JOANNEUM RESEARCH

# Annual Report 2021

JOANNEUM RESEARCH

JOANNEUM RESEARCH
Forschungsgesellschaft mbH

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# INTERVIEW

## Digitalisation and sustainability

***Dr Heinz Mayer***
*Managing Director of JOANNEUM RESEARCH*

**One of the goals of JOANNEUM RESEARCH is to put the results obtained by cutting-edge research into application. In which fields do you see the highest demand of Austrian economy and industry?**

Above all in the field of digitalisation, particularly in the context of sustainability. Since the introduction of the European Green Deal, the big aim of which is to use resources efficiently, attention has been shifting to topics such as closed-loop economy and flexible production. Solutions for the great social challenges in the fields of medicine and care are equally high in demand.

**How has JOANNEUM RESEARCH geared up for that?**

As an agile research and innovation company JOANNEUM RESEARCH has been constantly and successfully geared to the market needs, and has developed dynamically throughout the past few years. In the field of digital technologies the two largest institutes of JOANNEUM RESEARCH, DIGITAL and MATERIALS, are very well positioned. In varying degrees digitalisation also extends to ROBOTICS in the field of flexible automation and demand-oriented industrial robotics. Given their focus in terms of content, the institutes LIFE and POLICIES are well-prepared for the challenges of the European Green Deal and provide expertise in the field of sustainability as well as evidence-based solutions for the future.

**JOANNEUM RESEARCH is in the midst of a strategy development process. How will these topics be incorporated into the strategy for 2023 to 2027?**

Major focuses of the strategy are placed on the field of information and communication technologies with a focus on digitalisation and green technologies, e.g. closed-loop economy. In the field of health and care, where digitalisation plays an important role as well, HEALTH and COREMED are conducting excellent research already at this point. In the cross-sectional topic of sustainability and society we score valuable points on account of our technology development such as with Green Photonics or satellite-based environmental monitoring or studies by LIFE and POLICIES as decision-making aids for national and international stakeholders. Topics such as carbon footprint and Life Cycle Assessments are of interest not only for the economy, but increasingly also for individuals and households.

**Better together: Networks and cooperation - this is what Styria is known for. JOANNEUM RESEARCH is part of this success.In which areas will JOANNEUM RESEARCH strengthen its presence?**

Regionally, we will do so in networks such as the Digital Material Valley Styria research alliance, where we have been active for some years together with partners at the location, or the Digital Innovation Hub Süd (DIH SÜD), in which also JOANNEUM RESEARCH helps to prepare small- and medium-sized enterprises (SMEs) on their path to digitalisation. One of the next few steps will be to take DIH SÜD to the European level. At an international level we are getting more involved in so-called public-private partnerships, which are intended to contribute to a sustainable development in the context of the programmes of the European Union.

# STATEMENTS

Photo: Teresa Rothwangl

»In Styria's research landscape JOANNEUM RESEARCH has been acting as a motor that promotes innovations in issues of the future such as digital or green transformation. I am convinced that the research company under the leadership of Heinz Mayer will develop in a positive direction thanks to the current strategy process and will thus continue on its path of success.«

***Barbara Eibinger-Miedl***
*Member of the Styrian Government for Economy, Tourism, Regions, Science and Research, State of Styria*

Foto: Ivan Filipovic

»JOANNEUM RESEARCH plays a significant role in establishing and expanding the common economic, knowledge and research area of Southern Austria. Close cooperation across state borders has become a successful reality and is being enhanced further. The year 2021 marked the beginning of a strategic reorientation, an essential process in these times of rapid change, the results of which are being eagerly awaited.«

***Dr Gaby Schaunig***
*Deputy Governor of Carinthia*

»Research and development form the base for technological change, lead to economic growth and make the country more attractive to companies. I am pleased to say that we were able to further intensify the good cooperation between the State of Burgenland and JOANNEUM RESEARCH. I would like to extend heartfelt thanks to all employees and the management of JOANNEUM RESEARCH.«

***Dr Leonhard Schneemann***
*Member of the Burgenland Government for Economy, Research, Digitalisation, Social Affairs, Hunting and Fisheries*

»In 2021 JOANNEUM RESEARCH set out on a new course. Heinz Mayer became managing director and the development of the company's new strategy for 2023 to 2027 was initiated. As chairman of the Supervisory Board of JOANNEUM RESEARCH I look forward to actively shaping the future of this highly innovative research company, which is so important for the locations and the economy, and to continued good cooperation in the years to come.«

***Dr Martin Wiedenbauer***
*Supervisory Board Chairman JOANNEUM RESEARCH*

»Even in very challenging times JOANNEUM RESEARCH has managed to continue on its successful course in 2021 under its new leader, Heinz Mayer. I very much look forward to the results of the strategy process which was started in the autumn of 2021 and aims at developing a continued highly innovative, scientifically efficient and economically stable JOANNEUM RESEARCH.«

***Prof. Dr Dr Gerald Schöpfer***
*Chairman of the Scientific Advisory Board of JOANNEUM RESEARCH*

# LOCATIONS

**DIGITAL –**
Institute for Information and Communication Technologies

**MATERIALS –**
Institute for Surface Technologies and Photonics

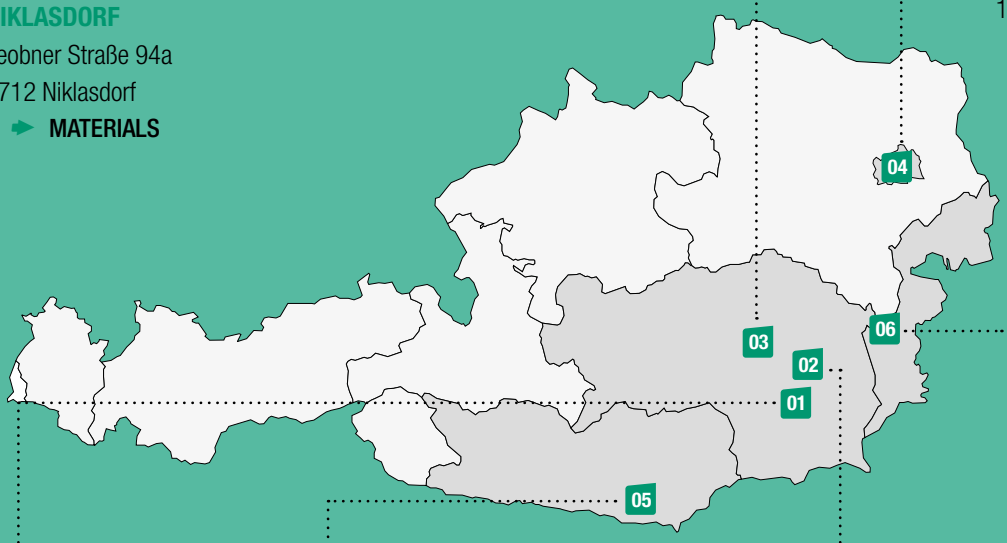
**ROBOTICS –**
Institute for Robotics and Mechatronics

**COREMED –**
Cooperative Centre for Regenerative Medicine

**HEALTH –**
Institute for Biomedicine and Health Sciences

**LIFE –**
Institute for Climate, Energy and Society

**POLICIES –**
Institute for Economic and Innovation Research




**Vienna**
Haus der Forschung
Sensengasse 1
1090 Vienna
- **POLICIES**

**NIKLASDORF**
Leobner Straße 94a
8712 Niklasdorf
- **MATERIALS**

**PINKAFELD**
Technologiezentrum Pinkafeld
Industriestraße 6
7423 Pinkafeld
- **MATERIALS**

**KLAGENFURT**
Lakeside Science and Technology Park
Lakeside B13b
9020 Klagenfurt am Wörthersee
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- **POLICIES**
- **ROBOTICS**

**WEIZ**
Franz-Pichler-Straße 30
8160 Weiz
- **MATERIALS**

**GRAZ**

Leonhardstraße 59
8010 Graz
- **Management**
- **Corporate Staff**
- **Corporate Departments**
- **POLICIES**

ZWT – Zentrum
für Wissens- und
Technologietransfer
in der Medizin
Neue Stiftingtalstraße 2
8010 Graz
- **COREMED**
- **HEALTH**

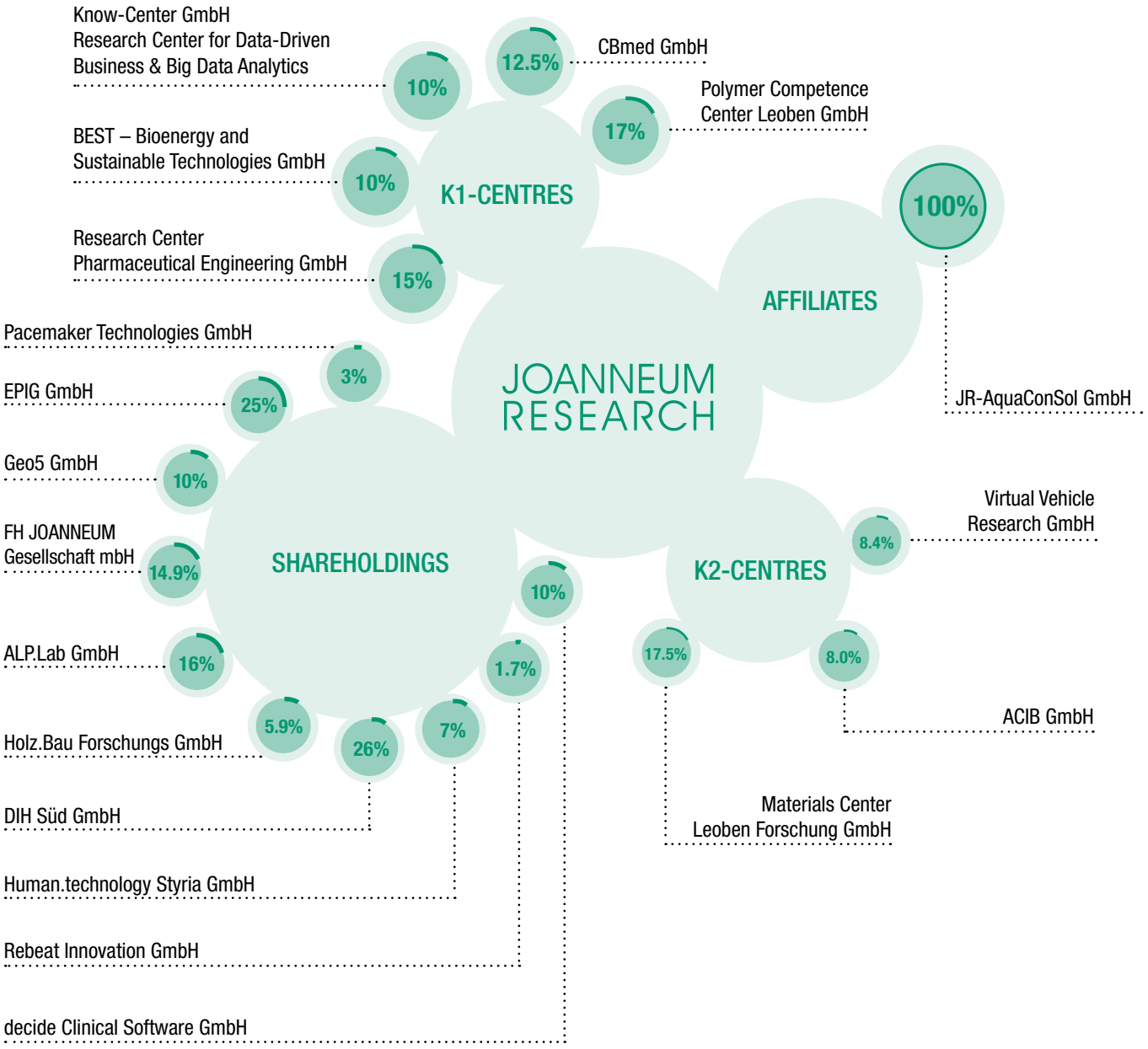
Steyrergasse 17
8010 Graz
- **Zentralbereich**
- **DIGITAL**

Hilmwarte
Roseggerweg 31
8044 Graz
- **DIGITAL**

Science Tower
Waagner-Biro-Straße 100
8020 Graz
- **LIFE**

# CORPORATE SHAREHOLDINGS

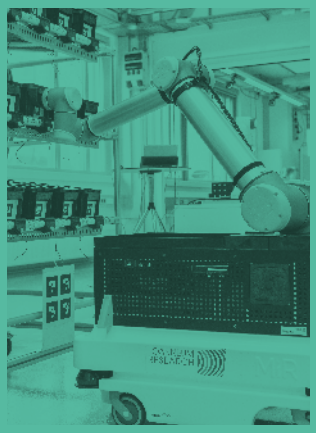
As an active network hub in the national and international research and innovation system, JOANNEUM RESEARCH works for and in close co-operation with partners from the business, scientific and research community, as well as the public sector. With its thumbprint as an "INNOVATION COMPANY" JOANNEUM RESEARCH contributes substantially to sustainable, innovative solutions and lives cooperation also through its corporate shareholdings in business enterprises, including spin-offs for exploitation of technologies and numerous companies under the Competence Centers for Excellent Technologies (COMET) programme.



# THEMATIC AREAS AT JOANNEUM RESEARCH

## INFORMATION AND PRODUCTION TECHNOLOGIES

**250 EXPERTS CONDUCT RESEARCH IN THE FOLLOWING FIELDS**



- **Digitalisation in Manufacturing:** Industrial sensors and instrumentation, acoustic, real-time, industrial Internet-of-Things (IIOT), robotics, data analysis
- **Optimisation of Manufacturing Technologies and Processes:** Generative manufacturing (laser production technology, 3D printing, plasma technologies), light and optical technologies
- **Robotics:** Robot system technologies, accredited test laboratory, ROBOTICS evaluation laboratory, training centre
- **Cyber Security and Cyber Defence:** Industry, e-commerce and critical infrastructure, cyber-attacks, military decision support systems
- **Printed Electronics** PyzoFlex®
- **Satellite Navigation and Communication technologies:** Navigation systems (Galileo, GPS, Glonass), satellite communication, wave propagation
- **Remote Sensing and Geoinformation:** Data from UAVs, aeroplanes, satellites
- **Roll-to-Roll Nanoimprint Lithography**
- **Traffic Telematics:** Highly autonomous driving, high-resolution maps, acoustic tunnel safety
- **Digitalisation in the Fields of Culture, Media and Agriculture:** Documentation, cataloguing, archiving

## HUMAN TECHNOLOGY AND MEDICINE

**75 EXPERTS CONDUCT RESEARCH IN THE FOLLOWING FIELDS**

- Pharmacokinetics, Pharmacodynamics, Bioequivalence
- Bio- and Pharmaceutical Analyses
- Metabolomics
- Medical Sensors
- Clinical Decision Support
- Skin Ageing and Anti-Ageing
- Wound Healing, Scar Formation and Tissue Regeneration
- Active and Assisted Living (AAL), and Digital Care
- Coating of Medical Implants and Surgical Instruments
- Metallic 3D Print for Implants

## SOCIETY AND SUSTAINABILITY

**75 EXPERTS CONDUCT RESEARCH IN THE FOLLOWING FIELDS**

- Climate-Neutral Manufacturing and Life-Cycle Analyses
- Environment Monitoring, Consequences of Climate Change and Land Use
- Risk Assessment of Changes in Weather and Climate, Disaster Control
- Future-proof Energy Systems and Lifestyles
- International Climate Policies and Economics
- Regional Economic Analyses, Site Research, Structure and Regional Policies
- Design and Evaluation of National and International Funding Programmes and Institutions
- Data Analysis and Statistical Modelling

# INFORMATION AND PRODUCTION TECHNOLOGIES

## RESEARCH HIGHLIGHTS

The manufacture of goods is an essential pillar of Europe's wealth and competitiveness in global competition. For protecting the business location, manufacturing processes must be extensively advanced, from increased digitalisation to optimisation for the purposes of a functioning and low-carbon closed-loop economy.

The experts of JOANNEUM RESEARCH work across disciplines in the field of „information and production technologies" for national and international customers and together with partners on the following research focuses:

- Digitalisation in production
- Optimisation of production technologies and processes
- Climate-neutral production

Depending on the field of application the activities of JOANNEUM RESEARCH range from carrying out primary analyses and feasibility studies to developing quality assurance systems, production processes/technologies and materials that can be used industrially, and to analysing industrial production data.

The research infrastructure available is aligned with the requirements of the business and the industrial sector. Close cooperation with leading international research institutions ensures access to the state of the art in international technology development.

# INFORMATION AND PRODUCTION TECHNOLOGIES

## RESEARCH HIGHLIGHTS

## Pioneering Work with W Band Frequencies from Outer Space

DIGITAL

Radio frequencies and bandwidths are resources which are fought over fervently on a global scale. Above all this applies to terrestrial applications, in particular communication between devices (The Internet of Things). Now, for the first time, Recently, satellite signals of 75 GHz from a height of 500 kilometres have been received on the roof of JOANNEUM RESEARCH in Graz. They are sent by CubeSat, which was launched from Cape Canaveral into a polar orbit on 30 June 2021 as part of the payload on bord of a Falcon 9 rocket. The mission‘s goal is to improve the understanding of atmospheric effects on signal propagation in such a high frequency band. JOANNEUM RESEARCH leads the European consortium, which has designed, produced and built the orbiter and the pertaining ground segment for this mission. The measurements are taken in Graz. The mission‘s success will contribute to clearing the path for future operational telecommunication services in the W band. After a competitive call for proposals the project was funded with some one million euros by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK). Financing is provided by the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft mbH/FFG) in the context of an ESA project.

