QUANTUM100

A HUNDRED YEARS OF QUANTUM PHYSICS

Program booklet for the nationwide closing event of the Internation Year of Quantum Science 2025

Saturday, 15.11.2025
Halle Münsterland

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Program

Program overview

ROOM NEO

11:00 a.m.–6:00 p.m.

- Welcoming of groups
- Quantum100 T-Shirt-Sale
- Workshops for school classes
- Quanten To Go
- Quantum-Minigolf
- Superaconducting maglev train

BLAUER SAAL

„Speakers Corner"
(Lecture titles see page 26)

1:30 p.m.
Benjamin Burkard (QOI)

2:00 p.m.
Fabienne Marco (QuantWorld)

2:30 p.m.
Stefan Küchemann (GALaQSci)

3:00 p.m.
Dr. Michael Johanning (eleQtron)

3:30 p.m.
Johannes Schaefer (duotec)

4:00 p.m.
Markus Gregor (University of Applied Sciences Münster)

4:30 p.m.
Björn Habrich (qutools)

5:00 p.m.
Prof. Dr. Alexander Kappes (Einstein Telescope Collaboration)

ROTER SAAL

1:00 p.m.
Quantum computers and quantum internet: New possibilities for computation and communication
Prof. Dr. Carsten Schuck
(University of Münster)

2:00 p.m.
Quantum relics from the early universe: On the structure of the cosmos and the gravitational wave echo of the Big Bang
Prof. Dr. Kai Schmitz
(University of Münster)

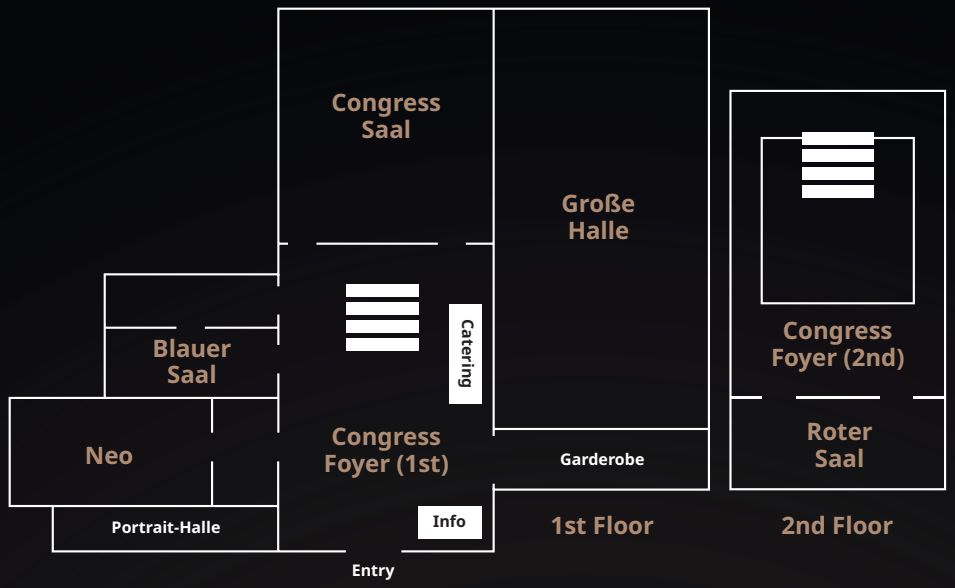
4:00 p.m.
Science Diplomacy and the work of physicists for Peace and disarmament: The Pugwash Conferences on Science & World Affairs
Prof. Dr. Götz Neuneck
(University of Hamburg)

Following podium discussion with:
Prof. Götz Neuneck (University of Hamburg),
Prof. Michiji Konuma (Keio University, Japan),
Prof. Michael Quante (University of Münster)

CONGRESS-SAAL

3:00 p.m.
Wintering with neutrinos – Life and research at the South Pole
Dr. Raffaela Busse (LWL-Museum Münster)

5:30 p.m.
100 years of quantum theory and the search for lost reality
Prof. Dr. Markus Arndt (University of Vienna)



CONGRESS FOYER

1:00–7:00 p.m. Exhibition
Representatives from education, science, and industry present innovative ideas and showcase exciting technological achievements and exhibits from 100 years of research and development in the field of quantum technology. Alongside the exhibition, there will be general-interest lectures and workshops for students.

GROSSE HALLE

7:30 p.m. International Closing Concert

6:30 p.m. Doors

7.30 p.m. Welcome and introduction

7:45 p.m. Fundamental Interactions, Part I-IV

8:45 p.m. Intermission

9:15 p.m. Fundamental Interactions, Part V with Choir

© Uni MS – Christoph Steinweg

Dear guests,

On behalf of the University of Münster, I would like to welcome you to the nationwide closing event of the Quantum Year here in Münster.

Exactly 100 years ago – particularly in Göttingen – groundbreaking work was carried out that laid the foundation for modern quantum physics. In less than two years, creative and intensive collaboration between many scientists led to the development of a formalism for describing nature, the basic ideas of which remain unchanged to this day, revolutionized physics, and has had a lasting impact on our society through a wide range of technological applications.

With “Quantum100,” we present the fascinating facets of quantum physics. The focus lies on 100 physicists from 100 years of the history of physics – with their biographies, portraits, and scientific contributions. The range of applications is impressive: from computers to medical imaging, lasers, and precise time measurement for GPS to technologies of the so-called “second quantum revolution” – from quantum computers to highly sensitive quantum sensors.

However, basic research and its technological applications cannot be viewed in isolation from the social context. Max Born, one of the fathers of quantum physics, wrote as early as 1960:

„When I was young, it was still possible to be a pure scientist without worrying too much about applications and technology. Today, that is no longer possible. Natural science is inextricably intertwined with social and political life. Thus, every natural scientist today is a link in the technical and industrial system in which he lives. This means that he also bears part of the responsibility for the sensible use of his findings.“

Max Born

Max Born, ”Physik und Politik“ [Physics and Politics]. Göttingen 1960, p. 45

The closing event, Quantum100 in Halle Münsterland, takes up these multifaceted references and brings them into the present. For even today, the question of science‘s responsibility remains central. The peace city of Münster provides the ideal setting for the joint declaration by the Japanese Physical Society (JPS) and the German Physical Society (DPG) on the responsibility of physics for peace, which was signed on November 14.

Prof. Dr. Johannes Wessels
Principal of the University of Münster

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Dear guests,

welcome to Münster for the closing ceremony of the International Year of Quantum Science and Technology (IYQ) in germany.

This outstanding event in Halle Münsterland is another highlight of the activities of the German Physical Society (DPG) during the IYQ. It follows the opening in Berlin, the World Quantum Day in Berlin, and the DPG Fall Meeting on Quantum Science and technology in Göttingen. Also, thanks to great initiatives such as the present event in Münster, we were able to conduct an impressive variety of activities this year, which have brought considerable attention and visibility to physics and quantum physics in particular. There was an exciting thematic spectrum of DPG activities in this quantum year – with the participation of several Nobel Prize winners in physics – aimed at anyone with an interest in quantum physics.

The activities ranged from the present status and perspectives of all fields of modern physics reigned by quantum mechanics, to the study of the historical roots of quantum mechanics and conceptual questions that still challenge us today, to music composed especially for the quantum year.

To give just a few examples: The European Physical Society (EPS) – together with the DPG and other national physical societies – emphasized the fundamental importance of quantum science for Europe in a joint declaration “Europe and the Future of Quantum Science”. With the DPG publication ‘Physics: Insights and Perspectives’, the DPG sheds light on physics in its entire breadth – from the fundamental building blocks of matter to the vastness of the cosmos. The History Wall of Quantum Physics offers – through an innovative website – insights into the multi-layered history of quantum physics. The Quantum Conductance Kit For Schools – a simple circuit – has been developed to demonstrate quantized conductance in physics lessons in a simple way.

And since the DPG has committed itself to its responsibility for society in its statutes, I am very pleased that here in the city of Münster, which, thanks to the Peace of Westphalia, is a symbol of peace like hardly any other city in Germany, the joint declaration of the Japanese Physical Society (JPS) and the DPG on the responsibility of physics for peace has been signed on November 14th as part of our closing event in Münster Town Hall.

As President of the DPG, I would like to express my sincere thanks for the great commitment of all those involved in the organization of the event in Münster and the quantum year in total.

My special thanks go to the Universität Münster for their hospitality and tremendous support for this final event; the team around Stefan Heusler, the Institute for Physics Education Research. We are grateful to the Wilhelm and Else Heraeus Foundation for its financial support of the DPG‘s diverse activities; and the DPG Head Office, here on behalf of the Chief Executive Bernhard Nunner, and the DPG Project Manager for the Quantum Year, Wiebke Schuppe.

Prof. Dr. Klaus Richter
President of the German Physical Society

Exhibition

EIN Quantum NRW

EIN Quantum NRW – Education | Innovation | Networking

EIN Quantum NRW is an initiative supported by the state of North Rhine-Westphalia and an open quantum technology network comprising universities, non-university research institutions and companies.

The network promotes visibility, awareness and enthusiasm for these future technologies.

