storage libraries to keep cold data from going dark.

30 min

3. Panel discussion: Hybrid cloud & AI advances are pushing AI to the Edge 09:45-10:15

Panelists:

- Dr. Robert Haas, Head of Cloud, IBM Research Europe – Zurich
- Dr. Abdel Labbi, Head of Data & AI Platforms, Research, IBM Research Europe – Zurich
- Dr. Patrick Ruch, researcher, IBM Research Europe – Zurich
- Dr. Cristiano Malossi, manager of the AI Automation group, IBM Research Europe – Zurich

Moderator: Katia Moskvitch

Abstract: The number of connected IoT devices has skyrocketed in recent years and the trend is set to continue at an even faster pace. By 2025, predictions put IoT device ownership at 3 per person worldwide, while the amount of data generated will reach a whopping 80 zettabytes. At IBM, researchers are creating the infrastructure to extract the most value from the growing amount of data in a secure and ethical way. We focus on open tools and a hybrid multi-cloud approach and develop the technology to exploit that infrastructure. In this session we will include discussions of applications in AI-assisted chemical sensing and monitoring of large-scale infrastructure such as bridges, wind turbines and others.

30min

NETWORKING COFFEE BREAK – 10:35-10:45

4. Interactive presentation: IBM Pathfinder – Hybrid Cloud Data

Governance tool

10:45-11:05

Presenter: Dr. Sean Rooney, senior research staff member, IBM Research Europe – Zurich

Abstract: IBM Research’s new tool, IBM Pathfinder, uses AI to crawl through distributed data processing activities of an enterprise – and extracts metadata to update a map of the company’s activities in real time. It can be used to give a wide variety of views of an observed space, such as the storage locations of the data and the relationships between data assets. In this session, you will see a demo of the Pathfinder system – and learn what it can do for a company and how it can simplify everyone’s life.

20 min

5. Panel discussion: Human-like AI – Neurosymbolic AI & Neuromorphic computing research

11:05-11:45

Presenters:

- Dr. Abbas Rahimi, researcher, IBM Research Europe – Zurich
- Dr. Angeliki Pantazi, Manager Neuromorphic Computing & IO Links, IBM Research Europe – Zurich
- Dr. Irem Boybat, researcher, in-memory computing, IBM Research Europe – Zurich
- Dr. Dan Gutfreund, principal investigator at the MIT-IBM Watson AI Lab, MIT-IBM Watson AI lab, Cambridge, Mass.

Moderator: Katia Moskvitch

Abstract: Today, machines translate languages, recognize objects and spoken speech. But ask a smartphone assistant something more complex than a basic command, and it will struggle.

Machines with *common sense*, which rely on an emerging AI technique known as neurosymbolic AI, could greatly increase the value of AI for businesses and society. It learns like human infants, and combines the original, symbolic, AI with deep neural networks that have helped revolutionize the AI field over the past few decades. Deep learning has achieved outstanding success in many AI tasks – resulting in human-like performance at a much higher power than the ~20 watts required by the human brain.

But the lack of common sense isn't all. In addition to **neurosymbolic AI**, we are also looking into biologically-inspired computing aspects for the next generation AI systems – what's known as **neuromorphic computing**. We've developed spiking neural units (SNUs) that add biologically-inspired neural dynamics into deep learning – drastically cutting computational cost and the inference time of the speech-to-text transcription. It's the first successful attempt at demonstrating biologically-inspired deep learning for a fairly involved task – and could greatly improve today's speech recognition products. This is what this session is about – the ongoing, mind-blowing progress in making AI truly 'smart'.

40min

LUNCH AT THE BELVOIR – 11:45-12:45

1:1 interviews during lunch are possible

Walk to the lab – 12:45-13:00

Demos at the THINK lab – 13:00 – 14:00

- ***Generative toolkit for scientific discovery*** – Dr. Matteo Manica, researcher in Accelerated Discovery, IBM Research Europe – Zurich
- ***Deep Search AI: new features, demo includes the Organovoltaics project*** – Dr. Peter Staar, Manager of the Scalable Knowledge Ingestion group, IBM Research Europe – Zurich
- ***AI SaaS for Visual Inspection of Civil Infrastructures: Demo on Storebaelt Piers*** – Dr. Chiara Marchiori, Dr. Andrea Bartezzaghi, researchers at IBM Research Europe – Zurich
- ***PAIRS & IBM Environmental Intelligence Suite – Understanding and adapting to climate and weather extremes*** – Dr. Jonas Weiss,

researcher in Physics and AI for Climate Impact, IBM Research Europe – Zurich

- ***Speech transcription using biologically-inspired neural networks with live or recorded speech, neuromorphic computing*** – *Thomas Bohnstingl, predoctoral researcher, IBM Research Europe – Zurich*

Walk back to the Belvoir – 14:00-14:15

EARLY AFTERNOON SESSIONS – Making our world more sustainable and safer with AI – 14:15-15:45

1. Fireside chat: A Deep Dive into RoboRXN – Creating a molecule live 14:15-15:00

Presenter: Dr. Teodoro Laino

Moderator: Angela Harp

Abstract: In this panel discussion, Dr. Teodoro Laino will tell the story of IBM RoboRXN, a cloud-based AI-automated chemistry lab that can cut the discovery and production time of a material in half.