# Ultra-Thin Energy-Generating Sensor Patches

## MATERIALS

**Blood pressure monitors are usually perceived as unwieldy and uncomfortable both in terms of their size, weight and the measuring process, in particular when it comes to 24-hour measurements. In cooperation with Osaka University an ultra-thin sensor was developed with which different vital parameters and the generation of energy can be measured. In total the patch is not more than 0.0025 mm thick. Hence, it perfectly adjusts to the skin, being ultra flexible so to say; these characteristics make the sensor the world's first, ultra-flexible piezoelectric sensor. The key of its design is the sensor material polyvinylidene difluoride-trifluoroethylene, which, together with an electronics module weighing only a few grams, is applied to an extremely thin film. Some of these pioneering results were published in the renowned journal „Nature Communications".**


# CredRoS - Credible and Safe Robot Systems

## ROBOTICS

In the CredRoS research project ROBOTICS studied the reliability of robot systems in depth. In doing so criteria and guidelines for designing and implementing reliable robot systems were developed across disciplines. On that basis, a robot system architecture was developed, which allows safe and transparent cooperation between humans and robots. It includes the perception of humans in the robot's workroom and the consequential adaption of the robot's planned movement.

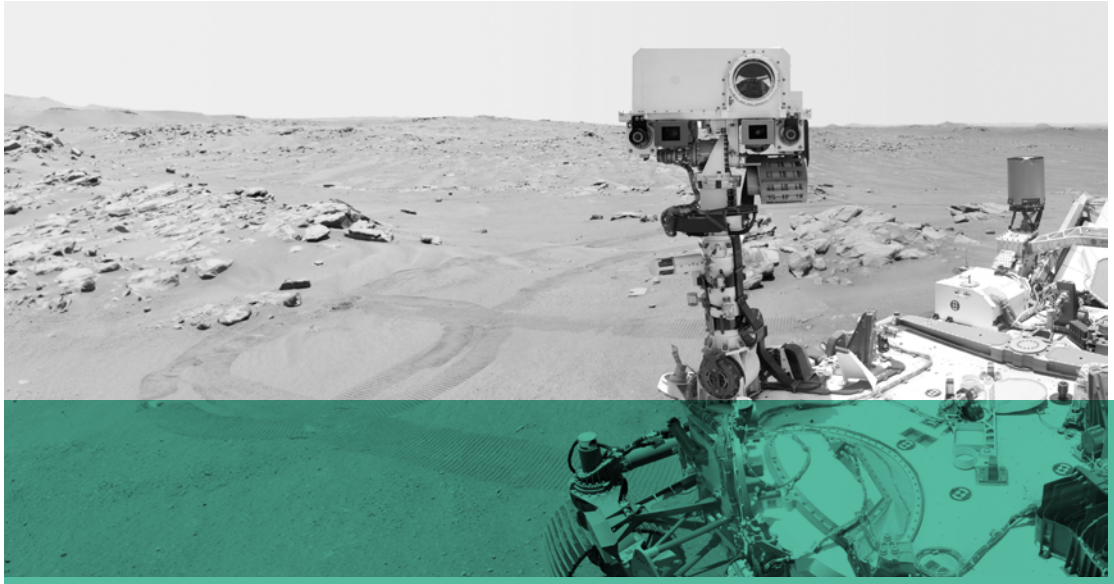
Particular attention was paid to the transparent presentation of momentary perception and the robot system's intention towards humans. The project was funded by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) as part of the 2019-2021 funding agreement.

# SAMY - Semi-Automatic Modification of Control Programs

## ROBOTICS

Robot systems capable of collaboration offer very high flexibility in manufacture so that no changes occur in the product, the number of pieces to be produced or the manpower used. Under the leadership of Fraunhofer Austria Research ROBOTICS develops concepts in the context of the „SAMY“ FFG research project in order to realise the application of a verification method for testing robotised manufacturing processes. For example, the application can evaluate whether potential time-related adaptions or changes in the order of process steps lead to inadmissible production results.

This means that the explored processes are an important core element of substantially increasing utilisation flexibility, adaptivity and sustainability of robot-based systems and the production processes implemented therewith. At the same time users are provided with a tool that makes creating and modifying control programs easier.



# Mars in 3D: Technology Made in Austria

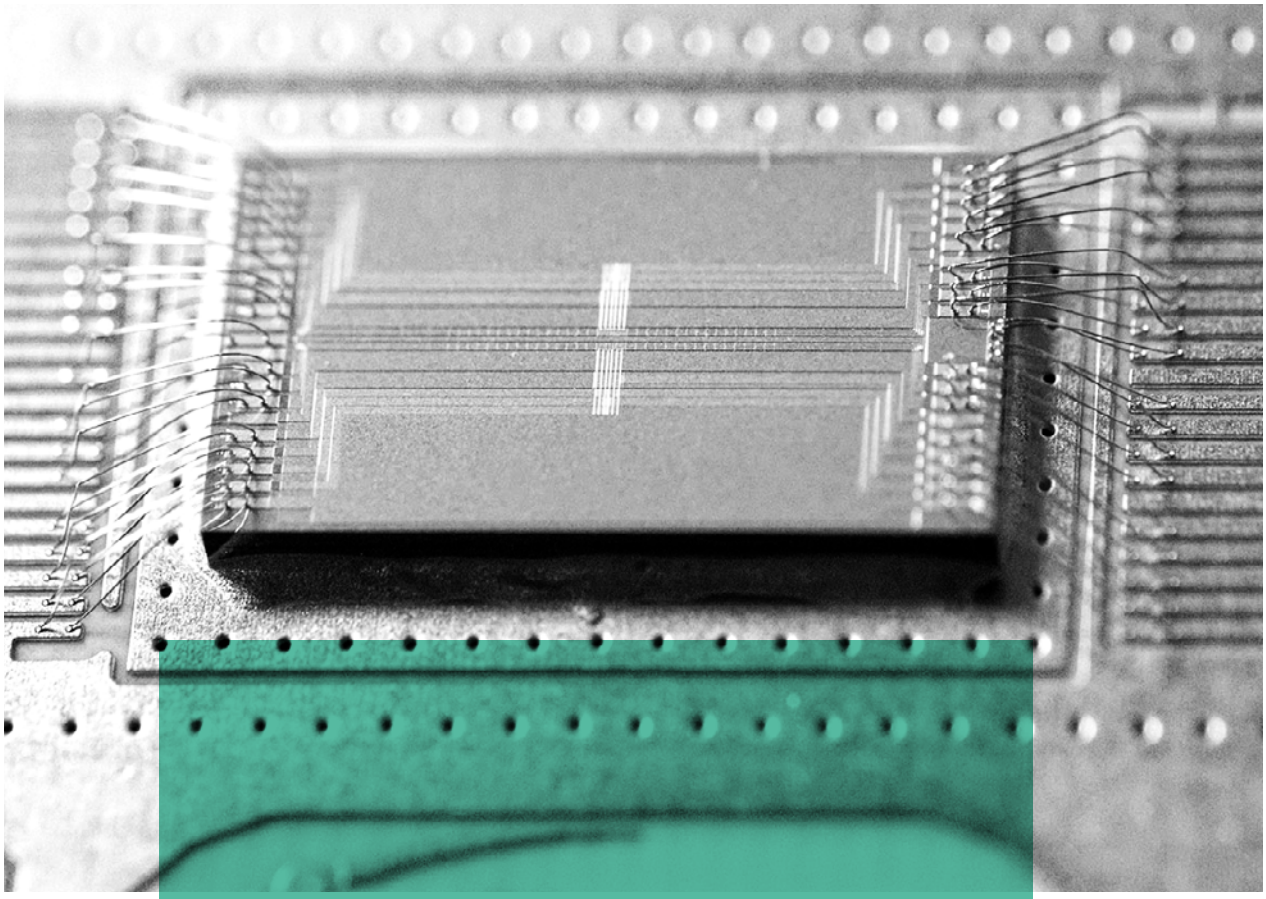
## DIGITAL

On 18 February 2021 NASA's Mars Rover, „Perseverance", landed on Mars. Its task is to explore the geological processes, the climate and the history of the planet in more detail. DIGITAL was involved in the development of Mastcam-Z, a stereoscopic camera system with zoom lenses on the Rover. As part of an ESA-PRODEX contract the 3D processing and visualisation mechanisms that will create the 3D models for geological interpretation from 2021 to 2022 were developed together with VRVis. The goal is to create three-dimensional maps for future research which will localise the data of the surface instruments and interpret it holistically. The Austrian contribution to the Mars 2020 mission is financed by funds of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) on the basis of a contract with the European Space Agency (ESA).

# Elastic Silver Inks

## MATERIALS

MATERIALS has developed elastic silver inks in order to create electronic, sensory devices and their interconnects on flexible and elastic substrates. Their areas of application include electrodes for ECG and EEG signals, body parameter sensors on textiles, electronic skin (e-skin) and curved machine elements. The silver inks contain no nano particles, but a silver format complex. By means of a moderate temperature increment the complex may be reduced to a conductive silver layer. The results were published in an article in the high-impact journal Chemistry of Materials entitled „SelfReducing Silver Ink on Polyurethane Elastomers for the Manufacture".



# Paving the Way for Quantum Computers

## MATERIALS

The whole world is doing quantum research. The „OptoQuant“ (Optically Integrated Quantum Computing) research project, which was started in 2021 in Austria and is implemented by JOANNEUM RESEARCH and the University of Innsbruck under the leadership of Infineon Technologies AG, now aims at promoting the next level of ultrafast and, most of all, industry-scale quantum technologies.

The goal of the cooperative research project is to develop ion-based quantum processors with integrated optical interfaces. They are intended to increase reliability, precision of the computing operations and the number of controllable qubits, in order to pave the way for highly scalable quantum computers. MATERIALS puts the expertise it has built up over many years to use in laser lithography and especially in multi-photon laser lithography.

The project is funded as part of the quantum research and technology initiative of the National Foundation for Research, Technology and Development and FFG.

# CoBot Studio - Mixed-Reality Simulation Environment

## ROBOTICS

The CoBot Studio project explores in which way factors such as trust, acceptance and mutual understanding can be boosted in collaborations between humans and robots. Virtual and mixed reality make it possible to immerse oneself in futuristic scenarios and to temporarily free oneself from physical restraints. This results in greater freedoms when shaping new patterns of robot behaviour and creating joint activities. The developed game enviroments are used in studies under the leadership of the LIT Robosychology Lab and aim to obtain valuable insights, which may also enhance cooperation in contemporary scenarios.

To this end ROBOTICS provides a flexible software stack which allows CHIMERA, a mobile manipulator, to solve novel tasks, both as a simulation in virtual reality and physically in the „Deep Space 8K“ of the Ars Electronic Center, makes adjustments to the specifications compiled together with experts from various fields, and contributes to evaluations.

# ESRIUM

## DIGITAL

The ESRIUM project of Horizon 2020 is the first EU project in the field of highly automated driving coordinated by JOANNEUM RESEARCH. The goal is to assess the condition of the road based on AI via cameras mounted on the vehicle. The data collected on road damage is provided to the road operator in order to optimise maintenance and directly transmitted to highly automated vehicles. This allows the vehicles to avoid damaged parts of the road in order to make driving safer while saving fuel and reducing wear and tear. In the autumn of 2021 the first international test drive took place as part of the project. It included the recording of road data under challenging weather and road conditions in Lapland (Finland). The data was then used to optimise the developed methods also at low temperatures, in snow conditions and when GNSS reception is poor.

# HUMAN TECHNOLOGY AND MEDICINE
## RESEARCH HIGHLIGHTS

JOANNEUM RESEARCH acts as the link between basic medical research and industrial application.

At the location a strong local network of academic and business facilities and players in the field of life sciences exists: JOANNEUM RESEARCH, the Medical University of Graz, the University of Graz, Graz University of Technology, and CBmed GmbH. In addition, JOANNEUM RESEARCH can rely on close cooperation with national and international partners and firms.

By strategically cooperating with local and international partners from science and business JOANNEUM RESEARCH acts as an interdisciplinary provider of overall solutions in the following areas:

- Pharmacokinetics, pharmacodynamics, bioequivalence
- Bioanalysis and pharmaceutical analysis
- Metabolomics
- Medical sensors
- Clinical decision-making support competence
- Skin ageing and anti-ageing
- Wound healing, scarring and tissue regeneration
- Active and Assisted Living (AAL) and Digital Care
- Coating for medical implants and surgical instruments
- Metallic 3D printing for implants

# HUMAN TECHNOLOGY AND MEDICINE

## RESEARCH HIGHLIGHTS

## Early Detection of Complication

### COREMED

In a joint publication with HEALTH and the Medical University of Graz, COREMED showed that burn injuries strongly influence the composition of miRNAs, small regulatory RNA molecules. It has been shown that both in the tissue and in the interstitial tissue fluid very specific miRNAs were present less frequently, so that certain genes were more active. Some of these processes affected above all genes controlling tissue regeneration and inflammatory processes. In addition, this publication suggests that these specific miRNA signatures may also serve as biomarkers in order to better assess complications after burns.

# Closing in on Lung Cancer

## HEALTH

**Microfluidic systems or mini labs are used for medical diagnostics due to their inexpensive production and high performance.**

As part of the Horizon 2020 “M3DloC” project HEALTH develops screen printed sensors (Lab on a Chip) which can detect lung cancer at an early stage. The necessary sensors are printed by HEALTH on site at the ZWT, the Center for Knowledge and Technology Transfer in Medicine, and integrated into the microfluidic mini labs. Proof of oncogene mutations (lung cancer) is provided by means of DNA derived from the tumour that circulates in the blood stream and is thus easily obtainable by drawing blood. With the help of this information subtypes of the cancer type can be identified, which saves valuable time in therapy, since the right medication can be used from the beginning.

# HUMAN TECHNOLOGY AND MEDICINE

## RESEARCH HIGHLIGHTS

## Targeting sugar

### HEALTH

Recently, a study carried out by the University of Zurich, which examined the connection between sugar intake and the liver's fat production, has been published in the „Journal of Hepatology". JOANNEUM RESEARCH contributed an underlying methodology: HEALTH established the methodology of glycerol tracers, by means of which the effects of sugar intake on the body can be examined. It entails administering a constant infusion of the ‚d5 glycerol' tracer to the test subjects. The path travelled by those supplied and marked substances (tracers) in the body is traced and analysed. From that conclusions can be drawn on reactions inside the body.

# BurnSkin

## COREMED

In 2021 COREMED was awarded the contract for another bridge project of FFG. Together with the Clinical Department for Plastic, Aesthetic and Reconstructive Surgery of the Medical University of Graz and Evomedis GmbH inflammatory processes following deep dermal burns are characterised in detail.

The study is to ensure in particular that the collected data comes as close to the clinical situation as possible. This is why also patient samples are examined for comparison purposes. In future the new findings regarding local processes of wound healing are intended to contribute to the identification of novel therapy targets, thus improving wound healing and reducing scarring after burns.

# SOCIETY AND SUSTAINABILITY

## RESEARCH HIGHLIGHTS

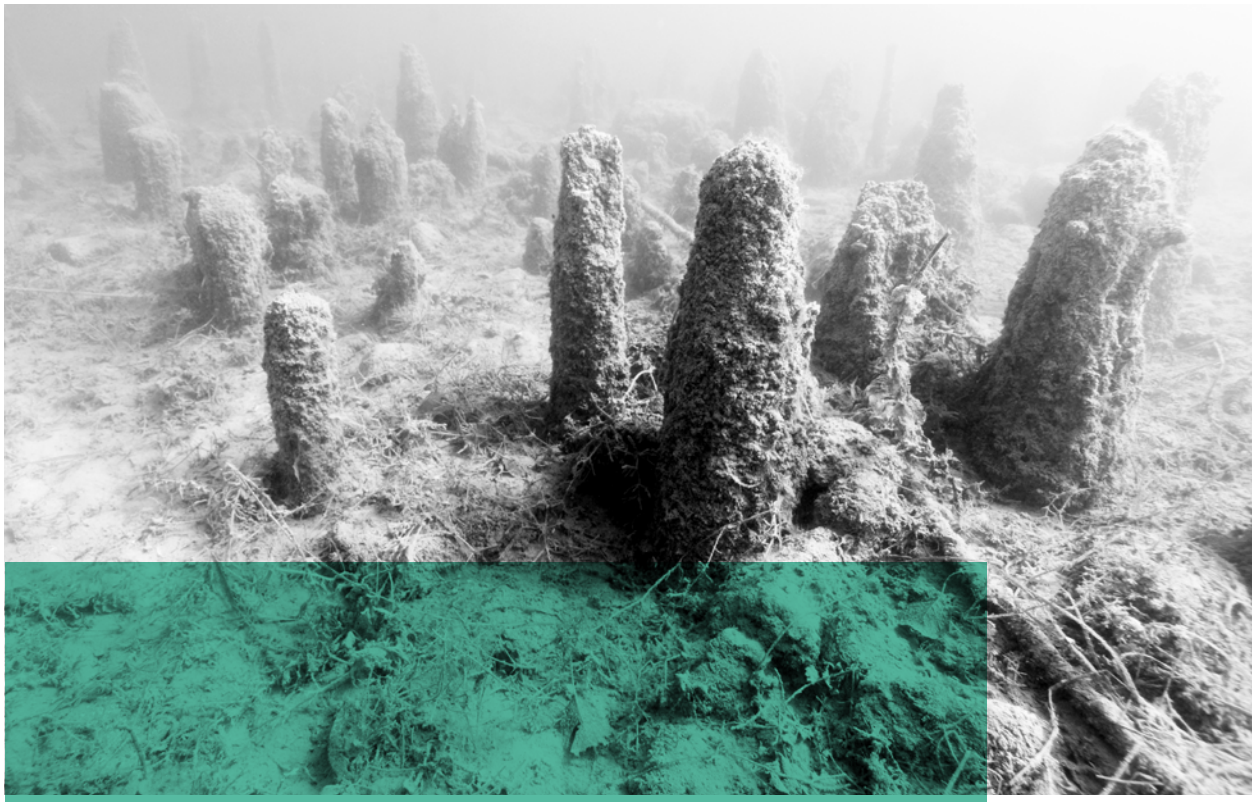
The internationally agreed climate goals offer Europe‘s manufacturing sector many opportunities in the transition to climate-neutral manufacture. In this context aspects of use of resources, environmental effects and profitability must be reconciled in the best possible manner. This is done through evidence-based innovation strategies, data-based technology developments and regional site assessment.