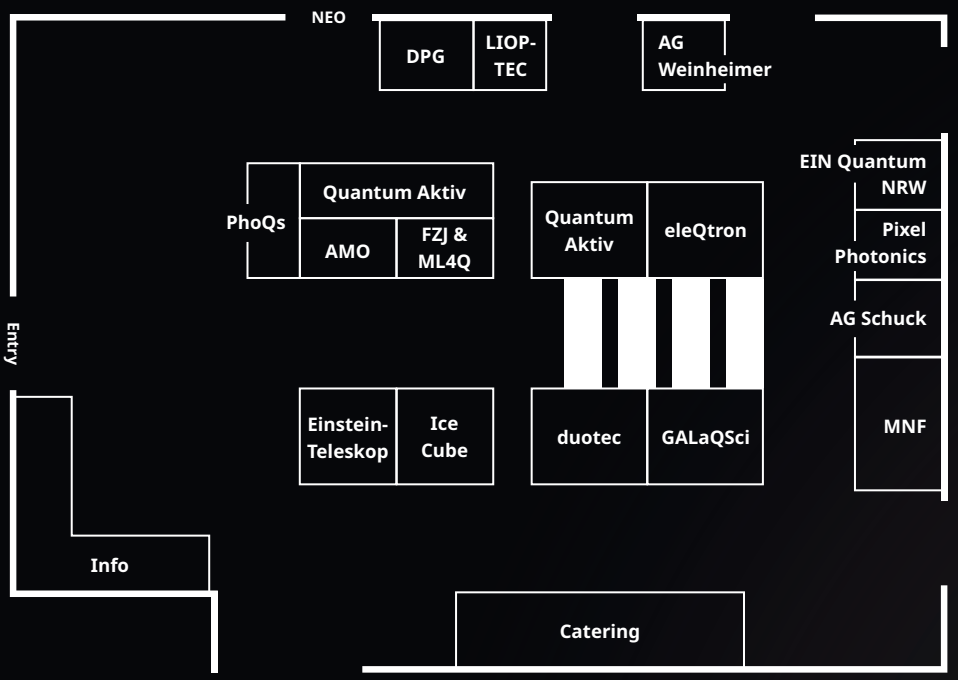
Through the targeted networking of science, industry and politics, EIN Quantum NRW identifies trends and developments in quantum technologies at an early stage and sets the course in good time.

In this way, EIN Quantum NRW promotes both scientific and economic goals and unites them in North Rhine-Westphalia under the umbrella of a unique quantum technology ecosystem.

EIN Quantum NRW supported the organisers of Quantum 100 in organising the exhibition.

More information at www.ein-quantum.nrw

1st Floor



AMO
Innovative technologies in the field of nanotechnology and digitalization

Group Prof. Schuck | University of Münster
Innovative teaching formats and modern research approaches

Group Prof. Weinheimer | University pf Münster
Neutrino oscillation – demonstration experiment

DPG – German Physical Society
The oldest national and largest physical society in the world

duotec
Developer of an applicable quantum sensors

EIN Quantum NRW – Education | Innovation | Networking
Open quantum technology network

Einstein-Teleskop Deutschland
Third-generation underground gravitational wave observatory.

eleQtron
Germany's first quantum computer manufacturer

Forschungszentrum Jülich & ML4Q
One of the leading locations for quantum research in Europe

IceCube-Neutrino-Teleskop | University of Münster
The world's largest neutrino detector at the South Pole

LIOP-TEC GmbH
Optomechanical products and tunable dye laser systems

Münster Nanofabrication Facility | University of Münster
Large-scale equipment centre for nanomanufacturing and nanoanalysis

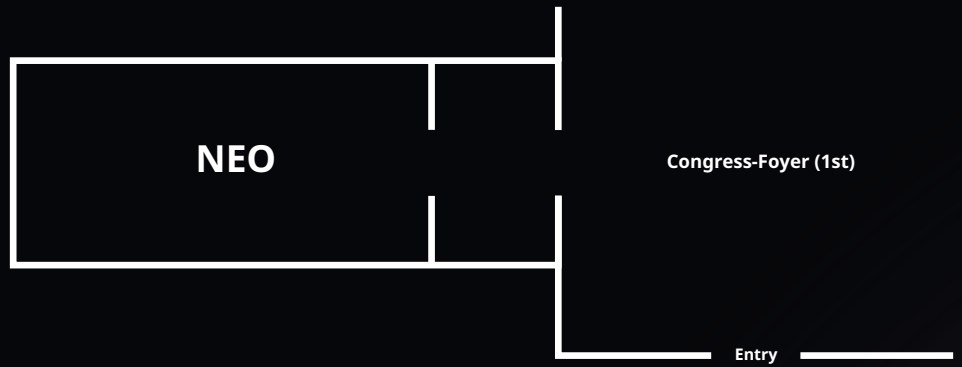
PhoQS - Institut für Photonische Quantensysteme
Quantum research for the future

Pixel Photonics
Developer of a core component for quantum communication

Qookies – A Quantum Quest (GALaQSci)
Discover the world of quantum technologies in a playful way!

Quantum Aktiv
Joint exhibition of the BMFTR funding line 'Quantum Aktiv'

1st Floor – Room NEO



Group Prof. Bratschitsch | University of Münster
Superconducting Maglev Train

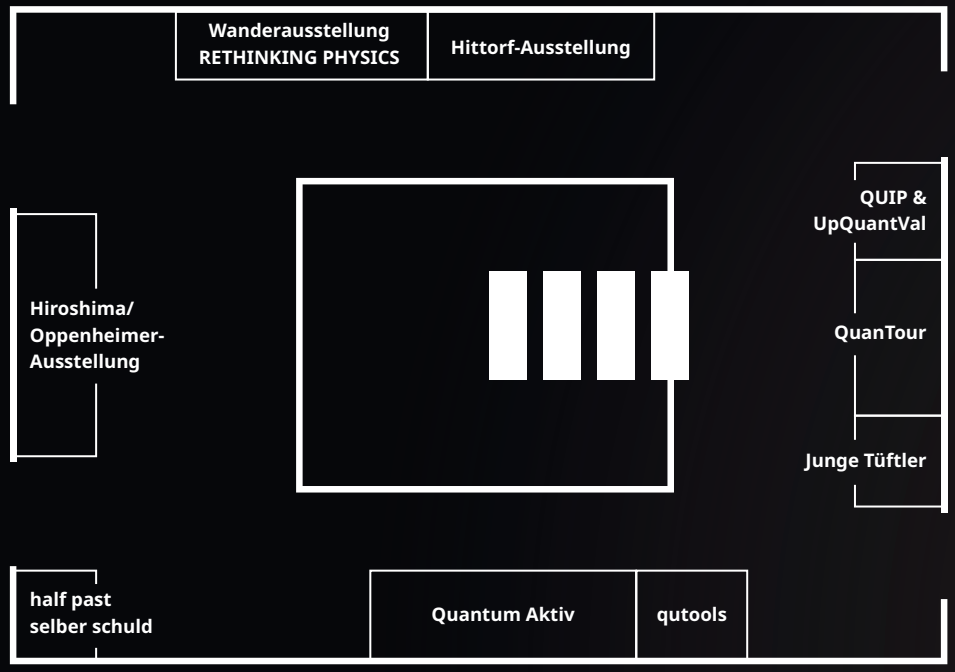
Group Wurstbauer, MExLab Physik and Friedemann Reinhard, Uni Rostock
Quantum Mini Golf – Mini Golf in the world of quantum physics

Group Prof. Wurstbauer | University of Münster
Quantum phenomena made visible – with low temperatures

MExLab Physik, Q.UNI and Netzwerk Teilchenwelt | University of Münster
Discover the quantum world at the participation booth „Quanten To Go“

Quantum100: T-Shirt Sale
100 famous physicists, illustrated by Michael Tewiele

2nd Floor



half past selber schuld
Erfinder des Bühnencomics: Ilanit Magarshak-Riegg und Frank Römmele

Hiroshima Exhibition
About the devastating atomic bomb attack on the Japanese city

Hittorf Exhibition | University of Münster
Johann Wilhelm Hittorf – 111 years as an honorary citizen of the city of Münster

Junge Tüftler – TüftelLab
A hybrid learning environment for future-oriented learning

Natsuki Ransai | Japanese quantum calligraphy
Japanese calligraphy combined with quantum physics

QuanTour – A quantum emitter on journey
Combining innovative science communication with open science

Quantum Aktiv
Joint exhibition of the BMFTR funding line ‘Quantum Aktiv’

QUIP & UpQuantVal
Training and career opportunities for quantum technologies

qutools
Quantum physics: promoting understanding and advancing technologies

RETHINKING PHYSICS | Traveling exhibition
100 years of quantum mechanics – time for a female perspective!

Lectures

1:00 p.m. | Roter Saal
Prof. Dr. Carsten Schuck | University of Münster
Quantum computers and quantum internet: New possibilities for computation and communication

1:30–5:30 p.m. | Blauer Saal
Various companies and research institutes
Speakers Corner