Dr. Laino will show you how he and his team are revolutionizing the art of making materials. He will demonstrate how a chemist can create a molecule remotely from anywhere in the world. But most importantly, he will highlight the vast application potential of IBM RoboRXN by introducing you to an array of industries partners who are currently adopting the technology into their workflows to accelerate more efficient molecular discoveries.

By the end of this session, you will not only understand how IBM RoboRXN can boost a range of initiatives across drug, chemical and molecule discovery; you will also learn about new technical features that support proprietary datasets and allow chemists to predict the most effective and sustainable enzymatic reactions that are critical for greener chemical processes; most importantly, you will see how a budding technology is making its way from research to commercialization, building a community of chemists and R&D specialists along the way.

***IMPORTANT: There will be an EMBARGOED announcement about RoboRXN...
Taking this technology to exciting new heights!***

45 min

2. Panel discussion: Emerging technologies to make our world more sustainable

15:00-15:45

Panelists:

- Dr. Peter Staar, Manager of the Scalable Knowledge Ingestion group, IBM Research Europe – Zurich
- Dr. Kommy Weldemariam, Impact Science, Future of Climate, IBM Research – Africa labs
- Dr. Edward O. Pyzer-Knapp, STSM, WW Research Lead, AI Enriched Modelling and Simulation, IBM Research Europe – Daresbury
- Dr. Matteo Manica, researcher in Accelerated Discovery, IBM Research Europe – Zurich
- Dr. Laura Gardiner, researcher, application of ML and informatics for life sciences, IBM Research – UK

Moderator: Angela Harp

Abstract: With the COP26 summit just a few weeks behind us, the discussions around how to accelerate action towards the goals of the Paris Agreement and the UN Framework Convention on Climate Change are still fresh in our minds. IBM Research believes that using the latest tech and science to accelerate the discovery and development of new materials and techniques is the way forward. This panel will focus on scientific breakthroughs aimed at helping the world deal with the negative impacts of climate change and improving sustainability.

We have just introduced you to IBM RoboRXN for Chemistry. Now we are going to show you how this cloud-based AI-driven autonomous lab along with other AI tools such as Deep Search and generative machine learning models are accelerating the discovery of new materials, including [complex polymers](#) and materials for carbon CO₂ capture and separation. We will show you how AI is playing a key role in helping researchers identify more biodegradable materials whose byproducts will be kinder to the environment if they end up in the ocean or accumulate in the tissue

of living things. Our panelists of IBM researchers will talk passionately about how they are combining materials science, cloud computing and AI to accelerate the discovery of climate change solutions.

45min

NETWORKING COFFEE BREAK – 15:45-16:00

LATE AFTERNOON SESSIONS – Security advances: Keeping the world secure – 16:00-17:30

1. Keynote: What's new with IBM security research?

16:00-16:15

Presenter: Dr. Marc Stoecklin, Principal Research Scientist, Department Head, Security Research (IBM Research Europe – Zurich)

15 min

2. Fireside chat: AI Security

16:15-16:45

Presenters:

- Dr. Beat Buesser, Research Scientist, AI Security and Privacy (IBM Research Europe – Dublin)
- Dr. Abigail Goldsteen, Research Scientist, Data Security and Privacy (IBM Research – Haifa)

Moderator: Leonid Ariosa

Abstract: AI and data are the motors of economic and societal progress today and in the coming decades. It is essential that this technological revolution puts trust front and center. In this session we will discuss the very latest technological developments out of IBM Research to build trustworthy AI that is robust against adversarial attacks and preserves the privacy of sensitive information in training data sets. These techniques are essential for compliance with data protection and AI regulations such as the EU's GDPR and new upcoming legal frameworks on AI.

15min

3. Presentation – Central Bank Digital Currency 16:45-17:00

Presenters:

- Dr. Elli Androulaki, Distinguished Research Scientist, Manager, Blockchain Security & Applications (IBM Research Europe – Zurich)
- Dr. Angelo de Caro, Research scientist, Cryptography, Blockchain Security & Applications (IBM Research Europe – Zurich)
- Dr. Kaoutar El Khiyaoui, Research scientist, Cryptography, Blockchain Security & Applications (IBM Research Europe – Zurich)

Abstract: Cryptocurrency is one of the hottest topics in fintech. But it's not just about Bitcoin, Ethereum and so on – central banks are also entering the market and exploring digital currencies. In this session, IBM researchers will reveal how they are working with Euroclear, the Central Bank of France, and other institutions in an experiment to make decentralised Central Bank Digital Currencies a reality.

15 min

4. Panel discussion: Privacy and encryption – New developments 17:00-17:30

Panelists:

- Dr. Julia Hesse, Research scientist, Cryptography & Privacy (IBM Research Europe – Zurich)
- Dr. Luca De Feo, Research scientist, Cryptography & Privacy (IBM Research Europe – Zurich)
- Dr. Bertram Poettering, Research scientist, Cryptographic Protocols (IBM Research Europe – Zurich)
- Dr. Michael Osborne, Principal Research Scientist, Manager, Foundational Cryptography (IBM Research Europe – Zurich)

Moderator: Leonid Ariosa

Abstract: IBM cryptography researchers will report in this session on their latest achievements in using cryptographic techniques to improve trust in everything from

password privacy to email encryption and analytics of sensitive data. The discussions will touch on new login protocols that do not require revealing users' passwords, vulnerabilities found in widely used email encryption tools and an advanced technique that allows encrypted data to be processed without having to be decrypted.

30min

Thanks for joining us!! 😊