In the field of society and sustainability the experts of JOANNEUM RESEARCH conduct interdisciplinary research for national and international customers and together with partners on the following research topics:

- Climate-neutral production and life cycle analyses
- Environmental monitoring, climate change impacts and land use
- Risk assessment of climate and weather changes, disaster prevention and management
- Future Energy Systems and Lifestyles
- International Climate Policy and Economics
- Regional economic analysis, site analysis, structural and regional policies
- Design and evaluation of national and international funding programs and institutions
- Data analytics and statistical modelling

# SOCIETY AND SUSTAINABILITY

## RESEARCH HIGHLIGHTS



## Floods as a Climate Risk - Of Particular Interest in 2021

**LIFE**

For years modelling damage caused by natural disasters, in particular modelling floods, has been one of LIFE's core competences. In this regard a holistic approach is taken: the subjects range from the examination of sediment cores and psychological aspects to the vulnerability of SMEs.

Due to the examination of sediment cores LIFE was able to make statements on the variability of past floods. This data may help to determine the insurability of the risk of floods. The conclusions drawn from the past 7,000 years were presented in June 2021 at the 8th European Congress of Mathematics in Portoroz/Slovenia, among other events.

The article „Bottomup citizen initiatives as emergent actors in flood risk management: mapping roles, relations and limitations" examines the future role of citizen groups in flood risk management and was honoured as a Highly Commended Paper by the Journal of Flood Risk Management.

Results from the JustFair project (Climate and Energy Fund, ACRP 2017, 10th call), which analyses crucial characteristic values and effects on buildings, social and psychological vulnerability indicators of affected groups as well as the flood vulnerability of SMEs were presented at the 2020 European Conference on Flood Risk Management.

# Checking Chips with Ultrasound

## POLICIES

As part of the LUSI-Q project JOANNEUM RESEARCH explores the possibility of checks with the aid of contactless inline sensors, laser ultrasonics technology (LUS), in a consortium consisting of the University of Graz, Infineon Technologies Austria AG and Montfort Laser GmbH. In a fast, non-destructive and contactless process hidden faults resulting from semi-conductor production are detected by means of laser ultrasonics. The data generated by this process is analysed by JOANNEUM RESEARCH. By way of statistical analytics patterns such as cracks or damage can be identified in the production process. This, in turn, makes production more efficient. The products' service life is increased, and the rejects are reduced. The project is funded by the FFG as part of the „Produktion der Zukunft" („Production of Tomorrow") programme.

# SOCIETY AND SUSTAINABILITY

## RESEARCH HIGHLIGHTS

## TRAMI

### POLICIES

At the moment the Austrian ministries and agencies responsible for the relevant topics dedicate themselves to the implementation of the five EU missions („Cancer“, „Adaptation to Climate Change”, „Climate-neutral and Smart Cities“, „SOIL Deal for Europe“, „Restore our Seas and Waters“). The intention is to push these EU missions not only with the help of the EU Framework Programme, but especially with the help of national instruments and grants.

POLICIES has been shaping the approach of mission-oriented policies for quite some years now. On behalf of the Federal Ministries of Education, Science and Research (BMBWF), Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and Agriculture, Regions and Tourism (BMLRT) POLICIES has carried out a baseline study for supporting the policy approach in Austria. At the same time POLICIES, as the coordinator of the TRAMI (TRANsnational Cooperation in Missions) project, was instructed by the European Commission as part of Horizon Europe to monitor cooperation and coordination of measures at the EU level and supplementary national, regional and local measures in supporting missions at a European level. This is intended to be achieved by setting up a mission core network of the most important institutions entrusted with the implementation of mission-oriented policies in the Member States and the European Union and by establishing permanent information and governance infrastructures. This project will enable politics to rapidly test, demonstrate and expand in order to manage major social challenges.

Thus, JOANNEUM RESEARCH does not only contribute materially to the development of technological solutions for the handling of major social challenges but also underlines its competence and recognition in the field of policy development at a national and an international level in the interest of society and a future worth living in.

# E-mobility on the test bench

## LIFE

JOANNEUM RESEARCH has developed the Battery Life Cycle Check for battery and aircraft manufacturers as well as for mobility services providers to be able to check the eco-friendliness of electric vehicles. Manufacturers are given the possibility to optimise their products and identify room for improvement and to inform consumers more transparently about a battery's climate impact. The greenhouse gas emissions from the production of one modern lithium-ion battery above all depend on the battery capacity, the battery chemistry and the manufacturing site of the materials and the battery. These influences lead to a wide range of emissions in battery manufacture, which amount to about two to twelve tons of CO2-eq for typical present-day battery sizes of between 40 and 100 kWh in electric cars. Cooperation with manufacturers and research companies is crucial and is supported by the network of the International Energy Agency (IEA) among other supporters. These activities are funded by the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the Austrian Climate and Energy Fund.

# DIRECTORS
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Institute for Economic and Innovation Research

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# **Event** highlights

JOANNEUM RESEARCH is a research company which operates at a national and an international level.
Its research network secures the quality of research results and facilitates access to a broad international research spectrum for businesses and the public sector.


**26 January 2021**

## 79th Digital Dialogue: C-ITS / CCAM

On 26 January 2021 JOANNEUM RESEARCH hosted, together with DIGITAL, the 79th Digital Dialogue. The speakers gave an up-to-date insight into the technological and economic challenges in designing a modern traffic infrastructure.


**10 February 2021**

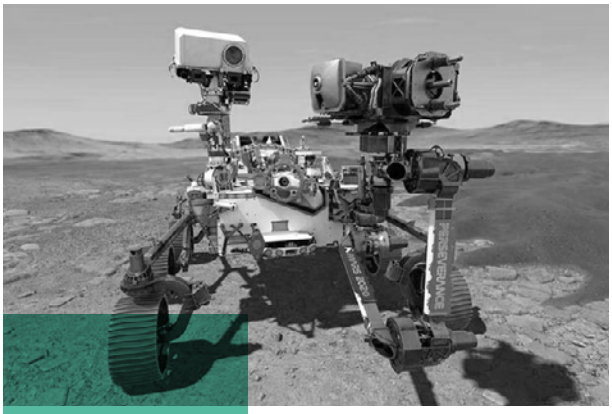
## Forum JOANNEUM RESEARCH

On 10 February 2021 JOANNEUM RESEARCH invited participants to the virtual forum, a discussion on the chances presenting themselves for Austria as a business and research location thanks to the European Green Deal. More than 100 participants attentively followed the online event.

**28 January 2021**

## HTH Styria Pitch & Partner 2021

On 28 January 2021 the HTH Styria Pitch & Partner Event took place for the third time. After a very successful premiere in January 2019 and a high-profile follow-up in 2020 the „health technology networking event“ was held exclusively virtually for the first time this year because of the still prevailing pandemic and the travel restrictions in place.



**18 February 2021**

## JR@Mars

On 18 February 2021 at about 10 p.m. CET NASA‘s Mars Rover, „Perseverance“, landed on Mars. As a co-investigator Gerhard Paar of DIGITAL is involved in the Rover in the development of Mastcam-Z, a stereoscopic camera system with zoom lenses. The software for image analysis developed by DIGITAL models the terrain and thus provides the rover with „eyes“.

**23 February 2021**

## Presentation of the annual EFI report

On 23 February 2021 the German Commission of Experts for Research and Innovation (Expertenkommission Forschung und Innovation, EFI) welcomed guests to the presentation of their latest annual EFI report. On the following day the report was handed over to German Chancellor Angela Merkel. Important input for it came from POLICIES.


**23 February 2021**

## 80th Digital Dialogue: Human Factors

Considering human factors is getting more and more important when developing and designing products, processes and systems. On 23 February 2021 DIGITAL hosted the 80th Digital Dialogue, which offered an insight into the importance of human factors in designing technical systems.

**2 to 4 March 2021**

## LIFE@BRIDGE Annual Meeting

**The virtual annual meeting of the BRIDGE initiative took place from 2 to 4 March 2021.**

**BRIDGE is an initiative of the European Commission, which bundles more than 30 Horizon 2020 projects from the research fields of smart grids and renewable energies. In the past 12 months LIFE has particularly contributed to the working groups „Consumer and Citizen Engagement“ and „Local Energy Communities“.**

**15 and 22 April 2021**

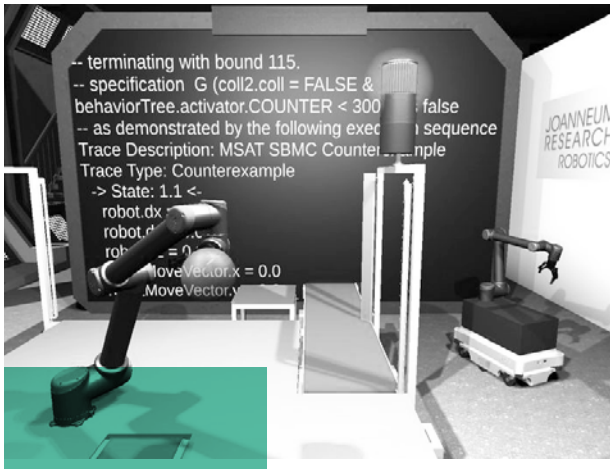
## Medialab Days 2021

**AI-based technologies in media are up and coming. What research needs follow from this? In order to answer this question JOANNEUM RESEARCH, together with the Austrian Press Agency (APA), hosted the Online-Medialab Days 2021 as part of the AI.AT.Media research project.**


**10 March 2021**

## 10th Future Conference

On 10 March 2021 the 10th Future Conference of JOANNEUM RESEARCH took place. The virtual congress not only gave some 900 visitors an overview of the company‘s research portfolio but also presented innovative solutions developed and made ready for the market together with clients and partners.




**13 to 15 April 2021**

## ERF 2021

From 13 to 15 April 2021 the 2021 European Robotics Forum was held virtually and covered the topics of industrial robotics, trustworthy robots, cybersecurity und software engineering. ROBOTICS was represented at four workshops.


**11 May 2021**

## 2021 Light Forum

In Burgenland JOANNEUM RESEARCH does high-quality research in the promising fields of lighting technology and optoelectronics. The virtual event with the subtitle „The Lighting-Sensorics Dualism of Light" offered an insight into the new high-tech lab infrastructure for connected lighting solutions at the Pinkafeld Technology Centre.

**18 May 2021**

## 2021 Global Innovation Summit

On 18 May 2021 more than 200 people attended the session on „Digital Sensor Innovations made in Styria", which was organised by JOANNEUM RESEARCH and at which ground-breaking innovations based on the latest sensor developments were shown.

**18 to 20 May 2021**

## Pentecost Dialogue

At the Pentecost Dialogue, which took place from 18 to 20 May 2021, Heinz Mayer was one of the speakers in the „Science and Digitalisation" forum.


**27 May 2021**

## Mentoring programme concluded

For the second time already the JR diversity office implemented a mentoring programme on behalf of the management. It was brought to a successful conclusion at the closing event on 27 May 2021, which was held online due to the pandemic.

**28 May 2021**

## DIH SÜD GmbH gegründet

On 28 May 2021 DIH SÜD GmbH was founded as the sponsoring company of the DIGITAL INNOVATION HUB (DIH) SÜD initiative, a competence network supporting SMEs with expertise, networking and infrastructure when it comes to their digital transformation. The initiative is led by JOANNEUM RESEARCH and Kärntner Betriebsansiedlungs- & Beteiligungsgesellschaft m.b.H. (BABEG).

**14 June 2021**

## Distribution effects of a carbon dioxide tax in Austria

LIFE was represented at three international high-profile conferences by the analysis of distribution effects of a tax on CO2 in Austria: the International Energy Workshop (IEW) on 14 June, the Annual Conference of the European Association of Environmental and Resource Economists (EARE) from 23 to 25 June, and the Conference of Economic Modelling (EcoMod) from 7 to 9 July 2021.

**16 June 2021**

## ACstyria Business Lounge

On 16 June 2021 the ACstyria Business Lounge was held at Graz Airport under the motto of „Automated Mobility“; there DIGITAL presented its unparalleled mobile mapping system.


**29 June 2021**

## 84th Digital Dialog - Digital Forest Twin

On 29 June the 84th Digital Dialog on the subject of „Digital Forest Twin“ took place as a webinar and was attended by 80 interested people. Different possibilities of how to build a Digital Forest Twin (a digital twin for simulations) from Earth observation data were presented and the participants discussed which applications and services are available now and how the wood-processing industry can better plan ahead using the valuable resource that is wood.

**7 July 2021**

## 30 years of cutting-edge research

On 7 July JOANNEUM RESEARCH celebrated more than 30 years of cutting-edge research at the Styrian premises in Niklasdorf in the presence of Barbara Eibinger-Miedl, Member of the Styrian Government. After the official ceremony the scientific seminar on laser manufacturing technologies took place.

**22 July 2021**

## AART

On 22 July 2021 the experts of DIGITAL presented PALONA, a system which allows vehicles to be located by means of exclusively passive sensors, at the Austrian Alpine Robotics Trials (AART) in the presence of Klaudia Tanner, Austria‘s Federal Minister of Defence.

**10 to 12 August 2021**

## ManuCode

From 10 to 12 August 2021 the European Summer School called „ManuCode“ took place for the first time both for pupils and teachers. In Austria, the Summer School was organised by ROBOTICS and the Austrian Computer Society (OCG) and focused on the topics of coding, robotics, artificial intelligence, human-robot interaction, project management and teamwork.

**18 August 2021**

## European Forum Alpbach

A working group of experts from business and science led by Heinz Mayer discussed the ways in which digital transformation is changing European society.

**September 2021**

## Employer of the Year 2021

In a survey conducted by MARKET, JOANNEUM RESEARCH achieved second place in the „Fair Working Conditions“ category and achieved other top ratings.

**29 September 2021**

## Fifteen Seconds Festival

At the pre-event on 29 September 2021, Claudia Winkler of LIFE gave a speech for „DIVERSITY:NOW“ at the „Dom im Berg“ event location. On 1 October 2021 two lectures were given by JOANNEUM RESEARCH in Lendhafen, one of many stages of the Fifteen Seconds Festival: Paul Hartmann, head of the institute of MATERIALS, explained the potential and benefit of „Green Photonics for a Sustainable Society“. The second lecture entitled „Healthy Ageing in a Sustainable Society“ was given by Lars-Peter Kamolz, head of COREMED.

**30 September to 4 October 2021**

## Space Tech 2021

For decades, DIGITAL has been providing top services when it comes to applications, measuring equipment and processes in the fields of outer space and telecommunication. These services were presented at the sideshow „Space Tech 2021“ of the Graz Autumn Trade Fair from 30 September to 4 October 2021 in a large exposition area.

**9 October 2021**

## Founders‘ Fair

On 9 October 2021 JOANNEUM RESEARCH was represented at the Founders‘ Fair [Gründermesse] at Messe Congress Graz. Managing director Heinz Mayer was part of an expert panel on working environments between digitalisation and automation. Erwin Kubista presented the spin-offs of JOANNEUM RESEARCH. At the „Mensch & Maschine“ („Humans & Machines“) exhibition participants could see demos of the Human Factors Lab.

**3 November 2021**

## EBSCON 2021

At the EBSCON on 3 November 2021 the experts of JOANNEUM RESEARCH institutes DIGITAL and MATERIALS were able to present their service portfolio in the field of electronic-based systems. Managing Director Heinz Mayer took part in the „Cyber Security“ panel on „Electronic-Based Security: How to protect our future with electronic-based and secure systems?“.


**18 October 2021**

## ECSEL-Austria

On the occasion of ECSEL-Austria‘s annual conference on 18 October 2021 in Vienna, POLICIES director Wolfgang Polt presented the results of a study on starting points for new European industrial policies and the implications for Austria.

**6 December 2021**

## Strategy development kick-off

On 6 December 2021 the kick-off event of the JR strategy development for 2023 to 2027 took place together with the owners‘ representatives, the bodies and the management team.


JOANNEUM RESEARCH ROBOTICS
Best Technologies for Robo-Business
ROBOTICS Technologies based on their Technology Readiness Level (TRL)
Digitalisierung im Krankenhaus

# JOANNEUM RESEARCH
# **Media Coverage**

»Research has to serve mankind and not be an end in itself.« Our successes in research are also impressively reflected in the media: approximately 700 articles made our innovative range of services known to a broad public.