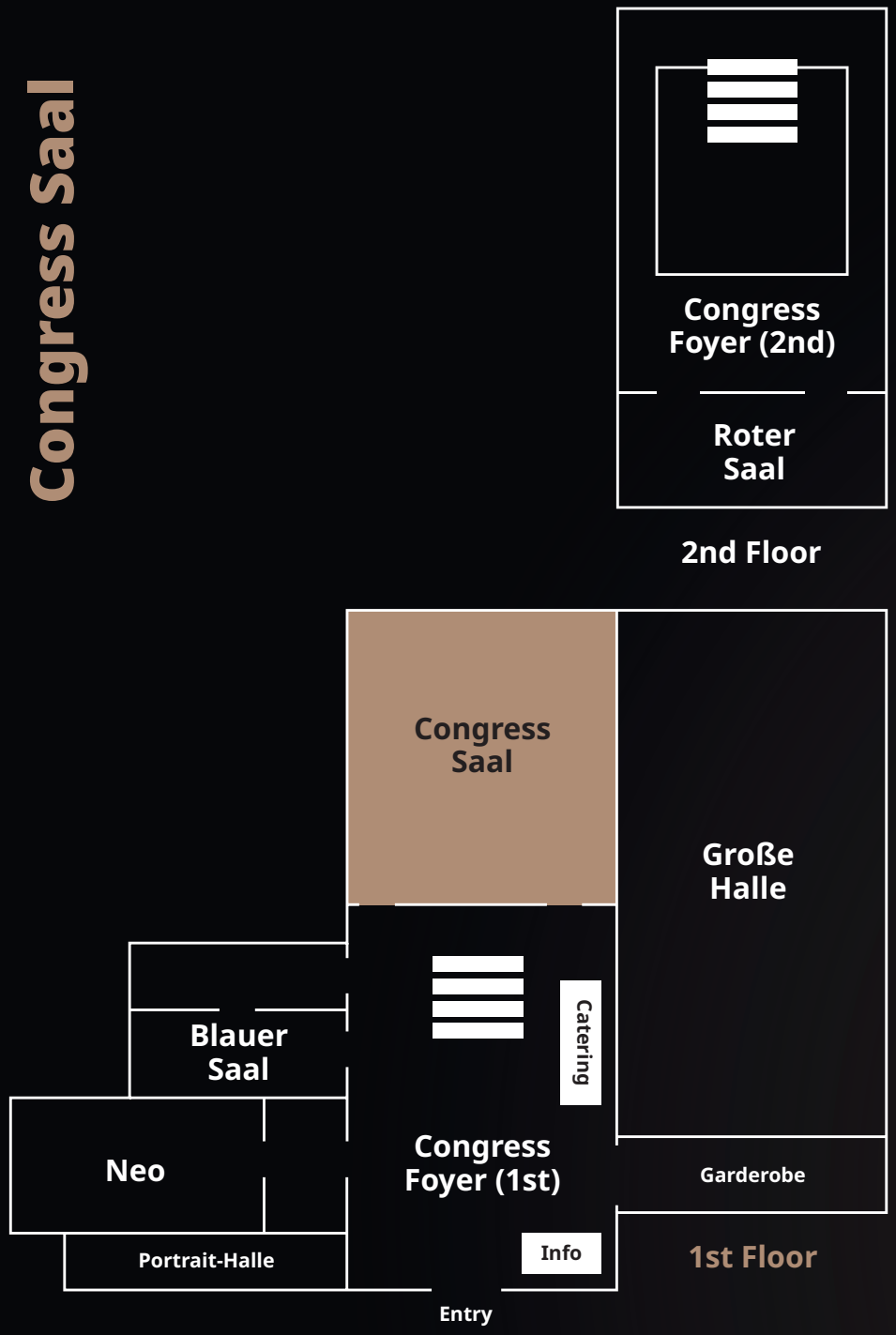
2:00 p.m. | Roter Saal
Prof. Dr. Kai Schmitz | University of Münster
Quantum relics from the early universe: On the structure of the cosmos and the gravitational wave echo of the Big Bang

3:00 p.m. | Congress Saal
Dr. Raffaela Busse | LWL-Museum Münster
Wintering with neutrinos – Life and research at the South Pole

4:00 p.m. | Roter Saal
Prof. Dr. Götz Neuneck | Chair of the Pugwash Council and Chair of the Federation of German Scientists
Science Diplomacy and the work of physicists for Peace and disarmament: The Pugwash Conferences on Science and World Affairs

5:30 p.m. | Congress Saal
Prof. Dr. Markus Arndt | University of Vienna
100 years of quantum theory and the search for lost reality

Congress Saal



Dr. Raffaela Busse | LWL-Museum Münster

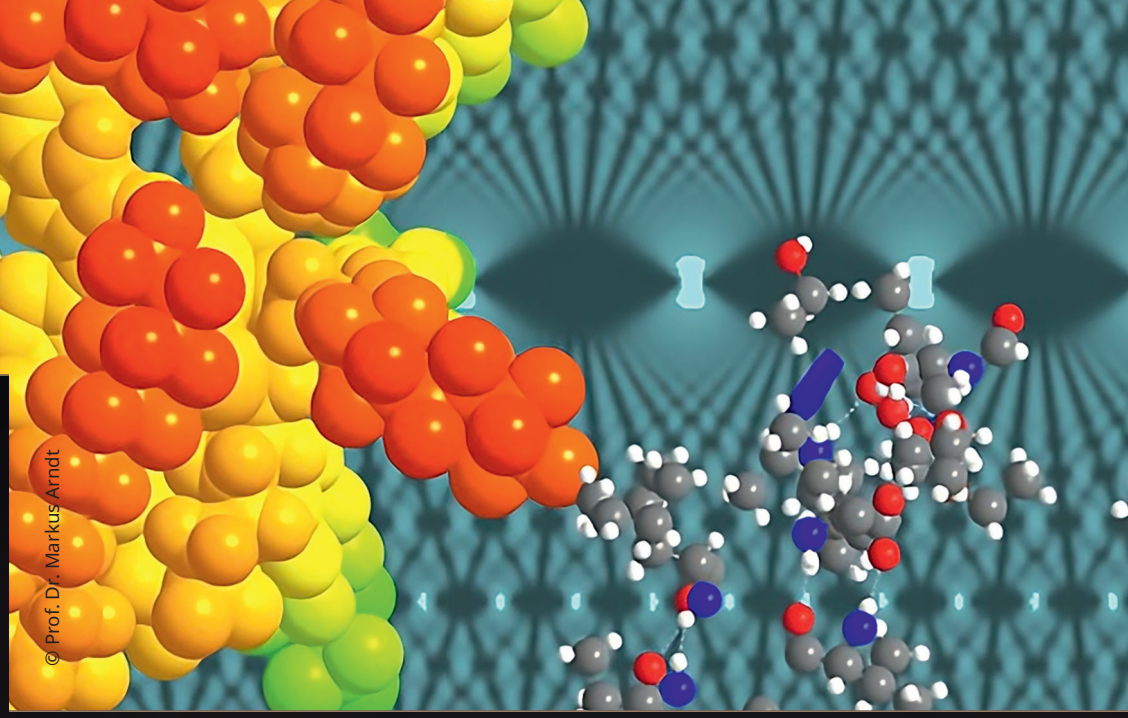
Wintering with neutrinos – Life and research at the South Pole

3.00 p.m. | Congress-Saal
Moderator: Prof. Dr. Christian Klein-Bösing

The geographic South Pole is located in one of the most extreme landscapes on our planet, surrounded only by ice as far as the eye can see. Not even penguins venture here.

When the sun sets for six months in March, temperatures can drop to -80° C. For eight long months, the Amundsen-Scott South Pole Station is isolated from the outside world, and with it a small crew of "winterovers". But the winterovers are able to withstand the extreme cold, the darkness and the isolation thanks to their special community and because of the fascinating science that is carried out here: Among other things, the South Pole is home to the IceCube Neutrino Observatory, which investigates the origin of high-energy cosmic particles, and with them the history of our universe.

Dr. Raffaela Busse lived and worked for IceCube at the South Pole for more than one year and provides insights into a world that very few of us will ever get to see.



Prof. Dr. Markus Arndt | University of Vienna

100 years of quantum theory and the search for lost reality

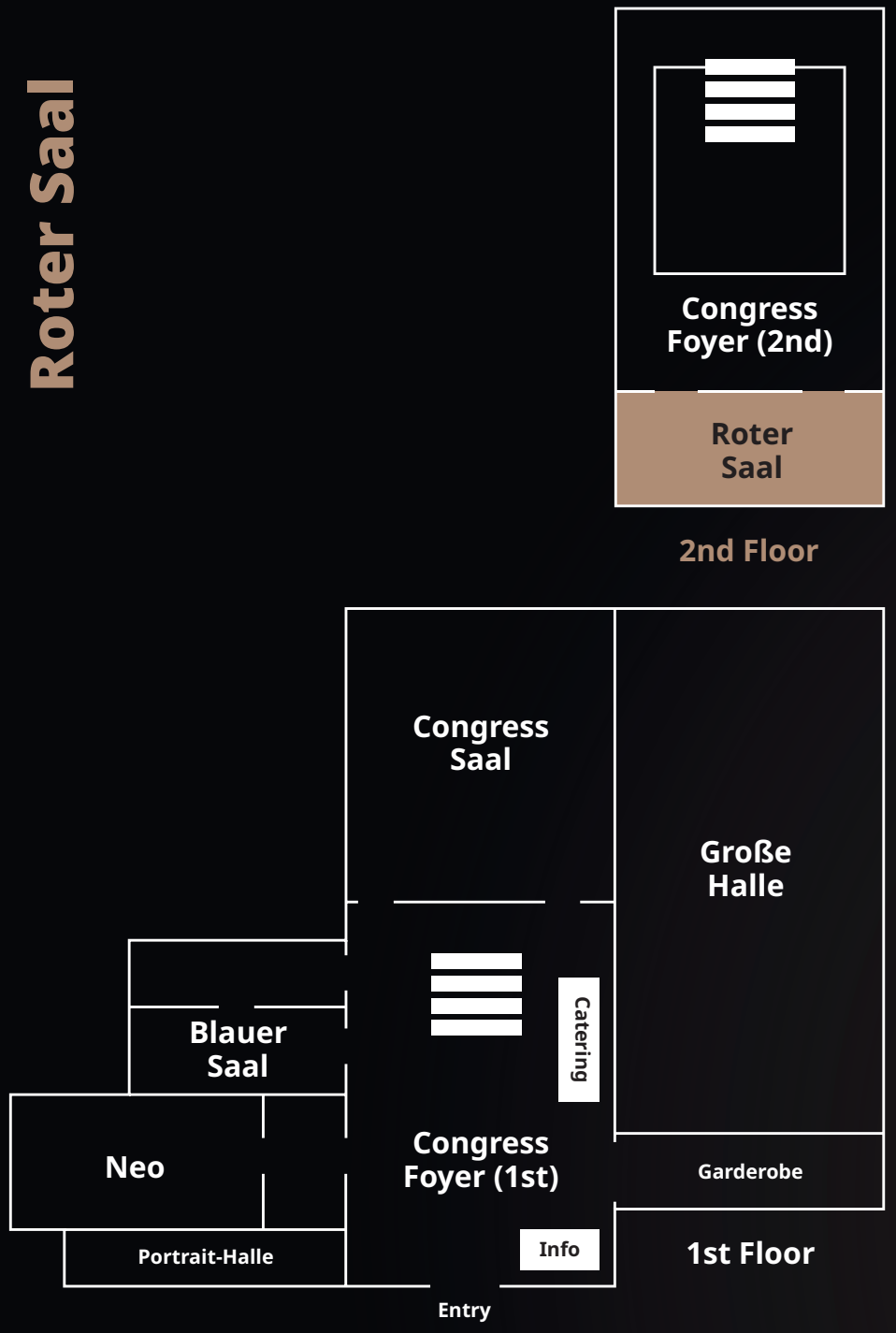
5.30 p.m. | Congress Saal
Greeting: DPG-Präsident
Moderator: Prof. Dr. Carsten Schuck

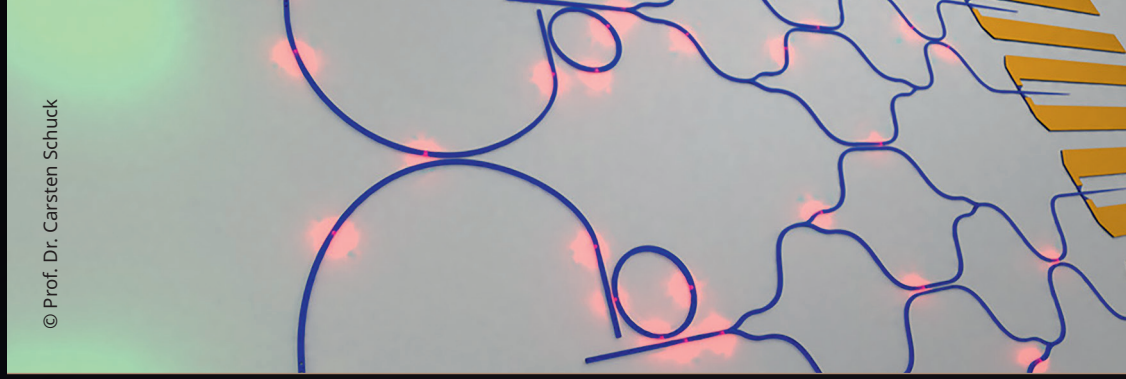
When Louis de Broglie published in 1923 that every massive object is associated with a wave, this was a bold idea at first. Later, this idea was formalized as quantum theory in 1925-1927 by Heisenberg, Schrödinger and Dirac, among others. This became the basis for a whole century of astounding discoveries and philosophical puzzles.

In quantum theory, objects can have properties and follow rules that seem to contradict our everyday experience and logic. And yet quantum physics has been producing innovative technologies for a century. Here, we will focus primarily on the quantum wave nature of matter. We will ask ourselves what ‚reality' means when objects that we can see individually under the microscope can delocalize in experiments and seem to collect information from places that they should never have according to our everyday understanding.

Markus Arndt is Professor of Quantum Nanophysics at the University of Vienna. He became known for his interference experiments with macromolecules such as fullerenes, which enabled him to demonstrate the wave properties of macromolecules. The fundamental question of the limit up to which quantum effects play a role is given a new perspective by his fundamental work. Markus Arndt is a member of the Austrian Academy of Sciences and has received numerous prizes for his work, including the Robert Wichard Pohl Prize of the German Physical Society and the Erwin Schrödinger Prize of the Austrian Academy of Sciences.

Further information at quantumnano.at





Prof. Dr. Carsten Schuck | University of Münster

Quantum computers and quantum internet: New possibilities for computation and communication

1.00 p.m. | Roter Saal
Moderator: Prof. Dr. Kai Schmitz

Quantum technology promises groundbreaking advances in communication, computer and sensor technology. But what is behind quantum computers, quantum cryptography and entangled particles?

We will look at the phenomena of the quantum world that allow us to fundamentally push the boundaries of what computers can calculate and encrypt data securely in completely new ways. After 100 years of research, we are on the cusp of a quantum revolution that is increasingly reaching our society. Today, modern technologies allow us to control the quantum properties of individual photons, atoms or superconducting circuits so well that we can process information in quantum computers in new ways and even want to network them in a quantum internet in the future. We take a look at today's quantum processors and emerging quantum network connections that open up exciting possibilities for science and technology.

Prof. Dr. Kai Schmitz | University of Münster

Quantum relics from the early universe: On the structure of the cosmos and the gravitational wave echo of the Big Bang

2.00 p.m. | Roter Saal
Moderator: Prof. Dr. Carsten Schuck

The galaxies in our universe are not randomly distributed, but form a form a characteristic large-scale structure: a cosmic network of nodes and network of nodes and empty spaces, in which galaxy clusters are connected to each other by filamentary clusters of galaxies.

In this lecture, I will describe how this structure of today's cosmos can be traced back to quantum mechanical processes in the early universe universe, in particular to quantum fluctuations during the phase of the so-called cosmic inflation phase in the first fractions of a second after the Big Bang. This astonishing finding gives rise to concrete cosmological predictions that can be verified by observations of the cosmic background radiation.

In addition, the phase of cosmic inflation is capable of providing a further quantum seed for another quantum relic: a gravitational wave echo of the Big Bang. Current searches for gravitational waves are on the trail of this signal and may be on the on the verge of eliciting further quantum secrets from the Big Bang.

Prof. Dr. Götz Neuneck | Chair of the Pugwash Council of the Federation of German Scientists

Science Diplomacy and the work of physicists for Peace and disarmament: The Pugwash Conferences on Science and World Affairs

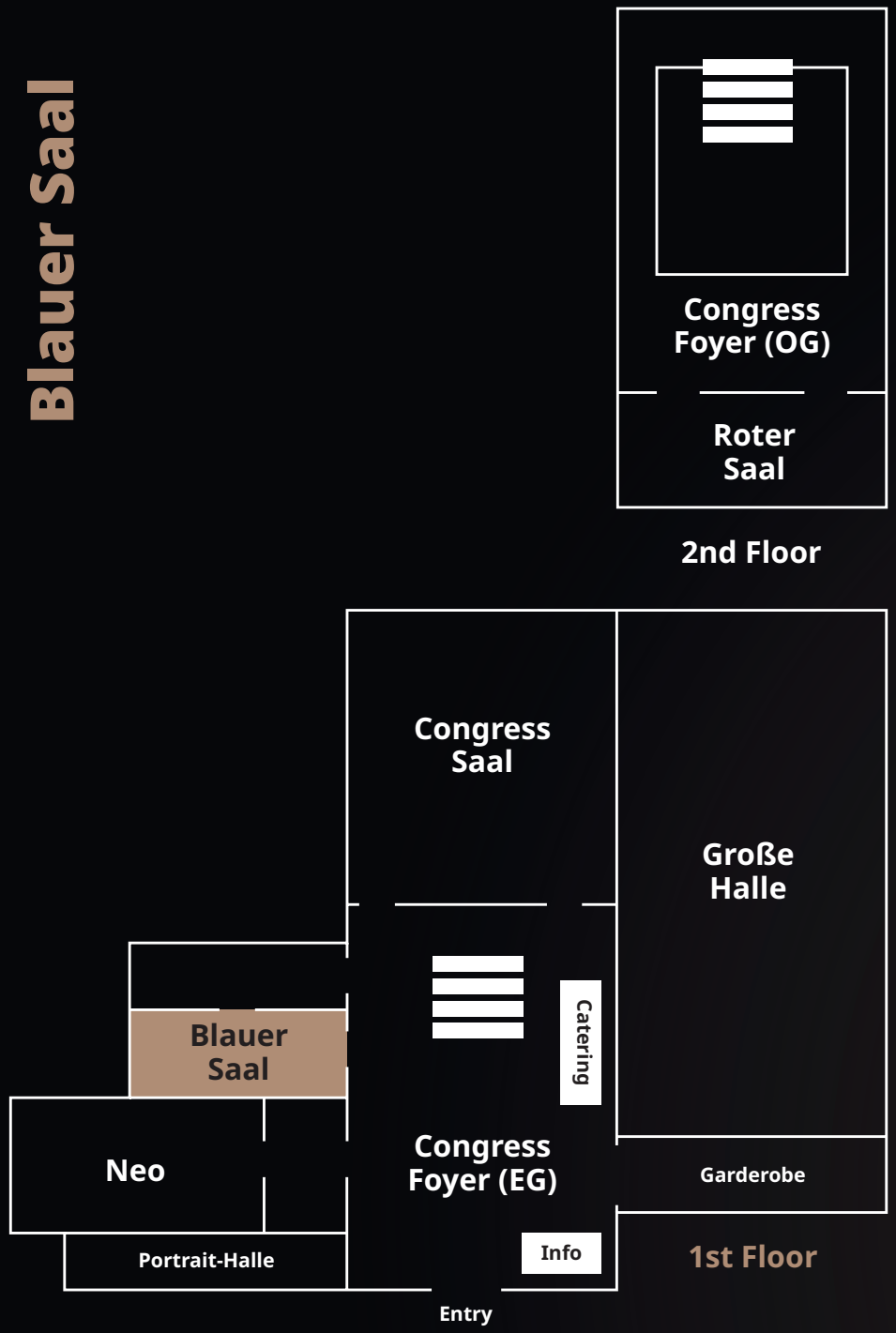
4.00 p.m. lecture / 4.45 p.m. panel discussion | Roter Saal
Moderator: Prof. Dr. Michael Quante

Physicists had a major share to build nuclear weapons and tried to prevent their use in the aftermath of World War II during the Cold War and beyond. They worked as advisors, diplomats and advocates for governments, the civil society and the international community. Key is to apply social responsibility for the consequences of their work. The new generation of physicist has to be prepared to understand the past being prepared to work further for finishing the business to get rid of nuclear weapons, before they get rid of us.