## ERFOLG ALS HERAUSFORDERUNG

*Heinz Mayer, der neue Leiter der Forschungsgesellschaft Joanneum Research, sieht vor allem in den Bereichen Energieeffizienz, Künstliche Intelligenz, Medizin und Pflege enormes Forschungspotenzial. Die Forschungsverwertung soll gesteigert werden.*

TEXT: HELMUT BAST, FOTOS: SALON DELUXE

Seit 1. September ist Heinz Mayer, bisher Direktor des Instituts DIGITAL, als neuer Geschäftsführer der Joanneum Research (JR) im Amt. Die JR ist eine der größten außeruniversitären Forschungseinrichtungen Österreichs und beschäftigt rund 500 Mitarbeiter*innen. Thematisch ist die JR in die sieben Institute Digital, Materials, Robotics, Coremed, Health, Life und Policies gegliedert. Wie Mayer im Gespräch mit dem Business Monat ausführt, ist die JR ein agiles Unternehmen mit einem breiten Portfolio, das flexibel auf Marktbedürfnisse reagieren kann.

**Werden Sie innerhalb dieser Forschungsbereiche neue Gewichtungen vornehmen?**

*Heinz Mayer:* Der Fahrplan ist sehr klar. Die JR ist gut aufgestellt und wirtschaftlich erfolgreich. Über das Gesamtunternehmen sind wir sehr gut ausgelastet. Vor allem unsere größeren Institute haben einen sehr guten Arbeitsvorrat. Das gibt Planungssicherheit und einen beruhigten Blick in die Zukunft. Wir können uns jetzt aus einer guten Ausgangslage mit der nächsten Strategieperiode, die von 2023 bis 2027 läuft, intensiv beschäftigen uns mögliche neue Schwerpunktsetzungen überlegen. Erfolgreich gemacht hat uns eine notwendige Flexibilität und Agilität, mit der wir uns permanent an den Herausforderungen der Industrie, Wirtschaft und Gesellschaft orientieren. Wir haben uns auch in den letzten Jahren schon sehr stark transformiert. Und das wird sicher in den nächsten Jahren noch stärker der Fall sein.

**In welchen Bereichen konkret?**

Diese Transformationen kamen in mehreren Wellen: Zuerst kam Big Data und die Digitalisierung, jetzt spielt Künstliche Intelligenz (KI) eine geradezu dramatische Rolle. Und natürlich sind mit dem Green Deal die Themen Nachhaltigkeit und Gesellschaft unter Berücksichtigung der Wettbewerbsfähigkeit der Industrie wesentliche Elemente.

**In welchen Bereichen werden Sie die Forschungsaktivitäten erhöhen?**

Energieeffizienz, Ressourcen- und Sekundärnutzung und damit die Kreislaufwirtschaft spielen sicher eine wesentliche Rolle, da spielt auch die Elektronik mit hinein. Im Stahlbereich hat man ja schon begonnen, nationale und europäische Forschungsprogramme auf diese Schwerpunkte auszurichten. Wir sind mit unseren Technologien vorbereitet, innovative Lösungen anzubieten. Auch die Überwachung unserer Umwelt selbst bekommt eine gesteigerte Bedeutung. Das spiegelt sich auch in den Budgets der Europäischen Weltraumorganisation ESA wider: Der Bereich Erdbeobachtung verfügt mittlerweile über das größte Budget der ESA. Medizin und Pflege werden eine große gesellschaftliche Herausforderung darstellen. Für unsere Institute Health und Coremed, die eng mit der Medizinischen Universität Graz kooperieren, sehe ich hier großes Potenzial. Im medizinischen Bereich werden die Digitalisierung und KI immer wichtiger, vor allem wenn es um die Entscheidungsunterstützung geht. Und: Es geht nicht nur um den Strategieprozess, sondern auch darum, welche Geschäftslogik wollen wir zukünftig verfolgen wollen: Wie wir mit Verwertungen umgehen, wie mit industrienahen Themen und wie mit Beteiligungen und Spin-offs? Und darum, das Forschungsportfolio im Kern noch weiter zu entwickeln.

**In welchen Geschäftsfeldern könnte man da verstärkt andocken?**

Die JR hat schon über die letzten Jahre sehr erfolgreich Technologien in neue Unternehmen ausgegründet, sei es über Spin-offs oder Tochtergesellschaften: z.B. die Nextsense GmbH, die decide Clinical Software GmbH, die Geo5 GmbH, die EPIG GmbH oder die JR-AquaConSol GmbH. Nextsense ist 2006 mit einem ursprünglichen Team von fünf Mitarbeitern ausgegliedert worden und 2018 von Hexagon, einem weltweit führenden Anbieter von Mess- und Informationstechnologien, wirtschaftlich äußerst erfolgreich übernommen worden.

**Was sehen Sie als den wichtigsten Auftrag in Ihrer neuen Rolle als Chef einer so großen Forschungseinrichtung an?**

Unsere Mitarbeiter*innen sind unsere wichtigste Ressource, daher ist das Thema Diversität, und da meine ich nicht nur Gender allein, ganz wichtig. Wir müssen die Rahmenbedingungen schaffen, damit wir die Humanressourcen – das Kapital unseres Unternehmens, das Potenzial unserer Expert*innen entsprechend nutzen. Das kann sowohl in der Forschungskompetenz als auch im Forschungsmanagement der Fall sein. Wichtig ist, die Mitarbeiter*innen entsprechend weiterzuentwickeln und einzusetzen.

**Wie würden Sie Ihren Führungsstil bezeichnen?**

Mein Führungsstil ist geprägt von extrem hoher Verantwortungsübertragung gepaart mit dem hohen Anspruch, den die JR hinsichtlich inhaltlicher und wirtschaftlicher Vorgaben an ihr Management stellt. Im Vergleich mit anderen Mitbewerbern der außeruniversitären Forschung sind wir Weltmeister, was die Förderquote betrifft. Der Erfolg stellt natürlich auch eine Herausforderung dar: Wir sind über die letzten Jahre stark gewachsen, nicht nur bei der Mitarbeiteranzahl, sondern auch geografisch: mit Einheiten in Kärnten und im Burgenland. Bei gleichbleibendem Gesellschafterzuschuss und geringer werdenden Förderquoten bedeutet das, dass wir wirtschaftlich noch erfolgreicher sein müssen. Darauf müssen wir in den nächsten Jahren reagieren. •

**ZUR PERSON**

**Der Telematiker Heinz Mayer (52)** kam nach Stationen an der TU Graz und Magna Steyr 2007 zur Joanneum Research, leitete dort seit 2013 das Institut Digital und ist seit 1. September Geschäftsführer der Joanneum Research Forschungsgesellschaft.



## Wie man versteckte Fehler in Chips findet

### Forscher entwickeln intelligente „Softsensoren" zur berührungslosen Qualitätsprüfung von Chips

**Graz** – Auf dem Weg vom Quarzsand zum verkaufsfertigen Chip kann viel schiefgehen. Einerseits kann bereits das Rohmaterial selbst fehlerhaft sein. Andererseits können sich in den zahlreichen Prozessschritten einer Halbleiterfertigung Fehler einschleichen, die ein Hightech-Produkt zur Ausschussware degradieren oder zumindest seine Lebensdauer empfindlich verkürzen. Jedes Unternehmen in der Halbleiterindustrie setzt deshalb Verfahren zur Qualitätssicherung bzw. zur Qualitätskontrolle ein.

Dem sind jedoch Grenzen gesetzt, wie Ulrike Kleb von Joanneum Research erklärt: „Es gibt versteckte Fehler in oder auf Chips, die mit den üblichen Prüfmethoden in der Halbleiterproduktion kaum erkannt werden. Entweder kann man nur die Oberfläche untersuchen oder man muss den Chip zerstören, um Fehler zu finden." Solche Fehler können Verunreinigungen im Material, winzige Risse, Lufteinschlüsse oder Ähnliches sein.

Im Projekt Lusi-Q (Laserultraschall zur In-Line-Qualitätssicherung in der Halbleiterindustrie) arbeitet Joanneum Research gemeinsam mit dem Halbleiterunternehmen Infineon Technologies Austria an einer neuen Methode für die berührungslose und zerstörungsfreie Prüfung von Chips. Das dreijährige Projekt wird von der Förderagentur FFG im Rahmen des Programms „Produktion der Zukunft" gefördert. Es läuft noch bis April 2023 und verfügt über ein Volumen von 960.000 Euro. Weitere Projektpartner sind die Universität Graz und der Vorarlberger Laserhersteller Montfort.

#### Sensor lernt aus Ultraschalldaten

In Lusi-Q werden sogenannte Softsensoren für die Qualitätskontrolle entwickelt. Dabei handelt es sich um statistische Modelle, die auf Grundlage von real gemessenen Inputdaten einen gewünschten Zielwert berechnen. Ein solcher Zielwert ist beispielsweise so definiert, ob ein Chip Fehler aufweist oder nicht. Wesentliche Quelle der Inputdaten sind Messungen an den Chips mittels Laserultraschall.

Bei dieser Technologie erzeugt ein Laser hochfrequente Schallwellen, die sich durch das jeweilige Prüfobjekt hindurch ausbreiten und von Detektoren an definierten Stellen erfasst werden. Im Unterschied zum klassischen Ultraschall ist hier kein physischer Kontakt zwischen Prüfling und Messeinrichtung erforderlich. Die Grundidee lautet, dass ein systematischer Zusammenhang zwischen konkreten Messdaten und dem Vorliegen von Fehlern im Chip besteht.

Mit Methoden des maschinellen Lernens kann man dem Softsensor beibringen, diesen Zusammenhang zu erkennen. Dazu benötigt man eine hinreichend große Anzahl an Datenpaaren, die einerseits die Messergebnisse des Laserultraschalls enthalten und als zweite Komponente die Information, ob der Chip fehlerhaft ist oder nicht. Aus diesen Datenpaaren kann das Modell den gewünschten Zusammenhang lernen und in der Folge auf ganz neue Inputdaten anwenden.

Anders als bei manchen neuronalen Netzwerken werden als Inputdaten allerdings nicht uninterpretierte, rohe Messsignale verwendet. Die Auswahl der Daten, die als Input für den Lernvorgang herangezogen werden, orientiert sich vielmehr an realen physikalischen Zusammenhängen, beispielsweise zwischen der Ausbreitungsgeschwindigkeit der Ultraschallwellen und dem Material, in dem sie sich ausbreiten. Diese Zusammenhänge werden vorab durch Computersimulationen errechnet und an den tatsächlichen Messungen verifiziert. Der Softsensor lernt also nicht wie eine Blackbox, bei der man keine Ahnung hat, wie das Lernresultat zustande kommt, sondern er modelliert plausible physikalische Regelmäßigkeiten.

Ein Ziel des Projekts ist es, die Technologie so weit zu entwickeln, dass die Kombination aus Softsensor und Laserultraschallmessung direkt in Anlagen zur Chipproduktion integriert werden kann und dort in Echtzeit Fehler prognostiziert. Als fehlerhaft klassifizierte Chips könnten dann sofort ausgesondert werden. Zusätzlich sollen auch die Art und das Ausmaß des Fehlers identifizierbar werden. Ein Fernziel ist es außerdem, die Resultate der Fehlererkennung an den Fertigungsprozess rückzukoppeln und so die Produktion selbst so weit zu optimieren, dass die Fehlerhäufigkeit reduziert wird. Das Projekt Lusi-Q konnte vergangene Woche bei der zehnten Zukunftskonferenz von Joanneum Research auch die Publikumsjury überzeugen – es holte dort einen Best Performance Award.

BARBARA STADLOBER,
FORSCHERIN AM INSTITUT MATERIALS DES JOANNEUM RESEARCH IN WEIZ

„EINMALVERPACKUNGEN AUS PLASTIK ÜBERALL DURCH SOLCHE AUS PAPIER ZU ERSETZEN, IST VOM ÖKOLOGISCHEN FUSSABDRUCK HER EIN WAHNSINN."

BARBARA STADLOBER
JOANNEUM RESEARCH





TEXT U.L. STEINBACH
FOTOS OLIVER WOLF

# WARUM PLASTIK IMMER GRÜNER WIRD

*Barbara Stadlober forscht am Institut Materials des Joanneum Research Weiz an umweltfreundlichen Materialien und Prozessen für die Kunststoffindustrie. Anwendungsgebiete sind die Sicherheits- und Medizintechnik sowie die Verpackungs-, Elektronik- und Mobilitätsindustrie.*

Der Umweltfeind Nummer 1: So hat sich Plastik in den Köpfen der meisten Menschen verankert. Wir meiden und substituieren es so oft wie möglich mit Papier, Stoff, kompostierbarem Plastik und anderen Materialien. Zu Unrecht, sagt Barbara Stadlober, Wissenschafterin am Institut Materials für Oberflächentechnologien und Photonik der Joanneum Research in Weiz: „Das ist eine fehlgeleitete Entwicklung."

Am Beispiel von Tragetaschen skizziert sie: „Im Vergleich zu Stoff und Papier kann die Plastiktasche in der Ökobilanz durchaus mithalten, wenn wir sie mindestens dreimal wiederverwenden und in der Plastiktonne entsorgen." Studien zeigten, dass Papier- und Stoffsackerln „vom ökologischen Fußabdruck her oft ein Wahnsinn" seien: Speziell Baumwolle benötigt bei der Herstellung viel Wasser und Chemie, ist insgesamt sehr $CO_2$-intensiv. „Für eine vernünftige Umweltbilanz muss man eine Stofftasche also bis zu 50 Mal verwenden." Bio-abbaubares Plastik wiederum sei zwar für Lebensmittelverpackungen geeignet, für viele Verwendungszwecke jedoch nicht widerstandsfähig genug und oft in modernen Anlagen zu langsam kompostierbar. „Die dickeren Polyethylentaschen sind aktuell ökologisch vermutlich das Beste, weil sie jahrelang in Gebrauch sein können bei vertretbarer Herstellungsweise – und außerdem sind sie waschbar, wasserdicht und reißfest!"

## PLASTIK IM KREISLAUF

Soweit also die Expertise für bewussten Konsum. Was bedeutet das aber für Industrie und Wissenschaft? Stadlober: „Weil Plastik im Hinblick auf Funktionalität so gut abschneidet, forschen wir an Methoden, das Material umweltfreundlicher zu produzieren, besser zu entsorgen und vor allem in einem Kreislauf wiederzuverwenden." Auf EU-Ebene heißt das „Green Deal" - das Ziel, die Kunststoffindustrie nachhaltiger zu machen. Das soll einerseits durch mehr und bessere Recyclingkreisläufe gelingen, andererseits durch biologisch abbaubare oder überhaupt biobasierte Polymere, also Plastik aus nachwachsenden Rohstoffen, statt auf Erdölbasis. „Es wird zunehmend wichtig, den gesamten Lebenszyklus eines Produkts mitzudenken inklusive Entsorgungs- beziehungsweise Recyclingstrategien. Daraus ergeben sich Handlungsrichtlinien für unsere zukünftige Arbeit." Mit ihrem internationalen Team arbeitet die gebürtige Steirerin an verschiedenen Projekten mit Partnern aus ganz Europa. Die Weizer Kernkompetenz: biobasierte UV-härtende Prägelacke und nachhaltige Stempelwerkzeuge für die Mikro- und Nanostrukturierung von Folien, die

**BARBARA STADLOBER**
Geboren 1966 in Graz. Studium der Physik (Universität Graz). Doktorat in München (TU Garching), 6 Jahre bei Infineon in der Halbleiterindustrie. 2002 wieder in Forschung zurückgekehrt bzw. ans Joanneum Weiz als Wissenschafterin und Forschungsgruppenleiterin



# Echt fett: So reagiert die Leber auf Zucker

**Im Fachblatt „Journal of Hepatology" wurde kürzlich eine Studie der Universität Zürich publiziert, die den Zusammenhang zwischen der Zufuhr von Zucker und der Fettproduktion der Leber untersucht hat. Eine Methodik dahinter kommt aus der Steiermark: HEALTH, das Institut für Biomedizin und Gesundheitswissenschaften der JOANNEUM RESEARCH, hat die dafür notwendige Methodik der Glycerol Tracer etabliert.**

Die Weltgesundheitsorganisation (WHO) empfiehlt, die Aufnahme an freiem Zucker auf unter 10 Energieprozent zu reduzieren. Das entspricht 50 Gramm beziehungsweise rund 10 Teelöffel Haushaltszucker pro Tag für einen durchschnittlichen Erwachsenen bei einer Kalorienzufuhr von 2.000 kcal. Unter „freiem Zucker" werden hier alle Zuckerarten verstanden, die Speisen und Getränken beigefügt werden. Aber auch jener Zucker, der natürlich in Honig, Sirup, Fruchtsaftkonzentraten und Fruchtsäften vorkommt. Was der zugeführte Zucker im Körper verursacht, kann mittels Tracer, Substanzen, die im Körper verfolgt werden, festgestellt werden. Das hat kürzlich ein Schweizer Team der Universität Zürich mit einer Methode der JOANNEUM RESEARCH aus Graz durchgeführt.

„Wir wurden direkt von der Erstautorin zu unserer Messmethode für die Bestimmung der Lipolyse, also des Abbaus oder der Hydrolyse von Körperfett zu Glycerol und Fettsäuren, angefragt", erklärt Anita Eberl, Projektleiterin bei HEALTH – Institut für Biomedizin und Gesundheitswissenschaften in Graz. Wie das funktioniert, erläutert die Expertin für bioanalytische Methoden: „Den Probanden wird eine konstante Infusion des Tracers ‚d5-Glycerol' verabreicht. Die Anreicherung des d5-Glycerols gegenüber dem natürlichen Glycerol wird aus Blutplasmaproben nach einer chemischen Umwandlung (Derivatisierung) mittels Gaschromatographie-Massenspektrometrie (GC-MS) bestimmt. Aus den Ergebnissen dieser Messungen kann dann die periphere Lipolyse errechnet werden." Vereinfacht heißt das, dass der Weg von zugeführten und markierten Substanzen (Tracer) im Körper verfolgt und analysiert wird. Daraus kann man Rückschlüsse auf Reaktionen im Körper ziehen.