The Pugwash Conferences for Science and World Affairs were founded as a consequence of the Russell-Einstein Manifesto of 1955, which urged leaders of the world to gather and to "think in a new way": to renounce nuclear weapons, to "remember their humanity" and to find peaceful means for the settlement of all matters of dispute between them.

Under the currently increasing geopolitical tensions, the original Russell-Einstein Manifesto's call is as relevant today as it was in the 1950's. Scientists have an important role in analyzing technical aspects in disarmament and arms control, verification, safeguards, dismantlement of nuclear weapons and ways to rid the world of these weapons of mass destruction.

Panel Discussion with Prof. Michiji Konuma,
Former President of the Physical Society of Japan | Former member of the Pugwash Council | Prof. Emeritus, Keio University, Tokyo, Japan
Moderator: Prof. Dr. Michael Quante, Vice-Rector for Internationalization, Knowledge Transfer and Sustainability, University of Münster



Speakers Corner

Representatives from research and industry invite you to attend short presentations and exchange ideas.
Moderator: Simone Roth

1:30 p.m. | Benjamin Burkard (QOI)
Technology-Problem-Fit for Quantum Technology in Industrial Companies

Industrial partners are essential for the successful commercial application of quantum technologies. However, generating ideas for innovative applications in and with industrial companies is particularly challenging due to the complexity of these technologies. The presentation provides insight into the approach and challenges faced by start-ups and technology providers and highlights solutions from the BMFTR project “Quantum Open Innovation”.

2:00 p.m. | Fabienne Marco (QuantWorld)
Quantum Responsibility & Creativity – Shaping the future with QuantWorld and the QSL

Quantum technologies are among the greatest challenges of this century when it comes to disruptive and emerging technologies. As development progresses, the question arises: How can we regulate these technologies responsibly? And how can we create a talent pipeline and an informed society that jointly shapes and advances the understanding of quantum technologies? In this presentation, we take you on a journey between physics and art – and show how the future can be shaped in new and creative ways.

2:30 p.m. | Dr. Stefan Küchemann (GALaQSci)
Qookies: A Smartphone Game-Based and AI-Cooperative Learning Opportunity on Quantum Technologies

The fundamentals of quantum technologies are often abstract and mathematical, which makes them difficult for learners to access. The smartphone game Qookies gives learners access to quantum technologies in a playful way and in cooperation with an AI character without mathematical formalisms. Empirical evidence points to significant learning effectiveness regardless of cooperation with the AI character.

3:00 p.m. | Dr. Michael Johanning (eleQtron)
MAGIC Moments – From The Laboratory to The Cloud: How Microwaves Make Qubits Dance

Dr Michael Johanning, CTO of eleQtron, offers a glimpse behind the scenes of the quantum pioneers.

How do you capture an ion – and get it to compute? This presentation introduces the fascinating world of ion trap quantum computers, in which electrically charged atoms serve as tiny information carriers.

The Siegen-based start-up eleQtron controls qubits with microwaves, thanks to its specially developed MAGIC technology (Magnetic Gradient Induced Coupling). But the path from the laboratory to cloud-based quantum computers is fraught with technical and physical challenges, and it is precisely these challenges that make the journey so exciting.

3:30 p.m. | Johannes Schaefer (duotec)
How Can My Data Be Protected in The Age of Quantum Computers? And What Does a Penny Have To Do With It?

Imagine: Your WhatsApp chats, Instagram stories, and Snapchat videos could soon be cracked by quantum computers. Who would want that?

The solution lies in tiny components that are smaller than a penny! Researchers are already working on coin-sized quantum modules that offer absolute data security. This revolutionary technology opens up exciting career opportunities in a future-oriented industry that will be looking for thousands of skilled workers by 2030 – from app development to hardware miniaturization.

Find out how you can join the smartphone revolution and protect your own data from quantum hackers before they crack your private messages and photos.

4:00 p.m. | Prof. Dr. Markus Gregor (Münster University of Applied Sciences)
Hands-On uantum Physics: 3D-Printed Low-Cost Experiment Kits With Color Centers in Diamonds

The year 2025 will mark the 100th anniversary of quantum physics. Its influence on society has been immense and continues to grow. Accordingly, interest in quantum physics education is also growing at all levels – from secondary school to university.

Practical experiments are considered particularly important for effective teaching and learning in quantum physics. Experimental setups that can be produced using 3D printing are particularly promising.

The presentation will introduce a low-cost experiment kit that enables the investigation and targeted manipulation of individual electron spins in color centers (NV centers). In addition, an overview will be given of how such color centers can form a qubit and form the basis for quantum computers.

4:30 p.m. | Björn Habrich (qutools)
Philosophy and Natural Science – What Can and Does Society Want to Learn With The Help of Quantum Theory?

The following topics will be covered:

- The problem with the ideas of objectivity, causality, and determinism that inspired the Enlightenment.
- Popular core effects of the quantum world that can be used to get even non-STEM people excited about the topic.
- The difference between Quantum Revolution 1.0 and Quantum Revolution 2.0 – what is so revolutionary about them?
- "Comprehensible" experiments with a scientific focus as the basis for people's trust in these completely new principles and their reality.

5:00 p.m. | Prof. Dr. Alexander Kappes (Einstein Telescope Collaboration)
Einstein Telescope – Listening to The Whispers of The Universe

Over a hundred years ago, Albert Einstein predicted that powerful cosmic events – such as when two black holes merge – trigger tiny waves in space-time: gravitational waves. It was not until 2015 that these waves were directly detected. Since then, we have been able to not only "watch" the universe, but also "listen" to it – with giant laser interferometers that measure the smallest vibrations in space-time. The Einstein Telescope (ET) is the next big chapter in this exciting journey of discovery. This future European observatory will be so sensitive that even the quanta of laser light itself will limit its measurements! With ET, we want to study the most mysterious objects in the cosmos – black holes, neutron stars, and perhaps even traces of the Big Bang – more closely than ever before.

In this lecture, we will take a look at gravitational wave astronomy: How can we "hear" space-time at all? What do these cosmic vibrations tell us about the universe? And why is the Einstein Telescope key to solving many of these mysteries?

Quantum100 – Closing Concert

18.30–19.30 Uhr
Doors

19.30–19.45 Uhr
Welcome and introduction with Jacob Beautemps

19.45–20.45 Uhr
“Fundamental Interactions”
Part I: Electromagnetism
Part II: Strong Force
Part III: Weak Force
Part IV: Gravity

20.45–21.15 Uhr
Intermission

21.15–21.45 Uhr
“Fundamental Interactions”
Part V: Unity | Quantum100 mit Chor

Composition, Conducting, Percussion and Electronics
Yannick Paget

Scientific Advisors
Koji Hashimoto (Universität Kyoto)
Stefan Heusler (Universität Münster)

Lyrics
Chris Mosdell

Live Video Direction
Alexandre Maubert

Real-Time Visuals
Sagar Patel

Lighting Design
Thomas Costerg

Sound Engineer
Nicolas Erard

Sculptor
Toru Kurokawa

N'SO KYOTO Soloists
Mami Nakamura (Clarinet)
William Prunkl (Cello)
Mikio Kawahara (Euphonium)

With Support from
Student Orchestra of Münster
Choirs of Paulinum Gymnasium
Choir „Piano 22/30"

Special Guest
David Rauterberg

Moderator
Jacob Beautemps (BreakingLab)

Yannick Paget, © Hiroshi Yamauchi

Yannick Paget

Yannick Paget is a French conductor and composer. Graduate of the Conservatoire National Supérieur de Musique de Paris (CNSMDP), he settled in Japan in 2005. Committed to a free and boundary-crossing vision of music, Paget leads numerous projects in contemporary music. With N'SO KYOTO, he brings together an international team of artists around his scores. They have given more than 50 performances in productions at the Kyoto Art Center, Nuit Blanche Kyoto, the Miraikan Museum Tokyo, Urbanguild, Expo 2025 Osaka, The Modern Art Museum Kyoto, and others.

Paget has also conducted orchestras in France, Italy, Romania, Japan, and Taiwan. His recent concerts include musicals in Tokyo and in Osaka, as well as a collaboration with Ken Watanabe. As a composer, his works have been broadcast in France and the United States, and performed by orchestras such as the HPAC Orchestra, Concerts Lamoureux, Kansai City Philharmonic, Taipei Symphony Orchestra, and Osaka Kyoiku Orchestra.

Koji Hashimoto

Professor, Graduate School of Science, Kyoto University. Born in 1973 and raised in Osaka. Major: particle theory, string theory. PhD at Kyoto University. He worked at the Institute for Theoretical Physics at the University of California, Santa Barbara, the University of Tokyo, RIKEN, and Osaka University before being appointed to his current position. His books include essays which won several prizes. He has also attempted to fuse physics with media and art, such as supervising physics for the film "Shin Ultraman", supervising subtitles for "Oppenheimer," and collaborating with musicians and physical performers.

Yannick Paget, Sagar Patel, Toru Kurokawa, Koji Hashimoto

Chris Mosdell

British lyricist/poet Chris Mosdell has been awarded the Yuki Hayashi-Newkirk Poetry Prize; the Tokyo Music Festival's Gold Prize; the Grand Prize for Poetry at the Boulder, Colorado, Festival of Literature, and was the recipient of Japan's 2023 Classics Day Cultural Foundation Award. His lyrics have been recorded by Michael Jackson, Eric Clapton, Sarah Brightman, Boy George, Ryuichi Sakamoto, and Yellow Magic Orchestra, amongst others, and included in the anime soundtracks to Ghost in the Shell, Cowboy Bebop, and Mobile Suit Gundam.
In collaboration with the London City Ballet, Mosdell also wrote the scenario for the dance-drama Amaterasu - based on the deity of the Japanese myth cycle - that was performed at the West End's Theatre Royal, Drury Lane.

Alexandre Ferdinand Maubert

Alexandre Ferdinand Maubert is a French artist based in Kyoto since 2012. His practice spans across video art, performing arts, mixed-media installations, and music production. Maubert studied cinema at Université Louis Lumière before studying at the National Photography School in Arles. He later joined the postgraduate program at Le Fresnoy – Studio National des Arts Contemporains. In 2012, he was resident at Villa Kujoyama, Kyoto. His work has been acquired by both public and private collections and exhibited internationally.

Sagar Patel

Sagar Patel is a creator of real-time visuals, digital interactive installations and XR experiences. His work focuses on multi-modal synesthesia with a particular focus on the audio-visual aspect. He often aims to merge the natural with the digital world in his works, and often collaborates with musicians and dancers for live performances. He is originally from Montreal, Canada and has been based in Kyoto since 2013.

Toru Kurokawa

Toru Kurokawa is a Japanese ceramic artist born in 1984 in Kyoto, Japan. He graduated with a Master of Fine Arts (M.F.A.) from Kyoto City University of Arts in 2009.

His works incorporate mathematical structures, featuring internal and external forms such as the Klein Bottle and Möbius strip, merging abstract geometry with organic craftsmanship. He has participated as an artist-in-residence in 10 countries across Asia and the Middle East, where he has studied ancient philosophies, forms, and the intersections between physics and mathematics.

N'SO KYOTO

N'SO KYOTO (pronounced 'en-so') is a Kyoto-based ensemble created by Yannick Paget in 2020. N'SO KYOTO reinvents the concept of an orchestra through immersive, multidimensional audio and visual performances. N'SO KYOTO explores various possibilities of immersive sound to develop new approaches to performing and experiencing music. The site-specific performances feature spatialized musicians, dancers, and video installations, moving the traditional boundaries between the audience and the stage, and uniquely emphasizing the spaces they perform in.

N'SO KYOTO combines acoustic and electroacoustic music, directed improvisation, and written compositions. N'SO KYOTO creates bridges between Science and Art, bringing abstract concepts to life and rendering the invisible visible through their performances.

Fundamental Interactions

Part I **Electromagnetism** (16 Min)
Part II **Strong Force** (16 Min)
Part III **Weak Force** (13 Min)
Part IV **Gravity** (11 Min)
Part V **Unity | Quantum100** (20 Min)

Fundamental Interactions is an immersive audio-visual experience that grew from a deep collaboration between Yannick Paget and Professor Koji Hashimoto. It is the last part of a cycle of performances called "Consciousness: A String Theory Symphony" that explores different core physics principles. Bringing Art and Science into conversation, Fundamental Interactions translates the invisible, underlying fabric of the universe into an auditory and visual form.

"Just as physics seeks to understand the invisible mechanisms of the universe, music allows us to feel them." – Professor Hashimoto

The piece uses a new musical language and new modes rooted in particle physics created by Paget and Hashimoto. They analyzed the Chan-Paton factors, which determine the formation of various subatomic particles within String Theory. Paget and Hashimoto defined a series of chords for each particle, as well as for antiparticles. It then became possible to musically reproduce fundamental interactions of the universe, such as those occurring within the sun or during the creation of atoms.

The concert begins with the crackling of radio waves from an old receiver. They are electromagnetic waves. They surround us and they are invisible. The music then drives us to a subatomic scale...
In fact, all our universe is balanced and governed by four fundamental forces -electromagnetic, strong, weak, and gravitational. These forces are responsible for all physical phenomena, including how matter and energy interact, and they are the subject of the first four movements of this composition.

Mami Nakamura, © Sajik Kim

"Both music and physics emerge from vibration and resonance. Through this project, I want audiences to sense the fabric of the universe - not through equations, but through sound and emotion." – Yannick Paget

In physics, FUNDAMENTAL FORCES are associated with elementary mediator particles known as gauge bosons, which are also musically transcribed in the score. Photons transmit the ELECTROMAGNETIC FORCE, gluons the strong interaction, W and Z bosons the weak interaction, and the graviton (not yet detected) is thought to mediate gravity.

On stage, reflecting on each force, the orchestra is divided into four ensembles. Each of them includes woodwind, brass, percussion, and strings. Their arrangement in the concert hall follows a principle of symmetry – an essential concept in particle physics – and each instrument has a counterpart in a symmetrical and opposite position.

Similar to the orchestra, the four screens are also displayed symmetrically. They reflect different aspects of the fundamental forces. These screens blend filmed images of physical and natural phenomena captured by Maubert, with real-time visuals – an ensemble of audio-reactive virtual particles – generated by Patel.

At the center of the stage, a unique element of the orchestra is the ceramophone. This instrument, created by Kurokawa, is entirely made of ceramic sculptures and is the culmination of extensive research on matter and sound. It is especially associated with the STRONG FORCE (second movement), a fundamental interaction that acts between subatomic particles of matter.

The score of Fundamental Interactions is, most of the time, written. Except in the third movement, Paget develops small musical motifs and assembles them through a unique improvisation shared with the orchestra. This movement embodies the constant transformation of particles into other particles driven by the WEAK FORCE.

The Quantum100 choir

The fifth movement is dedicated to the UNIFICATION OF THE FUNDAMENTAL FORCES and was created for the concert in Münster to celebrate 100 years of quantum physics.

Physicists have long dreamed of the unification of the forces, and this movement brings it to life symbolically through music – each orchestra drawing on the music material of one of the fundamental forces.

Then, escaping the subatomic scale, the music ascends to the human scale with the entrance of the choir. This final movement, enhanced by Chris Mosdell's lyrics, evokes human interaction through a century of research and dreams – a reflection of humanity's enduring hope for peace for the next 100 years.

N'SO KYOTO orchestra, © Sajik Kim

The Quantum Hum

Lyrics: Chris Mosdell
Music: Yannick Paget

Listen, listen,
The quantum Hum of the universe
Listen, listen to our epic verse
The spheres where creation bursts
Listen, listen to our epic verse
The quantum Hum of the universe

Oh subatomic majesty
The vibrating particle sea
6-6-2-6-0-7-0-1-5
Behind Planck's mask
There are things that are known
And things that are unknown
And in between there are doors
To myriad shores
Here lies the constant of our lives
The hidden genius in each mind
6-6-2-6-0-7-0-1-5

Pitter patter antimatter
Pitter patter antimatter
Gamma rays and nuclear rain
Pitter patter quarks and atoms
Pitter patter quarks and atoms
Long live creation's white hot flame
Pitter patter photon scatter
Pitter patter photon scatter
The golden lions of science untamed

One hundred years of innovation
Equations behind the growth of nations
Of waves and particle duality
The principles of Uncertainty
The theories of revolutionaries
Who let the mind be freed

One hundred years of discovery
The force field of vast energies
Ripples on a cosmic pond
Vibrations from a giant gong
Transforming views of gravity
By which we live and breathe

Oh listen, listen
We sing out loud
The choir of the particle cloud
"Of what is past, or passing, or to come"
For every generation under one sun
Here's to you young visionaries
Futurists of a far-flung age

Listen, listen, we sing to you
Nobel Sister, Brother Sage
Trailblazers who make the world a safer haven
To breathe and run free through the Unified field
Go forth, through time and space
The future awaits! The future awaits!

O the beauty of science lies in its truth
We are all the roots, the flowers, the shoot
Let us turn another page
Welcome, the Second Quantum Age
Let the Brother and Sisterhood of Man be ours
Onward, onward we charge
Eternity's Generations, we are

O subatomic majesty
Of oscillating realities
Sail forth upon a shoreless sea
Advancing all humanity

Let generations upward climb
To new perceptions of space and time
One hundred years what legacy
What eons of eternity
What journeys through the electrospheres?
The quantum seeds, we harvest these
To light the way to bright frontiers

Let generations upward climb
To new perceptions of space and time
What millennia,
What spectral realms
What kingdoms to transcend?
Dimensions that our senses have yet to comprehend
O let the future fly ahead on wings of firebolt humming birds

Now we've become the breath of life,
The discoverers of worlds
Now we've become the breath of life,
The discoverers of worlds

The School Choir of the Paulinum High School

Founded in 797, the Paulinum Grammar School in Münster is the oldest school north of the Alps and looks back on over twelve hundred years of history. From the very beginning, it has been a place where knowledge, culture and education have been combined. This tradition continues to shape our self-image today: we see school not only as a place of knowledge transfer, but also as a space for cultural and musical development. Particular emphasis is placed on music. Choirs have a long and lively tradition at the Paulinum, which extends far beyond the school setting. They are an integral part of our ensemble spectrum and embody values that are close to our hearts: community, expressiveness and a sense of responsibility. Those who sing experience and feel how complex a sense of community can be: each voice is unique, and yet the sound only comes into being when everyone works together, something we have been bringing to life for a long time in collaborations with, for example, Theater Münster, the Westfälische Schule für Musik, the Philharmonic Choir, the Borchert Theater Münster, and others.

We are delighted that a total of around 160 singers from the various school choirs at Paulinum - once again in collaboration with the Münster choir “Piano 22/30” and other guests, e.g. from partner schools – will be taking part in the nationwide closing event of Quantum Year 2025. This event is not only a celebration of science, but also a cultural event of international significance. It highlights how closely art and science are intertwined: both seek ways to explain the world, make it tangible, and connect people across borders.

In particular, the central message in the final chorus of the composition “Now we‘ve become the breath of life, the discoverer of worlds” – i.e. the reversal of Oppenheimer‘s famous quote “Now I am become Death, the Destroyer of Worlds” - from the perspective and with the voices of the younger generation, as a response to this past and a wish for their own future, reflects what our school‘s self-image is based on.