In der Studie der Universität Zürich wurde nun festgestellt, dass schon kleine Mengen an zugesetztem Frucht- oder Haushaltszucker die Fettproduktion in der Leber verdoppeln. Schon bei 80 Gramm pro Tag produziert die Leber mehr Fett. Auswirkungen hat das auf die Häufigkeit sogenannter Volkskrankheiten wie Typ-2-Diabetes, Fettleber oder Übergewicht.

Die JOANNEUM RESEARCH Forschungsgesellschaft mbH entwickelt Lösungen in einem breiten Branchenspektrum und betreibt Spitzenforschung auf internationalem Niveau.

Das Institut HEALTH agiert als Bindeglied zwischen medizinischer Grundlagenforschung und industrieller Anwendung. Die Anbindung zur Medizinischen Universität Graz ermöglicht es, ganzheitliche Lösungen anzubieten.

**Kontakt:**
*anita.eberl@joanneum.at*
*www.joanneum.at/health*



„SCIENCE" WIRD MIT FINANZIELLER UNTERSTÜTZUNG IN VÖLLIGER UNABHÄNGIGKEIT UNTER DER REDAKTIONELLEN LEITUNG VON ANDREAS KOLB GESTALTET.

# JOANNEUM RESEARCH
# **Media Coverage**

Reportage aus dem Lakeside-Park
Kleine-Zeitung-App kleinezeitung.at/wirtschaft

Kleine Zeitung
Samstag, 14. August 2021

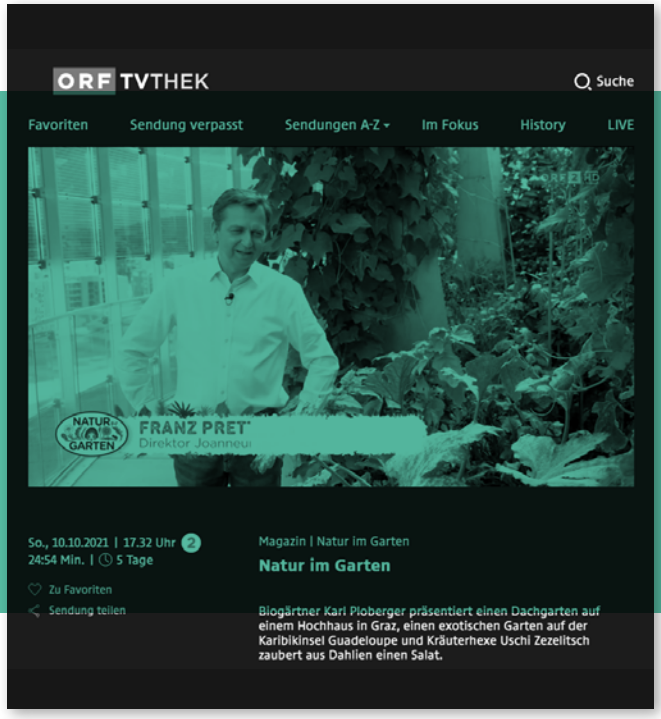
Kleine Zeitung
Samstag, 14. August 2021

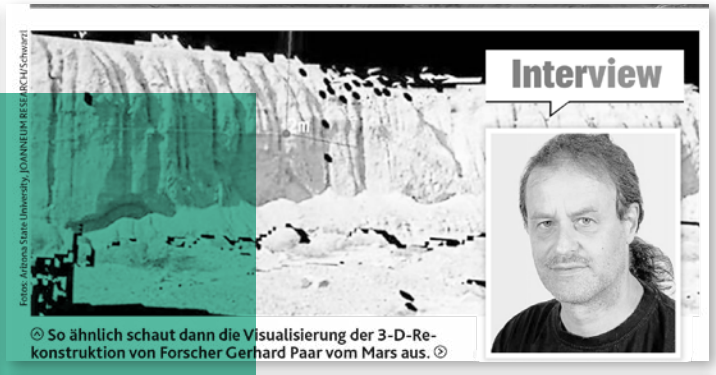
„MANUCODE" SUMMER SCHOOL

**Lernen, wie Roboter die Produktion erleichtern**

Hinter den Türen des Instituts für Robotik und Mechatronik der Joanneum Research im Klagenfurter Lakeside Park vermittelt eine Halle voller Roboter ein futuristisches Bild. Hier trafen sich im Rahmen der ersten „ManuCode"-Summer School mit Programmleiter Bernhard Dieber (Bild) 16 Teilnehmende, um sich der Robotik zu widmen. Drei Tage hatten sie Zeit, eine knifflige Aufgabe zu lösen. Ziel der Summer School ist es, vor allem junge Menschen dazu zu ermuntern, sich mit Technologie auseinanderzusetzen.

WEICHSELBRAUN (2), ADOBE STOCK




Fotos: Arizona State University, JOANNEUM RESEARCH/Schwarzl

So ähnlich schaut dann die Visualisierung der 3-D-Rekonstruktion von Forscher Gerhard Paar vom Mars aus.

## Weitere Mission ist schon in Planung

Gerhard Paar vom Grazer Forschungszentrum Joanneum Research kümmert sich um die 3-D-Rekonstruktion des Mars.

**Wie fühlt es sich an, als Wissenschafter Teil einer so wichtigen Mission zu sein?**

Wir sind nur ein kleines Rädchen, aber genau das macht es aus. Die vielen kleinen Beiträge ergeben so eine große Mars-Mission. Wir haben uns über Jahre einen guten Namen in der Branche erarbeitet und konnten jetzt zeigen, was wir können.

**Was erwarten Sie sich von den Rover-Fotos?**

Die ersten Aufnahmen zeigen, ob alles funktioniert. Befindet sich auf den Kameras Staub und andere Voraussetzungen werden abgeklärt. Am Montag gibt es dann das erste Stereobild. In ein paar Wochen können wir vielleicht schon ein Panorama erstellen. Mit der 3-D-Rekonstruktion fühlt es sich dann wirklich so an, als ob man auf dem Mars wäre.

**Sind in Zukunft weitere Missionen geplant?**

2022 sind wir bei der ExoMars-Mission wieder mit unserer Technik dabei. Im Sommer 2023 sendet ein Rover dann wieder Fotos.

**Die Europäische Weltraumorganisation sucht Astronauten. Bewerben Sie sich?**

(lacht) Nein, da bin ich mit meinen 58 Jahren zu alt. Wer das will, muss sich dieser Arbeit eine lange Zeit seines Lebens widmen. Das hätte ich nicht mal als junger Mann gemacht.

Interview: Kathi Pirker

# Bildung als Wirtschaftsmotor

**Pinkafeld.** Millionen-Investitionen in die Technik-Kaderschmiede des Südburgenlandes sollen den Bildungsstandort attraktiver machen und locken immer mehr Firmen und Forschungszentren in die Stadt

VON **ROLAND PITTNER**

In Pinkafeld werden derzeit rund 46 Millionen Euro in die Bildung investiert. Die Stadt mit rund 5.400 Einwohnern hat sich als Bildungsstandort in ganz Ostösterreich einen Namen gemacht, vor allem im technischen Bereich. Die HTL Pinkafeld wird um rund 18 Millionen bis 2024 saniert, bekommt einen Zubau und eine neue Mehrzweckhalle. „Die Arbeiten starten im Sommer", sagt Direktor Wilfried Lercher im KURIER-Gespräch. Über mangelnde Schülerzahlen könne er nicht klagen. „Wir haben bei allen Abteilungen eine hohe Nachfrage", meint der Direktor, der auch die vom Wirtschafts- und Bildungsministerium ausgezeichnete „innovativste Schule" des Landes führt. „Unsere Schüler konnten aus 333 Einreichungen beim Wettbewerb „Jugend innovativ" in der Kategorie Suistainability (Nachhaltigkeit Anm.) den zweiten Platz erreichen", sagt Lercher.

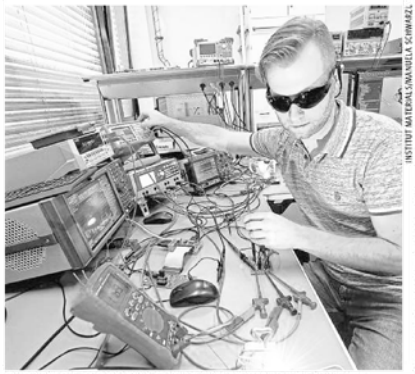
IM PINKAFELD

Auch das Lowergetikum wird Bestandteil des neuen Fachhochschul-Campus in Pinkafeld werden. Zwei Phasen sind für den Bau geplant

## Jobs

Die Schüler haben nicht nur bei Wettbewerben Erfolg, auch am Arbeitsmarkt ist die Nachfrage nach Absolventen hoch. „Rund 40 Prozent gehen nach der Schule in den Beruf, 40 Prozent studieren weiter und 20 Prozent machen etwas anderes", weiß Lercher. Einige bleiben dabei Pinkafeld treu, sei es bei den Bildungspartnern aus der Wirtschaft oder der Fachhochschule Burgenland.

Hier gibt es in mehreren Zweigen Kooperationen zwischen der HTL und der FH. Auch die FH Pinkafeld bekommt einen neuen Campus. Rund 28 Millionen Euro werden investiert, denn die aktuellen Räumlichkeiten seien am Limit. Erneuerbare Energie und Klimaschutz, Gesundheit und Pflege, Digitalisierung und Informatik sind Schwerpunkte. Auch in die Forschung floss in den vergangenen Jahren viel Geld. In das Energetikum, in dem die neusten Technologien der Gebäudetechnik erforscht werden, und in ein neues Lichtlabor.



INSTITUT MATERIALS/NAVELLA SCHWARZL

Im neuen Lichtlabor forscht das Joanneum Research Team

## Neues Lichtlabor

Seit Kurzem gibt es die hochmoderne Forschungsstätte in Pinkafeld. Die „Materials – Institut für Oberflächentechnologien und Photonik der Joanneum Research Forschungsgesellschaft" ist mit rund zehn Mitarbeitern in der Stadt tätig. Geforscht wird an vernetzten Systemen, um dem Licht neue Funktionalitäten zuzuweisen. „In einem unserer aktuellen Projekte setzen wir uns mit der Realisierung von Gestenerkennung mithilfe reflektierender Armbänder auseinander. Mit den Gesten kann zum Beispiel Licht gesteuert oder die Lichtfarbe verändert werden", erklärt Telematiker Andreas Weiss.

Es wird auch daran gearbeitet, Lichtsituationen möglichst genau und stabil herzustellen. „Die richtige Lichtzusammensetzung führt zum Beispiel dazu, dass bei Tieren die Dosis der Medikamente, die sie bekommen, reduziert werden kann. In Gewächshäusern führt es zu größerem und schnellerem Wachstum", sagt Weiss.

Das nächste mögliche Forschungslabor sei schon in Planung, wie SP-Bürgermeister Kurt Maczek erklärt. „Die Firma Herz will in Pinkafeld und Kemeten ihren Betrieb erweitern, auch ein Forschungslabor steht in Diskussion." Durch die gut ausgebildeten FH- und HTL Absolventen haben sich auch viele Firmen angesiedelt. „Wir haben Traditionsbetriebe wie die Firma Nikitscher, aber auch Neuansiedlungen etwa die Firma Altotec", sagt der Bürgermeister. Über die Investitionen ist er froh: „Für eine Kleinstadt wie Pinkafeld ist das alles schon sehr nachhaltig."

**Pinkafeld**

**5.400**
**Einwohner**
hat die Stadt Pinkafeld in etwa

**46**
**Millionen Euro**
werden in den nächsten Jahren in den Bildungsstandort investiert. Die Großprojekte sind der Fachhochschul-Campus und die Sanierung der HTL Pinkafeld

**9**
**Bildungseinrichtungen**
Von der Volksschule über die Mittelschule bis hin zur höheren Lehranstalt für wirtschaftliche Berufe und eine Landesberufsschule reicht das Spektrum in der Gemeinde

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Interview. „Die Digitalisierung ist angekommen, die Entwicklung nicht mehr aufzuhalten", sagt Heinz Mayer. Themen wie das autonome Fahren oder Big Data würden heute anders bewertet, berichtet der designierte Joanneum-Research-Chef.

## Jetzt werden die digitalen Hypes überprüft

VON ALICE SENARCLENS DE GRANCY

**Die Presse: Sie haben in Alpbach einen Workshop zur digitalen Zukunft der europäischen Gesellschaft geleitet. Welche Veränderungen erwarten uns?**
Heinz Mayer: Wir verlassen uns in der Gesellschaft immer mehr auf elektronische und digitalisierte Hilfen – und das über Abersgenzen hinweg. Das ist wahrscheinlich eine der ganz wesentlichen Neuerungen. Gerade in Zeiten von Corona haben wir gelernt, mit elektronischen Werkzeugen umzugehen. Das verändert unser Arbeits-

TECHNOLOGIEGESPRÄCHE
26. – 27. August
FORUM ALPBACH
diepresse.com/alpbach

leben technologisch, hat aber auch Effekte auf die Zusammenarbeit.

**Welche großen Entwicklungen sehen Sie?**
Zum einen, dass die Digitalisierung die Gesellschaft noch weiter durchdringt, zum anderen aber auch eine Überprüfung der Wirksamkeit und der fast schon hypeartigen Effekte. *KI (Künstliche Intelligenz, Anm.)* ist als Schlagwort in aller Munde, geprägt durch kleine Helferlein, die es früher nicht gab. Wir beschäftigen uns mit maschinellem Lernen zwar schon seit zig Jahren, nur durchdringt die Technologie jetzt die Gesellschaft und bekommt so eine ganz andere Aufmerksamkeit.

ZUR PERSON

**Heinz Mayer** (52) ist gebürtiger Grazer. Er studierte Telematik, schloss 2001 das Doktorat ab und lehrte an der TU Graz und an der FH Hagenberg. Nach mehreren Jahren bei Magna Steyr wechselte er 2007 zur steirischen Forschungsgesellschaft Joanneum Research (JR), seit 2013 leitet er das Institut „Digital". Mit 1. September folgt er Wolfgang Pribyl als Geschäftsführer. Bei den Technologiegesprächen leitete er den Arbeitskreis „The digital future of the European society".

**Und wann bringt mir ein Roboter den Kaffee oder deponiert eine Drohne das bestellte Paket auf einer Plattform vor dem Fenster?**
Das ist zeitlich ganz schwer festzumachen. Ein anderes von der Digitalisierung getriebenes Zukunftsthema ist das automatisierte Fahren. Hier wurde noch vor drei Jahren prognostiziert, dass schon bald Level 3 oder 4, also sehr starke Automatisierung beim Fahren, realisiert wird. Das sieht jetzt ganz anders aus. Man spricht von Level 2 plus, also sehr starker Unterstützung. Man kann automatisiert fahren, aber keiner sagt ganz genau, wann etwas passieren wird.

**Man ist vorsichtiger geworden mit den Prognosen.**
Deutlich. Warum? Weil sich Fahrzeuge über die hohe Stückzahl rechnen müssen – bei gleichzeitigem hohen Risiko. Man muss sehr viel absichern. Es ist etwas anderes, wenn mein Smartphone nicht mehr geht: Das ist ärgerlich, aber man kann damit leben und bekommt schnell Ersatz. Aber wenn ein Produkt eine Fehlfunktion aufweist und daran Leben abhängen, ist das viel sensibler.

**Über autonomes Fahren wird viel diskutiert. Gibt es Bereiche in der Digitalisierung, an die Laien heute noch gar nicht denken?**
Ganz offen ist noch, wie stark die Quantentechnologie uns in den nächsten Jahren in der Praxis begleiten wird. Hier gibt es in Österreich sehr viel Technologieentwicklung: von Aufgaben in der Algorithmik bis hin zur abhörsicheren Kommunikationstechnologie über optische Verbindungen.

Man sei mit Prognosen deutlich vorsichtiger geworden, sagt Heinz Mayer.

**Wie gut ist Österreich in der Digitalisierung im internationalen Vergleich gerüstet?**
Bei den Kennzahlen sieht Österreich nicht besonders gut aus, aber sie beschreiben den Ist-Zustand nur zum Teil. Wir können stolz sein auf eine gute Netzwerk-Infrastruktur, das betrifft den Breitbandausbau, aber vor allem die Mobilfunknetze. Wenn Sie heute über die Staatsgrenze nach Deutschland fahren, funktionieren die Dinge meist nicht besser, sondern schlechter.

**Welche Trends werden sich eher nicht durchsetzen?**
Das ist sehr schwierig einzuschätzen, manches kann man aus der Historie lernen. Wir alle erinnern uns an den Begriff Big Data. Da hat man sehr großen Technologieschub, der auch in der Gesellschaft ankommt, erwartet. Wenn man genauer hinschaut, ist es in vielen Bereichen zur eine Erweiterung technologischen Themen, die ohnedies schon am Tisch waren.