In this sense, our contribution shows that Germany‘s oldest high school is also young, vibrant, and forward-looking, and that the combination of tradition, education, and culture inspires us again and again to embark on new journeys.

Warm regards,

Tobias Franke
Headmaster

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CHOIR REHEARSAL
Susanne Schmitz | Margarete Sandhäger | Jörg von Wensierski

VOICE TRAINING
Rita Stork-Herbst | Hajnalka Keveceg

OVERALL CHOIR MANAGEMENT
Jörg von Wensierski

SOPRANO
Sandra Ahrens ..... Werner Heisenberg
Leni Altevers ..... Carolin Hahn
Jan-Luis Bachmann ..... Robert J. Oppenheimer
Karl Backhaus ..... Robert J. Oppenheimer
Sema Beckering ..... Hildegard Stücklen
Leonie Bentfeld ..... Niels Bohr
Katja Bogdan ..... Grete Hermann
Paulina Bruns ..... Marie Curie
Sonja Buskühl ..... Carolin Hahn
Berta Caspary ..... Berta Karlik
Anastasiia Denisova ..... Hendrika van Leeuwen
Timo Enders ..... Schrödingers Katze
Ella Franssen ..... Marie Curie
Tanja Friedrich ..... Schrödingers Katze
Julius Gels ..... Lieven Vandersypen
David Hamer ..... Georg J. Bednorz
Hannah Hengesbach ..... Lucy Mensing
Henrik Hoffmann ..... Richard Feynman
Anna Holschneider ..... Max Planck
Anni Holtbecker ..... Donna Strickland
Annika Ihle ..... Hedwig Kohn
Tonio Imai ..... Shuji Nakamura
Jana Karasch ..... Tim Berners-Lee
Lara Karasch ..... Berta Karlik
Nina Keller ..... Hedwig Kohn
Hajnalka Keveceg ..... Deborah Jin
Janosch Kleikamp ..... Takaaki Kajita
Barbara Knievel ..... Marie Skłodowska Curie
Christiane Kröger ..... Grete Hermann
Liah Krombholz ..... Edith Quimby
Ines Krull ..... Iris Runge
Katharina Liesert ..... Edith Quimby
Marlene Liesert ..... Berta Karlik
Sophie Linke ..... Donna Strickland
Katharina Lorenz ..... Lise Meitner
Alan Lüders ..... Paul Dirac
Erna Maatz ..... Carolin Hahn
Anna Matani ..... Edith Quimby
Madita Nieder ..... George Smoot
Liv Nottorf ..... Iris Runge
Anne Oester ..... Donna Strickland
Philine Ortland ..... Marie Curie
Liz Pühse ..... Schrödingers Katze
Lene Reuter ..... Chien-Shiung Wu
Philippa Riederer ..... Lucy Mensing
Miriam Riegelmeyer ..... Emmy Noether
Viktoria Rieger ..... Berta Karlik
Viola Riemann ..... Edith Quimby
Anna Rustemeyer ..... Carolin Hahn
Katja Schabbing ..... Schrödingers Katze
Anna Schaldt ..... Hertha Sponer
Susanne Schmitz ..... Grete Hermann

SOPRANO

Nicola Schuldt ..... Marietta Blau
Juliet Schulze Zumkley ..... Maria Goeppert Mayer
Johanna Schuurmann ..... John Mather
Julia Seidel ..... Hertha Sponer
Andrea Sievers ..... Ernst Ruska
Marit Sievers ..... Hendrika van Leeuwen
Yasamin Sohrabi ..... Carolin Hahn
Marlene Tebben ..... Schrödingers Katze
Dorothee Terhürne ..... Grete Hermann
Laura Tietmeyer ..... Donna Strickland
Lea Trieb ..... Anne L´Huillier
Xanthe Veenhuijzen ..... Alain Aspect
Birgit Wiewel-Terborg ..... Carolin Hahn
Barbara Wurstbauer ..... Otto Stern
Helin Alya Yilmaztürk ..... Simon van der Meer

ALTO

Amalia Artemova ..... Eli Yablonovitch
Luca Aziz Shaker ..... Albert Einstein
Viktoria Berssenbrügge ..... Max Born
Vitus Bodeux ..... Robert J. Oppenheimer
Ludwig Busse ..... Julian Schwinger
Madita Busse ..... Chien-Shiung Wu
Friederike Debus ..... Grete Hermann
Carla Dimon ..... Elizabeth M. Boggs
Liah Heinemann ..... Robert J. Oppenheimer
Katharina Hihn ..... Max Planck
Greta Himker ..... Peter Sohr
Tanya Imai ..... Takaadi Kajita
Yohji Imai ..... Schrödingers Katze
Sigrid Joch ..... Schrödingers Katze
Frederik Jörgens ..... Otto Lummer
Jakob Jostkleigrewe ..... Klaus von Klitzing
Alexander Kiblerski ..... Peter Shor

Susanne Kleine ..... Chien-Shiung Wu
Maren Klüsener ..... Chien-Shiung Wu
Julius Kneip ..... Erwin Schrödinger
Monika Koop ..... Grete Hermann
Paolo Koop ..... Wolfgang Pauli
Sophie Koschmieder ..... Marie Curie
Juliane Kubis ..... Elizabeth M. Boggs
Cornelia Lewe ..... Marietta Blau
Melia Mertens ..... Albert Einstein
Ilai Mierzwa ..... Hantaro Nagaoka
Alena Nölting ..... Lucy Mensing
Martha Papavassilis ..... Marietta Blau
Joshua Paul ..... Schrödingers Katze
Lea Rohlfing ..... Hantaro Nagaoka
Margarete Sandhäger ..... Markus Arndt
Kelda Schmelting ..... Carolin Hahn
Julia Schmid ..... Robert Laughling
Julia Schmitz ..... Hendrika van Leeuwen
Lexis Schneider ..... Edith Quimby
Jonna Seeger ..... Carolin Hahn
Friederike Slotta ..... Hendrika van Leeuwen
Louisa Sonneborn ..... Otto Hahn
Nadja Sprenger ..... Hendrika van Leeuwen
Rita Stork-Herbst ..... Hendrika van Leeuwen
Dorothee Surmann ..... Edith Quimby
Leni Todte ..... Hantaro Nagaoka
Louisa Todte ..... Anne L´Huillier
Eduard Trebicka Tortosa ..... Max Born
Evelien van Assche ..... Walter Gerlach
Catharina Volbers ..... John S. Bell
Veronika Völker ..... Edith Quimby
Claudius Wamhoff ..... Markus Arndt
Livia Wamhoff ..... Deborah Jin

ALTO

Henri Westphal ..... Enrico Fermi
Susanne Weydert ..... Arnold Sommerfeld
Lina Wilmer ..... Marietta Blau
Mechthild Wiltink ..... Marietta Blau
Charlotte Zumnorde ..... Grete Hermann

BARITONE

Kai Bauhaus ..... Charles K. Kao
Matthias Bruns ..... Albert Einstein
Tobias Dimon ..... Calvin Souther Fuller
Michael Düber ..... Max Born
Andreas Duttmann ..... Albert Einstein
Albrecht Hoffmann ..... Wilhelm Wien
Lucian Jeremias ..... Lov Kumar Grover
Christoph Karla ..... Marie Curie
Jonte Kawaters ..... Niels Bohr
Henning Kischkel ..... Gerard ‘t Hooft
Justus Klüsener ..... Werner Heisenberg
Paul Koch ..... Russell Ohl
Petra König ..... Anton Zeilinger
Tonio Koop ..... Johann Wilhelm Hittorf
Christoph Koschmieder ..... Werner Heisenberg
Bernd Lenkeit ..... Tim Berners Lee
Valentin Lorenz ..... Schrödingers Katze
Rüdiger Ohmenhäuser ..... Shuli Nakamura
Pakin Panittakoon ..... Steven Weinberg
Jona Rüschoff ..... Serge Haroche
Julian Rustemeyer ..... Lov Kumar Grover
Cornelis Schmelting ..... Peter Higgs
Alexander Schmid ..... Lov Kumar Grover
Julius Schuster ..... Gerard ‘t Hooft
Jürgen Schwar ..... Georg J. Bednorz
Max-Magnus Seperant ..... Hideki Yukawa
Vincent Storb ..... Stuart Fredman

Ciwan Sür ..... Charles H. Bennett
Lohis ter Hürne ..... Konstantin Novoselov
Johannes Tumbrink ..... Albert Einstein
Jörg von Wensierski ..... Werner Heisenberg
Jakob Wethmar ..... Peter Higgs
Onno Wilmink ..... Charles K. Kao
Ivo Yordanov ..... Max Planck

PROFESSIONAL SUPPORT FOR THE QUANTUM100 CHOIR PROVIDED BY THE PHYSICS STUDENT COUNCIL OF THE PAULINUM HIGH SCHOOL

Henrik Becker | Marc Brischke | Kevin Johnson | Dr. Melanie Klein-Bösing
Erik Vejvoda | Dr. Alexander Wilk | Bernd Wilpsbäumer

The Münster Student Orchestra

For almost five decades, the Münster Student Orchestra (SOM) has been playing an active role in the cultural life of the university and the city, from grand symphonies and solo concerts to contemporary compositions and works from dance, theater, and film. Around 90 musicians – most of them students at the University of Münster – work together each semester to develop a challenging program, which is traditionally performed in two end-of-semester concerts. Under the motto “Music with a Plus,” the concerts are regularly enriched by creative contributions from other artistic disciplines. The orchestra often collaborates on a project basis with students from the arts, theater, or film. The international final concert that forms part of Quantum100 continues this tradition in a special way with the addition of voices from the choir, images from video-art, and inspiration from quantum physics.