**Neue Technologien sind immer zweischneidig, sie bieten Chancen und Gefahren: im Fall der Digitalisierung eine Plattform für Verschwörungstheorien, Lügen und Verbrechen. Wo sehen Sie die größten Risken und wie begegnet man ihnen?**
Daten an Dritte zu geben – von Individuen, aber auch Unternehmen – ist ein sehr großes Thema. Und es wird immer größer. Hier wird mehr Vorsicht geboten sein, aber die Chancen dominieren. Viele Firmen haben begonnen, ihre IT-Infrastruktur auszulagern. Es gibt massive Anstrengung, die Systeme vertrauenswürdig zu gestalten und auch erklärbar zu machen.

**Wie gelingt es, im Tempo des Wettbewerbs nicht diejenigen zu verlieren, die die Innovationen ja mittragen und nutzen sollen?**
Das ist eine ganz schwierige Frage. In Wirtschaft und Industrie wurde über sogenannte Digital-Innovations-Hubs bereits begonnen, vor allem kleine und mittelständische Unternehmen abzuholen. Denjenigen, die sehr resistent sind, muss man aber leider sagen: Die Entwicklung ist nicht mehr aufzuhalten, die Digitalisierung ist angekommen. Und jeder, der sich diesen modernen Werkzeugen verschließt, wird langsamer sein. Es ist keine Frage mehr, ob man sich anschließt oder nicht, sondern es ist zwingend notwendig, um international überhaupt noch wettbewerbsfähig zu sein.

**Das mag für manche bedrohlich klingen. Werden die Menschen heute mehr in die Entwicklung einbezogen?**
Ja. Software-Entwicklungsprozesse haben sich im Vergleich zu anderen Produktentwicklungs-Spuren über die letzten Jahrzehnte sogar extrem weiter entwickelt. Sogenannte agiles Entwickeln ist darauf ausgerichtet, Benutzerbedürfnisse möglichst früh zu involvieren. Es geht darum, dass die Systeme am Ende einen Nutzen und eine Akzeptanz haben. Das ist das Allerwichtigste.

**Sie stehen bald als Geschäftsführer an der Spitze der JR. Wie werden Sie den Herausforderungen in dieser Position begegnen?**
Neben Digitalisierung und KI werden wir uns mit dem Thema Green Deal beschäftigen, etwa mit Sensorik gestützten Technologien. Wir haben sehr viel Kompetenz in der Überwachung von Landflächen und der Erde. Und wir werden uns mit grüner Elektronik, Green Photonics *(nachhaltige Erzeugung und Nutzung von Licht, Anm.)* befassen, da gibt es viele Anknüpfungspunkte im Haus.

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Infineon baut in Villach einen Quantencomputer. Zusammen mit Joanneum Research und der Uni Innsbruck wird erforscht, wie man die Produktion von Quantenchips auf ein industrielles Niveau bringen kann.

Von Roman Vilgut

# Quantensprung für Quantencomputer



Bernhard Lamprecht, Joanneum Research

Quantenexperte Clemens Rössler

Nun, Bits. Diese beiden Worte bilden die Basis einer computerisierten Welt. Doch bei gewissen Problemen stößt diese Logik an ihre Grenzen. Die Lösung: Quantencomputer. Hier kommen die kleinsten Bausteine des Universums, eben Quanten, zum Einsatz. Durch ihre ungewöhnlichen Eigenschaften können Prozessoren gebaut werden, die nicht nur 1 oder 0 kennen, sondern auch eine Überlagerung dieser Werte. In der Fachsprache Qubit genannt, ermöglichen diese Elementarteilchen komplett neue Rechenmodelle. Zumindest theoretisch. Denn die Technologie steckt noch in den Kinderschuhen.

Schlagzeilen gemacht haben bisher die Quantencomputer der Technologieriesen Google oder IBM. Sie arbeiten mit sogenannten Supraleitern und müssen auf Minus 270 Grad abgekühlt werden. Einen anderen Weg haben die Forscher der Universität Innsbruck rund um Rainer Blatt eingeschlagen. Sie fangen Quanten in elektrischen Feldern in einer Vakuumkammer ein und aktivieren diese mithilfe von Lasern. In Quantenlabor in Innsbruck können so aktuell 24 Ionen individuell kontrolliert und verschränkt werden.

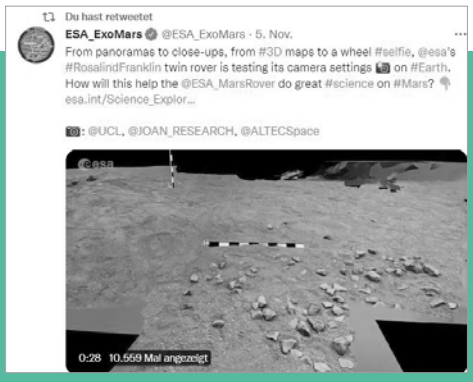
Um die Technologie weiterzuentwickeln und industriell nutzbar zu machen, hat sich die Universität Innsbruck in dem Forschungsprojekt „Opto-quant" mit dem Mikroelektronikkonzern Infineon und Joanneum Research zusammengetan. „Für die Skalierung unserer Quantenprozessoren auf eine größere Anzahl von Qubits und für deren Ansteuerung sind industrielle Techniken unerlässlich", erklärt Quantencomputer-Pionier Blatt.

Bei Infineon verantwortet Clemens Rössler in Villach die Forschung an dieser Art Quantencomputer. „Das Besondere an dieser Technologie: Im Gegensatz zu Supraleitern, funktioniert sie theoretisch auch bei Raumtemperatur." Nun gehe es darum, die Technologie anwendungstauglich zu machen. „Bisher bestehen lonenfallen-Quantencomputer aus einem Raum voller Spiegel und Laser, das ist nicht stabil genug für den zuverlässigen produktiven Einsatz", sagt Rössler.

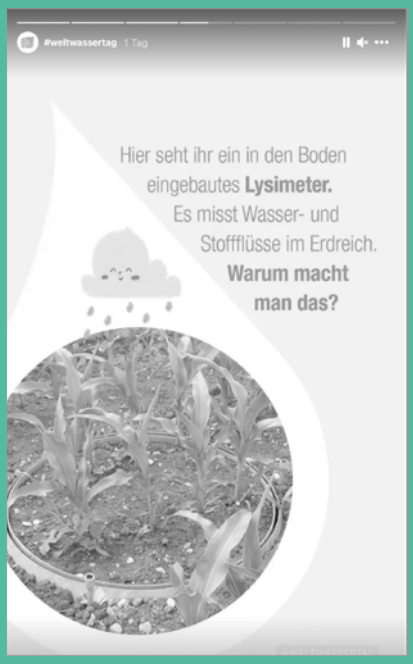
Hier kommen die Material-Experten des Joanneum Research in Weiz ins Spiel, wo eine spezielle Zweiphotonen-Laserlithografie entwickelt wurde. Stark vereinfacht, ein extrem genaues 3D-Druckverfahren. „Diese Art Quanten-

# Social Media
# #joanneumresearch














JOANNEUM RESEARCH Forschungsgesellschaft mbH
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Jetzt ·
Unser Institut #ROBOTICS lud vom 10. – 12. 08. 2021 zur ersten »ManuCode«. Im Zuge dieser Summer School hatten die Teilnehmer*innen ab 15 Jahren die Möglichkeit, anhand eines fiktiven Szenarios zu lernen, wie man mobile Roboter programmiert.
Die Aufgabenstellung war komplex, der Sachverhalt fühlte sich dennoch sehr real an: Aufgrund einer Pandemie musste ein durch Robotik unterstützter Produktionsbetrieb innerhalb von 3 Tagen seine Produktion umstellen, sodass die mobilen Roboter ansteckendes Material zu einem Roboterarm transportieren können.
Jugendliche und Erwachsene arbeiteten in Kleingruppen hochkonzentriert an deren Problemlösung, welche am letzten Tag präsentiert wurde.
#ManuCode #Summerschool #Coding
https://lnkd.in/d8EKza8p
KLEINE ZEITUNG


JOANNEUM RESEARCH
@JOAN_RESEARCH
20 YEARS OF HEALTH Auch LRin MMag.a Barbara Eibinger-Miedl sieht unsere Expert*innen als Zukunftsgestalter*innen! Voller Elan, weiterhin zukunftsweisende #Forschung für unser aller #Gesundheit zu leisten, starten wir in die nächsten 20 Jahre! joanneum.at/health/aktuell...
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HEALTH gestaltet mit seiner Forschungsarbeit seit 20 Jahren die Zukunft des Gesundheitswesens mit.
MMag.ª Barbara Eibinger-Miedl
Landesrätin für Wirtschaft, Tourismus, Regionen, Wissenschaft und Forschung


JOANNEUM RESEARCH @JOAN_RESEARCH · 1 Min.
Happy Birthday #NextGenMicrofluidics!
Nachhaltiger, ressourcenschonender Druck mit der Rolle-zu-Rolle-Technologie
ON! Kostengünstige Herstellung von Diagnostik-Chips für die Medizin, auch Lab-on-a-Foil genannt. Weiterlesen: bit.ly/3cwVl4O
#microfluidics #MATERIALS
scienion


JOANNEUM RESEARCH
Gepostet von Maike Sophie Rindler · Gerade eben ·
Wissen für die #Wirtschaft – in den vergangenen Jahren haben unsere Forscherinnen und Forscher ihr Wissen an rund 100 Unternehmen weitergegeben und somit für innovative Impulse gesorgt. Ein Beispiel dafür ist die Entwicklung einer #Software für Filmrestaurierungen in Kooperation mit der Firma HS-Art Digital GmbH.
Wie solche Kooperationen, innovatives Arbeiten und Wissensgenerierung funktionieren können, erklärt unsere #DIGITAL Expertin Silvia Russegger im Interview mit dem Magazin Die Wirtschaft: https://lnkd.in/dXidEKv
#smart #technology #digitalization
0 Erreichte Personen
0 Interaktionen
– Distributionswert
Beitrag bewerben
Gefällt mir
Kommentieren
Teilen


JOANNEUM RESEARCH
Gepostet von Buffer · 54 Min. ·
Wie wirkt Zucker im Körper? In einer neuen Studie der UNI Zürich wird der Zusammenhang zwischen der Zufuhr von Zucker und der Fettproduktion der Leber untersucht. Unsere Expertin Anita Eberl vom Institut #HEALTH hat mit ihrem Team die dafür notwendige Methodik der #GlycerolTracer etabliert.
Erfahre mehr darüber: https://buff.ly/3xu5jwA
#jrhealth #zucker #diabetes #bioanalytik


JOANNEUM RESEARCH
Gepostet von Buffer · 8 Min. ·
Wie verlässt man ausgetretene Pfade angesichts der Herausforderungen des Klimawandels? Unser #LIFE-Experte Sebastian Seebauer ist Mitautor eines aktuell erschienenen Artikels. Mit diesen Erkenntnissen können Entscheidungsträger*innen Lock-In und Pfadabhängigkeit im Naturgefahrenmanagement verstehen und verändern:
https://www.sciencedirect.com/.../pii/S0959378021002041
#Change #Adaptation #Klima #Naturgefahren


JOANNEUM RESEARCH Forschungsgesellschaft mbH
4.365 Follower:innen
Jetzt · Bearbeitet ·
Rasante Forschung 7 Kilometer legt unser Forschungssatellit #CubeSat im #Weltall in der Sekunde zurück! Mehr über die Pionierleistung der Erforschung eines neuen Frequenzbandes erzählt unser Experte Michael Schmidt in einem Beitrag von ORF Steiermark https://lnkd.in/dx8AF2t6
Entwickelt wurde der Satellit übrigens mit unseren Kooperationspartnern VTT, Reaktor, Fraunhofer-Gesellschaft, Universität Stuttgart und LCtechnologies.
Das Projekt ist durch die FFG Österreichische Forschungsförderungsgesellschaft mbH gefördert.
#pioniere #frequenz #daten #wissen #satelliten #BMK #DIGITAL
Ganz schön wissenswert: Satellit CubeSat - Steiermark heute vom 05.10.2021 um 19:00 Uhr

# FINANCIAL STATEMENTS OF JOANNEUM RESEARCH

## Assets

| | | | 31 Dec 2021<br>EUR | 31 Dec 2020<br>EUR |
|---|---|---|---|---|
| **A.** | **Non-current assets** | | | |
| | I. Intangible assets | | | |
| | 1. Rights and licences | | 376,658.00 | 320,614.00 |
| | II. Property, plant and equipment | | | |
| | 1. Land and buildings | | 11,759,758.02 | 10,099,978.02 |
| | 2. Technical plant and machinery | | 4,714,434.00 | 5,205,773.00 |
| | 3. Other plant, furniture and fixtures | | 606,726.00 | 743,418.00 |
| | 4. Advances made and construction in progress | | 541,485.25 | 1,989,659.23 |
| | | | 17,622,403.27 | 18,038,828.25 |
| | III. Financial assets | | | |
| | 1. Shares in affiliates | | 150,000.00 | 150,000.00 |
| | 2. Participating interests | | 270,788.25 | 341,688.25 |
| | 3. Investment securities (book-entry securities) | | 2,390,149.64 | 1,724,750.00 |
| | | | 2,810,937.89 | 2,216,438.25 |
| | | | **20,809,999.16** | **20,575,880.50** |
| **B.** | **Current assets** | | | |
| | I. Inventories | | | |
| | 1. Raw materials and supplies | | 3,412.90 | 3,638.10 |
| | 2. Services not yet chargeable | | 10,180,745.51 | 8,392,501.98 |
| | less advances received | | -6,799,111.67 | -5,738,309.25 |
| | 3. Advances made | | 32,189.46 | 1,891.22 |
| | | | 3,417,236.20 | 2,659,722.05 |
| | II. Receivables and other assets | | | |
| | 1. Trade receivables | | 1,122,410.56 | 1,703,861.76 |
| | *(thereof due within 1 year* | *1,122,410.56* | | *1,670,123.86)* |
| | *(thereof due after more than 1 year* | *0.00* | | *33,737.90)* |
| | 2. Receivables from affiliates | | 30,923.92 | 13,266.69 |
| | *(thereof due within 1 year* | *30,923.92* | | *13,266.69)* |
| | 3. Receivables from undertakings with which the company is linked by virtue of participating interests | | 68,544.70 | 42,923.59 |
| | *(thereof due within 1 year* | *68,544.70* | | *42,923.59)* |
| | 4. Receivables from proprietor | | 0.00 | 110,000.00 |
| | *(thereof due within 1 year* | *0.00* | | *110,000.00)* |

# BALANCE SHEET
as at 31 December 2021

## Assets

| | | 31 Dec 2021<br>EUR | 31 Dec 2020<br>EUR |
|---|---|---|---|
| 5. Receivables from subsidies and project grants | | 5,133,817.79 | 4,435,394.65 |
| *(thereof due within 1 year* | *5,133,817.79* | | *4,435,394.65)* |
| 6. Other receivables and assets | | 11,828,665.68 | 13,289,004.50 |
| *(thereof due within 1 year* | *11,828,665.68* | | *13,289,004.50)* |
| | | 18,184,362.65 | 19,594,451.19 |
| *(thereof due within 1 year* | *18,184,362.65* | | *19,560,713.29)* |
| *(thereof due after more than 1 year* | *0.00* | | *33,737.90)* |
| III. Securities and shares | | | |
| 1. Other securities and shares | | 853,997.86 | 1,624,100.00 |
| IV. Cash and balances at banks | | 11,074,783.87 | 12,376,642.31 |
| | | **33,530,380.58** | **36,254,915.55** |
| **C. Prepayments and accrued income** | | **3,141,023.85** | **3,282,568.31** |
| **D. Escrow funds** | | **3,055,956.60** | **5,845,290.34** |
| **Total assets** | | **60,537,360.19** | **65,958,654.70** |

## Liabilities and shareholders' equity

| | | 31 Dec 2021 EUR | 31 Dec 2020 EUR |
|---|---|---|---|
| **A. Equity** | | | |
| I. Share capital called in and paid up | | 3,600,000.00 | 3,600,000.00 |
| II. Capital reserves | | | |
| 1. Appropriated | | 4,135,961.85 | 4,396,531.71 |
| 2. Unappropriated | | 362,637.44 | 362,637.44 |
| | | 4,498,599.29 | 4,759,169.15 |
| III. Retained earnings | | | |
| 1. Statutory reserves | | 360,000.00 | 159,571.25 |
| 2. Other reserves (free reserves) | | 725,030.22 | 772,750.22 |
| | | 1,085,030.22 | 932,321.47 |
| IV. Net profit for the year | | 1,607,202.08 | 385,078.51 |
| *(thereof profit carried forward* | *385,078.51* | | *63,179.57)* |
| | | **10,790,831.59** | **9,676,569.13** |
| **B. Investment grants** | | **1,692,402.31** | **1,792,330.57** |
| **C. Provisions** | | | |
| 1. Provisions for severance pay | | 5,483,700.00 | 5,122,400.00 |
| 2. Provisions for pensions | | 5,711,790.00 | 5,610,020.00 |
| 3. Tax provisions | | 7,019,500.00 | 6,614,200.00 |
| 4. Other provisions | | 10,239,000.00 | 9,903,200.00 |
| | | **28,453,990.00** | **27,249,820.00** |
| **D. Liabilities** | | | |
| 1. Bank borrowings | | 1,484,625.30 | 1,580,333.71 |
| *(thereof due within 1 year* | *712,193.77* | | *712,193.77)* |
| *(thereof due after more than 1 year* | *772,431.53* | | *868,139.94)* |
| 2. Advances received on orders | | 2,375,100.72 | 2,473,623.90 |
| *(thereof due within 1 year* | *360,778.11* | | *1,492,319.71)* |
| *(thereof due after more than 1 year* | *2,014,322.61* | | *981,304.19)* |
| 3. Trade payables | | 1,883,819.01 | 2,269,434.59 |
| *(thereof due within 1 year* | *985,659.97* | | *1,402,341.23)* |
| *(thereof due after more than 1 year* | *898,159.04* | | *867,093.36)* |
| 4. Payables to affiliates | | 275,545.53 | 315,652.11 |
| *(thereof due within 1 year* | *275,545.53* | | *315,652.11)* |
| 5. Payables to undertakings with which the company is linked by virtue of participating interests | | 42,000.00 | 0.00 |
| *(thereof due within 1 year* | *42,000.00* | | *0.00)* |
| 6. Other liabilities | | 10,313,787.28 | 14,563,244.06 |
| *(thereof due within 1 year* | *1,431,056.84* | | *4,281,247.21)* |
| *(thereof due after more than 1 year* | *8,882,730.44* | | *10,281,996.85)* |
| *(thereof for taxes* | 385,174.02 | | *496,527.12)* |
| *(thereof for social security* | *746,691.14* | | *1,050,996.82)* |
| | | **16,374,877.84** | **21,202,288.37** |
| *(thereof due within 1 year* | *3,531,688.69* | | *7,888,101.92)* |
| *(thereof due after more than 1 year* | *12,843,189.15* | | *13,314,186.45)* |
| **E. Accruals and deferred income** | | **169,301.85** | **192,356.29** |
| **F. Escrow liabilities** | | **3,055,956.60** | **5,845,290.34** |
| **Total liabilities** | | **60,537,360.19** | **65,958,654.70** |

# INCOME STATEMENT

1 January 2021 to 31 December 2021

| | | 2021<br>EUR | 2020<br>EUR |
|---|---|---|---|
| **1. Revenue** | | **14,645,453.09** | **14,031,646.60** |
| **2. Changes in the amount of services not yet chargeable** | | **1,788,243.53** | **760,806.33** |
| **3. Project-related other income** | | **17,735,679.09** | **16,504,165.80** |
| **4. Shareholder contribution** | | **10,051,000.00** | **9,816,017.71** |
| **5 Other own work capitalised** | | **52,360.00** | **23,367.64** |
| **6. Other operating income** | | | |
| (a) Income from disposal of non-current assets except for financial assets | | 340,01 | 19,957.62 |
| (b) Income from reversal of provisions | | 576,809.80 | 492,742.06 |
| (c) Income from reversal of investment grants | | 396,389.43 | 315,882.57 |
| (d) Other | | 3,397,589.98 | 3,477,112.81 |
| | | **4,371,129.22** | **4,305,695.06** |
| **7. Cost of materials and other services purchased** | | | |
| (a) Cost of materials | | 2,016,887.81 | 1,637,626.69 |
| (b) Costs of services purchased | | 1,567,845.88 | 1,359,423.49 |
| | | **3,584,733.69** | **2,997,050.18** |
| **8. Cost of staff** | | | |
| (a) Salaries | | 25,080,747.86 | 23,535,171.52 |
| *(thereof COVID-19 short-time work allowance* | *0.00* | | *-421,873.48)* |
| (b) Social benefits | | | |
| (aa) Expenses for old-age provision | | 450,761,14 | 528,697.31 |
| (bb) Expenses for severance pay and contributions to Severance Pay and Pension Funds | | 769,391.74 | 867,571.60 |
| (cc) Expenses for statutory social security contributions and payroll-related taxes and compulsory contributions | | 6,772,672.86 | 6,437,258.13 |
| (dd) Other social benefits | | 138,694.81 | 138,971.01 |
| | | **33,212,268.41** | **31,085,796.09** |
| **9. Amortisation of intangible non-current assets and depreciation of property, plant and equipment** | | **3,522,206.63** | **3,414,966.45** |
| **10. Other operating expenses** | | | |
| (a) Taxes, other than taxes stated in line 19 | | 7,868.48 | 7,868.43 |
| (b) Other | | 6,949,316.98 | 8,010,104.53 |
| | | **6,957,185.46** | **8,017,972.96** |
| **11. Subtotal lines 1 to 10 (Operating result)** | | **1,367,470.74** | **-74,086.54** |

| | | | | |
|---|---|---|---|---|
| **12.** | **Income from investments** | | **13,602.10** | **200,000.00** |
| | *(thereof from affiliates* | *10,000.00* | | *200,000.00)* |
| **13.** | **Income from other securities** | | **14,055.00** | **23.450.00** |
| **14.** | **Other interest and similar income** | | **7,846.00** | **18,024.80** |
| **15.** | **Expenses for financial assets and securities held as current assets** | | | |
| | (a) Write-downs | | 158,885.00 | 7,900.00 |
| | (c) Other | | 46,224.69 | 19,953.87 |
| | | | **205,109.69** | **27,853.87** |
| **16.** | **Interest and similar expenses** | | **46,851.69** | **65,718.93** |
| | *(thereof from affiliates* | *10,777.82* | | *17,780.55)* |
| **17.** | **Subtotal lines 12 to 16 (Financial result)** | | **-216,458.28** | **147,902.00** |
| **18.** | **Profit or loss before tax (Subtotal lines 11 and 17)** | | **1,151,012.46** | **73,815.46** |
| **19.** | **Income taxes** | | **1,750.00** | **1,750.00** |
| **20.** | **Profit or loss for the year = profit or loss after tax** | | **1,149,262.46** | **72,065.46** |
| **21.** | **Reversal of capital reserves** | | | |
| | (a) Appropriated | | **260,569.86** | **237,113.48** |
| **22.** | **Reversal of retained earnings** | | | |
| | (a) Other reserves (free reserves) | | **12,720.00** | **12,720.00** |
| **23.** | **Allocation to retained earnings** | | | |
| | (a) Statutory retained earnings | | **-200,428.75** | **0.00** |
| **24.** | **Profit carried forward from previous year** | | **385,078.51** | **63,179.57** |
| **25.** | **Net profit for the year** | | **1,607,202.08** | **385,078.51** |

# NOTES to the financial statements for the financial year 2021 of JOANNEUM RESEARCH Forschungsgesellschaft mbH, Graz

## ACCOUNTING AND VALUATION POLICIES

### General principles

The annual financial statements of JOANNEUM RESEARCH Forschungsgesellschaft mbH were prepared in accordance with the provisions of the Austrian Business Code [*Unternehmensgesetzbuch/UGB*] as amended in accordance with generally accepted accounting principles and the general principle of presenting a true and fair view of the Company's financial position and financial performance.

When preparing the annual financial statements the principle of completeness was complied with.

Assets and liabilities were measured on a going concern basis according to the principle of item-by-item valuation.

The principle of prudent valuation was taken account of by recognising only the profits realised as at the balance sheet date. All recognisable risks and anticipated losses were taken into consideration.

### Non-current assets

#### Intangible assets

Intangible assets are recognised at cost plus incidental acquisition costs less cash discounts deducted and after amortisation on a straight-line basis. The useful life applied is three to five years (20%-33%).

## Property, plant and equipment

Property, plant and equipment is recognised at cost plus incidental acquisition costs less cash discounts deducted and after depreciation.

Public subsidies for non-current assets are presented on the liabilities side as investment grants from public funds. Those investment grants are used for the non-current assets analogously to the depreciation of non-current assets.

Amortisation and depreciation is calculated on a straight-line basis according to the following useful lives and rates:

| | Useful life in years | Depreciation rate in % |
|---|---|---|
| Buildings, including buildings on land owned by others | 10 - 40 | 2.5 - 10 |
| Machinery, scientific equipment and electronic data processing systems | 3 - 10 | 10 - 33 |
| Other plant, furniture and fixtures | 4 - 10 | 10 - 25 |

Full annual depreciation is applied to additions made in the first half of the financial year, and half the yearly rate is applied to additions made during the second half of the year.

Low-value assets as defined in Section 13 of the Austrian Personal Income Tax Act [*Einkommen-steuergesetz/EStG*] 1988, i.e. the cost of acquisition of which is less or equal to EUR 800 per asset, are fully written off in the year of acquisition and presented as additions and disposals in the non-current assets movement schedule.

## Financial assets

**Shares in affiliates** and **participating interests** are measured at cost less impairment losses, where appropriate.

**Investment securities** are recognised at the lower of cost or fair value at the balance sheet date.

In the reporting year a write-down of financial assets was made.

## Current assets

### Inventories

**Consumables** were measured at the lower of cost or market.

**Services not yet chargeable** in connection with contract research are calculated on the basis of cost accounting. Project costs are recognised on the basis of an itemisation by cost centre and direct cost statements. Item-by-item valuation at cost of production or acquisition as defined in Section 203 *UGB* is applied. Apart from the costs attributable according to the costs-by-cause principle, production costs also include pro rata production overheads that can be capitalised and portions of social expenses as defined in the second to last sentence of Section 203(3) *UGB*. Interest expenses and the research risk are not accounted for.

Due to the Company's project structure administrative overheads must be capitalised for projects with a term of more than twelve months. In order to give a true and fair view of the Company's financial position and financial performance, the option right (cf. Section 206(3) *UGB*) was exercised.

If losses are anticipated in connection with orders or if additional costs are expected to be incurred for services that have been invoiced already, semi-finished products are discounted or provisions are set up. For contingent warranty obligations in connection with contract research provisions are recognised in the balance sheet as well.

### Receivables and other assets

**Receivables and other assets** are measured at nominal value unless the lower fair value is recognised in the case of specific recognisable risks. Provisions for general credit risks are made in the form of general allowances at a rate of 2% (previous year: 2%) of total net receivables.

## Provisions

**Provisions for severance pay** are calculated according to principles of financial mathematics on the basis of the 10-year average interest rate with a term of fifteen years. Calculation of the provision for severance pay was based on an interest rate of 1.87% (previous year: 2.30%) as at 31 December 2021, a salary trend of 2.78% (previous year: 2.70%) and a retirement age of 65 years on a going-concern basis.

No fluctuation discount was recognised. The allocation amount resulting from a change in measurement due to the Austrian Act on Changes in Accounting Practices [*Rechnungslegungs-Änderungsgesetz/RÄG*] 2014 is allocated over five years.

The **pension provision** is calculated in the amount of the actuarial cover requirement on the basis of the provisions of Section 198 and Section 211 *UGB* as amended by the *RÄG* 2014 in compliance with the AFRAC Opinion on "Provisions for pension, severance pay, long-service bonus and comparable long-term obligations under *UGB* provisions" of June 2016. The calculation was based on the Pagler & Pagler reference tables. The calculatory interest rate used was the 10-year average interest rate of 1.62% (previous year: 1.84%) with an average remaining term of ten years.

**Other provisions** take into account all recognisable risks and liabilities the amount of which is contingent and are recognised at the amounts which, according to best estimate, must be used to fulfil the obligation. No provisions other than those provided for by law are set up.

Changes in provisions concerning a reversal of provisions are recognised in item 6(b) and allocations to provisions are stated in item 8(b) if they are attributable to staff costs; all others are recognised as other operating expenses in item 10(b) of the income statement.

## Liabilities

Liabilities are recognised at the settlement value in compliance with the principle of prudence.

## Currency translation

Receivables and payables are measured at the mean rate of exchange at the date of the transaction and according to the lower of cost or market principle or higher of cost or market principle at the balance sheet date, respectively.

# NOTES TO THE BALANCE SHEET

# A S S E T S

## NON-CURRENT ASSETS

As to the development of the different non-current assets and the breakdown of annual amortisation and depreciation reference is made to the non-current assets movement schedule (Annex to the Notes). As at the balance sheet date non-current assets amounted to EUR 20,809,999.16 (previous year: kEUR 20,575.9) in total. In the financial year 2021 capital expenditure amounted to a total of EUR 5.251.294,25 (previous year: kEUR 4,627.4) and amortisation and depreciation amounted to EUR 3,658,739.49 (previous year: kEUR 3,415.0). In the financial year 2021 disposals at historical cost amounted to EUR 2,034,318.34 (previous year: kEUR 419.5).

**Intangible assets** include software and data transmission rights of a carrying amount of EUR 376,658.00 (previous year: kEUR 320.6). Additions in the amount of EUR 301,756.97 (previous year: kEUR 186.7) are attributable to the acquisition of licences and various software.

As at the balance sheet date **property, plant and equipment** amounted to EUR 17,622,403.27 (previous year: kEUR 18,038.8). The land value was EUR 2,877,794.02 (previous year: kEUR 2,877.8). The building value of land with buildings and buildings on land owned by others of EUR 8,881,964.00 (previous year: kEUR 7,222.2) is made up of the net building value of EUR 3,751,902.00 (previous year: kEUR 3,255.2) and structural improvements worth EUR 3,065,585.00 (previous year: kEUR 1,736.8), i.e. EUR 6,817,487.00 (previous year: kEUR 4,992.0) are attributable to buildings on land owned by the Company and an amount of EUR 2,064,477.00 (previous year: kEUR 2,230.1) is attributable to capital expenditure on buildings owned by others. Additions in a total amount of EUR 2,861,754.78 (previous year: kEUR 4,072.7) mainly concern the provision of modern scientific equipment for the Company's research activities and further expansion of the IT infrastructure. Disposals at historical cost in the amount of EUR 649,615.78 (previous year: kEUR 205.5) mainly concern disposals or, to a small extent, sale of scientific equipment, IT equipment and various office equipment. No impairment losses were recognised.

**Shares in affiliates** in the amount of EUR 150,000.00 (previous year: kEUR 150.0) concern the shares in JR-AquaConSol GmbH in Graz.

According to the statement of investments the following **participating interests** are held:

**Statement of Investments as at 31 December 2021**

| | Interest | | Equity | Net profit | Balance sheet |
|---|---|---|---|---|---|
| | EUR | % | EUR | or loss in EUR | date |
| ACIB GmbH | 16,000.00 | 8.00% | 4,818,978.80 | 550,396.36 | 31 Dec 2020 |
| ALP.Lab GmbH | 5,600.00 | 16.00% | 60,959.32 | 25,959.32 | 31 Dec 2020 |
| BEST - Bioenergy and Sustainable Technologies GmbH | 20,000.00 | 10.00% | 1,127,770.04 | 892,416.11 | 31 Mar 2021 |
| CBmed GmbH | 25,000.00 | 12.50% | 2,195,156.84 | 1,995,156.84 | 31 Dec 2020 |
| decide Clinical Software GmbH | 42,500.00 | 10.00% | 90,993.63 | -334,006.37 | 31 Dec 2020 |
| DIH SÜD GmbH | 9,100.00 | 26.00% | n.a. | n.a. | founded in 2021 |
| EPIG GmbH | 8,750.00 | 25.00% | 288,170.07 | 253,170.07 | 31 Dec 2020 |
| FH JOANNEUM Gesellschaft mbH | 10,828.25 | 14.90% | 4,000,000.00 | 0.00 | 30 Jun 2021 |
| Geo5 GmbH | 8,000.00 | 10.00% | 104,098.98 | 24,098.98 | 31 Dec 2020 |
| Holz.Bau Forschungs GmbH | 3,500.00 | 5.98% | 410,615.01 | 352,115.01 | 31 Dec 2020 |
| Human.technology Styria GmbH | 2,450.00 | 7.00% | 200,343.29 | -320.54 | 31 Dec 2020 |
| Know-Center GmbH Research Center for Data-Driven Business & Big Data Analytics | 14,540.00 | 10.00% | 2,000,319.92 | 0.00 | 31 Dec 2020 |
| Materials Center Leoben Forschung GmbH | 51,100.00 | 17.50% | 7,007,250.32 | 443,883.32 | 31 Dec 2020 |
| Pacemaker Technologies GmbH | 1,050.00 | 3.00% | 212.36 | -34,787.64 | 31 Dec 2020 |
| Polymer Competence Center Leoben GmbH | 34,000.00 | 17.00% | 6,059,389.17 | 1,601,935.77 | 31 Dec 2020 |
| Rebeat Innovation GmbH | 80,000.00 | 1.70% | -617,214.01 | -1,757,592.62 | 31 Dec 2020 |
| Research Center Pharmaceutical Engineering GmbH | 15,000.00 | 15.00% | 5,347,820.77 | 812,920.77 | 30 Jun 2021 |
| Virtual Vehicle Research GmbH | 10,640.00 | 8.40% | 6,647,983.82 | 1,078,779.49 | 31 Dec 2020 |

As at the balance sheet date a write-down of that item of EUR 80,000 (previous year: kEUR 0.0) was made.

As at the balance sheet date the carrying amount of **investment securities** was EUR 2,390,149.64 (previous year: kEUR 1,724.8).

In the reporting year a write-down of financial assets of EUR 56,532.86 (previous year: kEUR 0.0) was made.

Amortisation and depreciation of the remaining non-current assets completely result from ordinary amortisation and depreciation.

## CURRENT ASSETS

### Inventories

The item **raw materials and supplies** in the amount of EUR 3,412.90 (previous year: kEUR 3.6) is made up of consumables (mainly toners, computer network cards, laser printer spare parts and various small items of equipment).

The item **services not yet chargeable** in connection with contract research includes work in progress and services not yet chargeable in the amount of EUR 3,381,633.84 (previous year: kEUR 2,654.2), under which administrative overheads of EUR 1,866,690.36 (previous year: kEUR 1,598.2) were capitalised for contracts the execution of which lasts more than twelve months. The Company's project structure requires such capitalisation of administrative overheads to present a true and fair as well as a continuous view of the Company.