In addition to its end-of-semester concerts, the SOM regularly performs in Germany and abroad, for example at the Neue Wände festival at the Theater Münster and the Romberg Festival at Schloss Harkotten in 2023. Concert tours have already taken the orchestra to numerous European countries as well as to Venezuela and Japan. Most recently, the SOM took part in the Festival International de Musique Universitaire (FIMU) in Belfort, France.

Another project close to the orchestra‘s heart is its family concerts, which take place once a year in spring at the Stadthalle Mülheim in collaboration with music educator Dr. Ulrike Schwanse.

The SOM‘s next concerts will take place in cooperation with the University Choir Münster on January 31 and February 1, 2026, at the Heilig-Kreuz-Kirche. Further information and tickets will soon be available at www.studentenorchester.de

Witolf Werner, Conductor of the rehearsals

Witolf Werner began his musical training with piano, cello, and singing. After studying orchestral conducting at the Cologne University of Music and Dance with Prof. Michael Luig, he furthered his training in master classes in Trier and Budapest and was an early assistant to Michael Gielen at the SWR Symphony Orchestra. His first engagements took him to Osnabrück and Dortmund before he joined the Theater Bielefeld in 2005/06 as solo répétiteur and assistant to GMD Peter Kuhn. There he worked as an assistant, director of studies, and second conductor from 2008, developing a broad opera and concert repertoire. In 2011, he was voted Conductor of the Year by Welt am Sonntag, was a scholarship holder of Akademie Musiktheater heute from the Deutsche Bank Foundation, and a member of the Richard Wagner Foundation. From 2014 to 2019, he was a member of the Vienna State Opera ensemble, conducted the stage orchestra and supervised all stage music. There he worked with conductors such as Christian Thielemann, Sir Simon Rattle and Kirill Petrenko, and premiered numerous children‘s operas and productions. At the same time, he conducted concerts and children‘s productions.

Since 2020, he has been working as a freelancer with engagements in Cologne, Düsseldorf, Frankfurt and Vienna, among other places, as well as with orchestras such as the Vienna Symphony Orchestra, the Bergische Symphony Orchestra, and the South Westphalia Philharmonic Orchestra. Since 2021, he has been conducting the Bergische Symphony Orchestra choir. In 2025, he took over as conductor of the Münster Student Orchestra and has worked with Yannick Paget on the Quantum 100 project. In addition to his work in professional opera, he is particularly committed to promoting children, young people and amateur orchestras, including interdisciplinary projects such as those involving physics.

Quantum100 Orchestra – Ensemble of the Münster Student Orchestra

VIOLINS
Marie-Christin Beckers
Hannah Broy
Vivienne Chiata
Christopher Crighton
Pauline Dorra
Sabine Fröhlich-Schwertheim
Eilika Hempel
Clara Hölscher
Johanna Hüge
Katharina Isaak
Hanna Janowski-Grüber
Leonore Marquardt
Melisa Meryem Ülker
Marlin Müller
Sabine Omland
Tobias Pörsel
Carina Schlüppmann
Pia Schlüter
Sophie Schneider
Timo Veenhuijzen
Clara Warlich

VIOLAS
Etta Hindersmann
Jannika Lauterbach
Annika Menking
Sophia Raabe
Kora Sabas
Hugo Vigo
Daniel Espinoza
Julia Waimann

CELLI
Felix Albert
Emma Brinkmann
Carlos Ferrer
Jannis Mittring
Konrad Schilling
Samuel-Leander Schulze
Philipp Wessolowski

BASS
Hendrik Berssenbrügge
Gesine große Hackmann
Katharina Nolte
Jakob Schaefer

FLUTES
Cosima von Peterffy-Rolff
Bettina Scheffer

OBOES
Christopher D'Arcy
Elias Schwesig

CLARINETS
Mami Nakamura (N'SO Kyoto)
Tristan Herpens

BASSOONS
Hannah Dewein
Jan Timmers

FRENCH HORNS
Pascal Féaux de Lacroix
Ralph Kloth

TRUMPETS
Seylan Baldauf
Pia Heinrichs

TUBA
Joost Hoveling

TROMBONES
Tobias Brock
Jonathan Spelsberg

PERCUSSION
Simon Eismann
Gianluca Richter
Bernd Schwertheim
Tobias Zorn

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Quantum100: Closing Concert

Celebrate 100 years of quantum physics with us! Today, we offer you a full program with lectures, an exhibition, and a spectacular audiovisual closing concert. Quantum physics often reveals itself in unexpected places, like a cat always ready to pounce. You have probably already noticed the calligraphy by Japanese artist Natsuki Ransai in the exhibition. These calligraphies do not show Japanese characters, as you might have expected, but fundamental equations of quantum physics first conceived100 years ago: Heisenberg‘s uncertainty principle and Schrödinger‘s equation! Can you recognize which of the equations is shown in the calligraphy?

Despite the fact that much remains unclear in the interpretation of quantum physics, we have already come a long way: quantum physics is by far the most successful and important scientific theory of all time, shaping virtually every modern technological application of the present and, most likely, the near future as well.

A special artistic arc spans from the quantum world to music tonight: Michael Jackson released the song Behind the Mask in 1982, a song about a woman whose facial expressions are so inscrutable that you don‘t know whether she loves you or not. However, Michael Jackson reinterpreted another song that originated in Japan: the lyrics were written by Chris Mosdell, originally for the Yellow Magic Orchestra, one of the most innovative Japanese pop music groups of the late 1970s and early 1980s.
In this original version, the “mask” refers to traditional Japanese Nō masks – to the invisible that hides behind the face of the player. “Behind the Mask” is thus more than a pop song – it is a poetic look behind the facades of the visible.

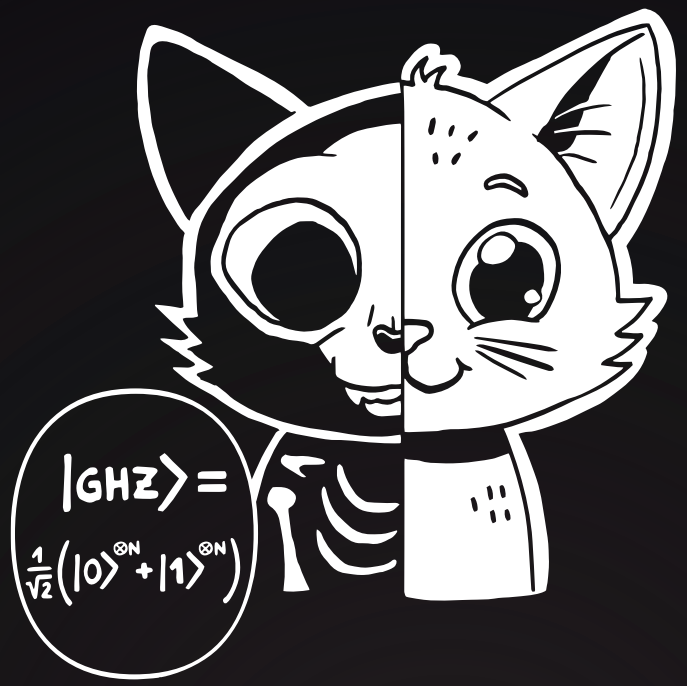
Many years later in 2024, the composer and conductor Yannick Paget of the New Sound Orchestra Kyoto (N'SO Kyoto) asked his friend Chris Mosdell if he would write a text for an extraordinary project: a quantum choir consisting of 100 students who would sing on stage wearing fluorescent T-shirts with portraits of 100 physicists. Mosdell immediately agreed.

The text has many associations and invisible connections. The text passage "Behind Planck's Mask" has a double connection to quantum physics: Nature's 'mask' is Planck's quantum of action $\hbar$, that fundamental limit beyond which no physical observation is possible. Or, as Chris Mosdell describes in his text, "The hidden genius in our minds."

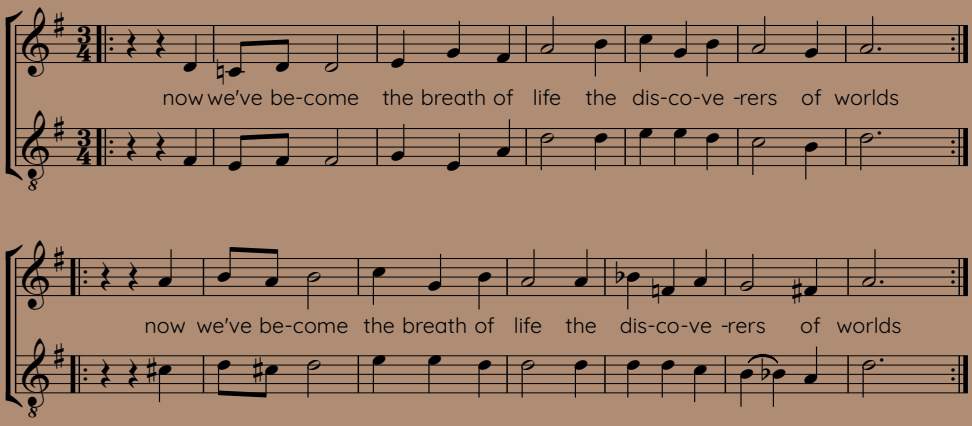
At the same time, the text looks behind the very different and often not immediately apparent human intentions that lead to scientific research. Mosdell quotes a passage from the Hindu Bhagavad Gita, which was also quoted by Robert Oppenheimer, the "Father of the Atomic Bomb": "Now I am become Death, the destroyer of worlds." In the choir, this dark vision is reversed as a vision of the future for the coming generation: "Now we have become the breath of life, the discoverers of worlds."

With this in mind, I wish you a multifaceted and inspiring evening at Halle Münsterland – Expect the Unexpected!

Your Schrödinger's Cat



Quantum100



Music: Yannick Paget | **Lyrics:** Chris Mosdell