In the reporting year advances received were stated separately for the first time due to the constantly increasing project volumes and the advances received for research projects in the amount of EUR 6,799,111.67 (previous year: kEUR 5,738.3) included therein. The excess amount of EUR 2,375,100.72 (previous year: kEUR 2,473.6) was recognised on the liabilities side. The figure for the reference period 2020 was restated.

**Advances made** on inventories amounted to EUR 32,189.46 (previous year: kEUR 1.9).

## Receivables and other assets

| | Receivables as at 31 Dec 2021 (31 Dec 2020) | thereof due after more than 1 year | thereof evidenced by bills of exchange | Capitalised accruals Section 225(3) *UGB* | General allowance |
|---|---|---|---|---|---|
| | EUR | EUR | EUR | EUR | EUR |
| Trade receivables | 1,122,410.56 | 0.00 | 0.00 | 0.00 | 21,400.00 |
| | (1,703,861.76) | (0.00) | (0.00) | (0.00) | (32,700.00) |
| Receivables from affiliates | 30,923.92 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (13,266.69) | (0.00) | (0.00) | (0.00) | (0.00) |
| Receivables from undertakings with which the Company is linked by virtue of participating interests or book-entry securities | 68,544.70 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (42,923.59) | (0.00) | (0.00) | (0.00) | (0.00) |
| Receivables from the owners | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (110,000.00) | (0.00) | (0.00) | (110,000.00) | (0.00) |
| Receivables from subsidies | 5,133,817.79 | 0.00 | 0.00 | 5,133,817.79 | 0.00 |
| and project grants | (4,435,394.65) | (0.00) | (0.00) | (4,435,394.65) | (0.00) |
| Receivables from the liability commitment | 5,600,000.00 | 0.00 | 0.00 | 5,600,000.00 | 0.00 |
| of the State of Styria | (5,600,000.00) | (0.00) | (0.00) | (5,600,000.00) | (0.00) |
| Other receivables and assets | 6,228,665.68 | 0.00 | 0.00 | 6,155,355.38 | 0.00 |
| | (7,689,004.50) | (0.00) | (0.00) | (7,494,233.54) | (0.00) |
| | 18,184,362.65 | 0.00 | 0.00 | 16,889,173.17 | 21,400.00 |
| TOTAL | (19,594,451.19) | (0.00) | (0.00) | (17,639,628.19) | (32,700.00) |

Itemised allowances in the amount of EUR 1,014,716.96 (previous year: kEUR 1,045.7) were made for doubtful **trade receivables** and deducted from the assets.

**Receivables from affiliates** concern trade receivables.

**Receivables from subsidies and project grants** concern grant approvals from various funding agencies. Due to the fact that processing, including receipt of payment, takes more than three months, a discount in the amount of EUR 8,100.00 (previous year: kEUR 9.7) was made. The calculatory interest rate was 0.4% (previous year: 0.47%).

**Other receivables and assets** mainly include claims vis-à-vis the Tax Office for Large Enterprises, various interest accrued, as well as refunds and aids. This item also includes a liability commitment of the State of Styria in the amount of EUR 5,600,000.00 (previous year: kEUR 5,600.0) to cover the loss from the tax audit by the Tax Office of Graz-Stadt, and claims vis-à-vis the Tax Office of Graz-Stadt from research allowances in the amount of EUR 5,962,572.46 (previous year: kEUR 6,068.6).

### Securities held as current assets

**Securities held as current assets** in the amount of EUR 853,997.86 (previous year: kEUR 1,624.1) concern bonds with a base term until the end of October 2026, which may, however, be sold at short notice.

### Cash and balances at banks

This item in the amount of EUR 11,074,783.87 (previous year: kEUR 12,376.6) is made up of **cash** in the amount of EUR 7,522.01 (previous year: kEUR 9.2) and **bank balances** of EUR 11,067,261.86 (previous year: kEUR 12,367.5).

## PREPAYMENTS AND ACCRUED INCOME

**Prepayments and accrued income** in the amount of EUR 3,141,023.85 (previous year: kEUR 3,282.6) include payments made in the financial year 2021 which have to be charged as expenses in the following year and mainly concern prepayments of maintenance expenses, various subscriptions and membership fees, insurance premiums and congress fees. In addition, this item includes a prepayment of rent in the amount of EUR 2,878,437.41 (previous year: kEUR 2,954.7).

## ESCROW FUNDS

**Escrow funds** include balances at banks for projects with the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft mbH) and the European Commission, where JOANNEUM RESEARCH Forschungsgesellschaft mbH acts as the coordinator and holds the funds in escrow and manages payments for the project partners (see escrow liabilities).

# LIABILITIES AND SHAREHOLDERS' EQUITY

## EQUITY

The Company's **share capital** amounts to EUR 3,600,000.00 (previous year: kEUR 3,600.0), of which 80.75% (previous year: 80.75%) or EUR 2,907,000.00 (previous year: kEUR 2,907.0) are held by the State of Styria and 14.25% (previous year: 14.25%) or EUR 513,000.00 (previous year: kEUR 513.0) by BABEG - Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. and 5% (previous year: 5%) or EUR 180.000.00 (previous year: kEUR 180.0) are held by Landesholding Burgenland GmbH.

In the reporting year allocations were made to statutory retained earnings up to the maximum amount of EUR 360,000.00 (previous year: EUR 159,571.25).

Taking into account the **profit for the year** of EUR 1,222,123.57 (previous year: profit for the year of EUR 321,898.94) and the profit carryforward in the amount of EUR 385,078.51 (previous year: EUR 63,179.57) the resulting **net profit for the year** is EUR 1,607,202.08 (previous year: EUR 385,078.51).

## APPROPRIATED CAPITAL RESERVE

Both in the Participation and Cooperation Agreement with Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG) of 18 December 2014 and in the Participation and Cooperation Agreement with Landesholding Burgenland GmbH of 20 April 2018 the shareholders agreed that the **appropriated capital reserve** be reversed as stipulated.

## SPECIAL ITEMS FOR INVESTMENT GRANTS FROM PUBLIC FUNDS

In the reporting year **investment grants from public funds** developed as follows:

| | As at 1 Jan 2021 | Additions | Consumption according to depreciation | Reversal | Reclassi-fication or corrections | As at 31 Dec 2021 |
|---|---|---|---|---|---|---|
| | EUR | EUR | EUR | EUR | EUR | EUR |
| **Property, plant and equipment** | | | | | | |
| 1. Buildings, including buildings on land owned by others | 1,019,833.65 | 61,460.45 | -129,606.02 | 0.00 | 125,624.92 | 1,077,313.00 |
| 2. Machinery, scientific equipment and electronic data processing systems | 643,994.00 | 220,484.90 | -260,548.25 | 0.00 | 0.00 | 603,930.65 |
| 3. Other plant, furniture and fixtures | 128,502.92 | 10,302.87 | -2,022.21 | 0.00 | -125,624.92 | 11,158.66 |
| **Financial assets** | | | | | | |
| 1. Financial assets | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **1,792,330.57** | **292,248.22** | **-392,176.48** | **0.00** | **0.00** | **1,692,402.31** |

Applications for covid-19 investment grants were filed and taken into account also in the reporting year 2021.

## PROVISIONS

An amount of EUR 69,326.00 (previous year: kEUR 49.0) of the **provisions for severance pay** was used. In order to meet the cover requirement of EUR 5,483,700.00 (previous year: kEUR 5,122.4), an amount of EUR 430,626.00 (previous year: kEUR 249.5) was allocated to the provision.

An amount of EUR 330,539.10 (previous year: kEUR 267.1) of the **pension provisions** (for former managing directors) was used for pension payments and an amount of EUR 0.00 (previous year: kEUR 146.4) was reversed. In order to meet the actuarial cover requirement of EUR 5,711,790.00 (previous year: kEUR 5,610.0), an amount of EUR 432,309.10 (previous year: kEUR 450.5) had to be allocated to the provision.

The item **provision for taxes** concerns additional tax claims resulting from the tax audit in connection with the temporary loss of the status of a non-profit organisation in the amount of EUR 4,731,700.00 (previous year: kEUR 4,731.7), additional tax claims in the amount of EUR 2,192,500.00 (previous year:

kEUR 1,787.2) resulting from the tax audit in connection with the division of input taxes into a business part and a non-business part, and additional tax claims resulting from the tax audit in connection with VAT treatment of services provided for the State of Styria in the field of "locational positioning" in the amount of EUR 95,300.00 (previous year: kEUR 95.3).

**Other provisions** include as main items the provision for unconsumed annual leave in the amount of EUR 2,413,700.00 (previous year: kEUR 2,309.2), provisions for potential claims for refund of various funding parties in the amount of EUR 1,175,100.00 (previous year: kEUR 1,277.2), the provision for working time credits in the amount of EUR 820,000.00 (previous year: kEUR 639.6) and the provision for anticipated losses or costs of work in progress in the amount of EUR 716,700.00 (previous year: kEUR 571.7).

This item also includes the **provision for the tax audit** by the Tax Office of Graz-Stadt in the amount of EUR 3,980,700.00 (previous year: kEUR 3,980.7).

## LIABILITIES

The item **bank borrowings** in the amount of EUR 1,484,625.30 (previous year: kEUR 1,580.3) includes an export fund credit line of EUR 712,193.77 (previous year: kEUR 712.2) and a loan for the acquisition of the property EZ [folio number] 458 GB [Land Register] 60340 in Niklasdorf with a remaining term of more than five years in the amount of EUR 772,431.53 (previous year: kEUR 868.1).

**Advances received** on orders that may be deducted from inventories amounted to a net amount of EUR 2,375,100.72 (previous year: kEUR 2,473.6). For the first time in the reporting year 2021 advances received in connection with services not yet chargeable were offset against the relating items of inventories.

As at the balance sheet date **trade payables** were EUR 1,883,819.01 (previous year: kEUR 2,269.4), predominantly to Austrian suppliers.

**Other liabilities** include the profit-participating loan granted by the State of Styria on 1 November 2004 in the amount of EUR 1,387,477.00 (previous year: kEUR 1,387.5). In addition, this item mainly includes clearing funds with the Austrian Health Insurance Fund [*Österreichische Gesundheitskasse/ÖGK*] and other necessary deferrals. For the first time this item also includes advances of EUR 7,509,860.76 (previous year: kEUR 10,907.9) made by funding parties.

**Other liabilities** include expenses in the amount of EUR 1,491,589.34 (previous year: kEUR 2,218.7), which will be paid only after the balance sheet date.

**Other financial obligations**

Based on the Grant Agreement of the Office of the Styrian Government, Department 8, Health, Care and Science, by decision of the Styrian Government of 29 April 2021, reference number: ABT08-129749/2021-6, funding of a shareholder contribution of JOANNEUM RESEARCH Forschungsgesellschaft mbH to DIH Süd GmbH of a total amount of EUR 900,000.00 for the period from 1 April 2021 to 31 March 2024 was approved and granted.

Obligations arising from use of property, plant and equipment not presented in the balance sheet:

| | for the next financial year | for financial years 2022 to 2026 |
|---|---|---|
| | EUR | EUR |
| Room rents | 929,695.00 | 4,648,475.00 |
| (previous year) | (893,669.00) | (4,468,345.00) |
| Equipment rents | 91,100.00 | 343,400.00 |
| (previous year) | (60,312.00) | (207,160.00) |
| Total | 1,020,795.00 | 4,991,875.00 |
| (previous year) | (953,981.00) | (4,675,505.00) |

## ACCRUALS AND DEFERRED INCOME

**Accruals and deferred income** in the amount of EUR 169,301.85 (previous year: kEUR 192.4) mainly concern price gains not yet realised.

## ESCROW LIABILITIES

**Escrow liabilities** result from projects with the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft mbH) or the European Commission, where JOANNEUM RESEARCH Forschungsgesellschaft mbH acts as the coordinator and holds the funds in escrow and manages payments for the project partners (see escrow funds).

## CONTINGENT LIABILITIES

(cf. in this respect Other disclosures, Contingencies).

## NOTES TO THE INCOME STATEMENT

**Revenues** generated in the financial year 2021 are classified according to areas of activity and divided into domestic and international revenues:

| Amounts in EUR | Financial year 2021 | Financial year 2020 |
|---|---|---|
| **Domestic revenues** | | |
| Research | 5,379,107.79 | 5,935,866.81 |
| Royalties | 994,723.96 | 702,551.84 |
| Congress fees | 2,289.40 | 3,919.11 |
| Other | 1,727,814.83 | 1,431,266.38 |
| **Total domestic revenues** | **8,103,935.98** | **8,073,604.14** |
| **International revenues** | | |
| Research | 6,456,788.61 | 5,938,449.13 |
| Royalties | 84,516.00 | 19,593.33 |
| Congress fees | 0.00 | 0.00 |
| Other | 212.50 | 0.00 |
| **Total international revenues** | **6,541,517.11** | **5,958,042.46** |
| **Total revenues** | **14,645,453.09** | **14,031,646.60** |

The expenses of EUR 769,391.74 (previous year: kEUR 867.6) stated in item 8.(bb) include contributions to Severance Pay and Pension Funds in the amount of EUR 280,151.14 (previous year: kEUR 254.0) and expenses for severance pay in the amount of EUR 489,240.60 (previous year: kEUR 613.5).

## OTHER DISCLOSURES

### Shares in affiliates and participating interests

As at the balance sheet date 31 December 2021 the Company held 100% of the shares or EUR 150,000.00 (previous year: kEUR 150.0) in JR-AquaConSol GmbH.
The annual financial statements for the year ended 31 December 2021 show equity of EUR 1,358,189.28 (previous year: EUR 1,299,286.08), which includes a net profit for the year of EUR 1,058,189.28 (previous year: EUR 999,286.08).

In addition, the Company held another participating interest of 25% of the shares or EUR 8,750.00 (previous year: kEUR 8.8) in EPIG GmbH as at the balance sheet date 31 December. The annual financial statements for the year ended 31 December 2020 show equity of EUR 288,170.07 (previous year: EUR 216,286.06), which includes a net profit for the year of EUR 253,170.07 (previous year: EUR 181,286.06).

By notarial deed dated 28 May 2021 the Articles of Association of DIH SÜD GmbH, another investment of 26% or EUR 9,100.00, was signed. According to the Articles of Association the balance sheet day is 31 December.

All other participating interests were below 20%.

### Staff

As at the balance sheet date the Company had 478 (previous year: 483) employees; taking part-time employees into account on a pro rata basis, the number of staff was 400.4 (previous year: 398.1). Taking part-time employees into account on a pro rata basis, the average number of employees was 398.1 (previous year: 392.5).

In application of the provisions of Section 242(4) *UGB* no itemisation of salaries, severance pay or pensions for the management as defined in Section 239(1) *UGB* was made in the previous year. As at the balance sheet date of the reporting year expenses for old-age provision in the amount of EUR 450,761.14 for former managing directors were recognised.

No loans or advances were granted to members of the management or of the supervisory board. No liability in favour of that group of persons was assumed either.

The cost of remuneration of members of the Scientific Advisory Board and of the supervisory board amounted to EUR 110,238.96 (previous year: kEUR 109.2) in total.

### Results after the balance sheet date

After closing of the accounts for the financial year 2021 no other significant events occurred which would have affected the financial position or financial performance in the financial year 2021.

**Bodies of the Company in the financial year 2021:**

## SCIENTIFIC ADVISORY BOARD

Prof. Dr Dr Gerald SCHÖPFER
Chairman

Prof. Dr Gerhard FRIEDRICH
Deputy Chairman

Prof. Dr Gernot HANREICH
Deputy Chairman

Prof. Dr Hansjörg ALBRECHER

Prof. Dr Horst BISCHOF

Dr Michaela FRITZ

Prof. Dr Günter GETZINGER

Prof. Dr Dr Manfred HUSTY

Dr Mario MÜLLER

Michael PATAK

Reinhard PETSCHACHER

Herbert RITTER, MBA

Prof. Dr Karin SCHAUPP

Waltraud SCHINKO-NEUROTH

Caroline SCHOBER

Dr Stefan TASCH

Prof. Dr Frank UHLIG

## Management:

Prof. Dr Wolfgang PRIBYL, MBA
(until 1 September 2021)

Dr Heinz MAYER (since 1 September 2021)

## SUPERVISORY BOARD

Dr Martin WIEDENBAUER
Chairman

Prof. Fritz SPERL
Deputy Chairman

Dr Erlfried TAURER
Deputy Chairman

Klaus HATZL, MA

Prof. Dr Werner HAUSER

Alexandra HÖRMANN (since 28 April 2021)

Michaela KRENN

Dr Rupert PICHLER (since 28 April 2021)

Ingolf SCHÄDLER (until 28 April 2021)

Dr Birgit STRIMITZER-RIEDLER

Ursula STROHMAYER (until 28 April 2021)

## Members delegated to the supervisory board by the works council:

Ferdinand GOLJA, Chairman of the Works Council

Clemens HABSBURG-LOTHRINGEN, MAS

Helen HASENAUER, MSc

Maria HINGSAMER

Gertrude MATZER, BA MSc

## Contingencies

Pursuant to Section 199 *UGB* guarantees for rent security deposits vis-à-vis Zentrum für Wissens- und Technologietransfer in der Medizin GmbH (EUR 110,890.00), W.E.I.Z. Immobilien GmbH (EUR 38,019.46) and SFL technologies Science Tower GmbH (EUR 36,000.00) as well as retention guarantees vis-à-vis Autobahnen- und Schnellstraßen-Finanzierungs Aktiengesellschaft (EUR 73,706.27) and a payment guarantee vis-à-vis Stummer Kommunalfahrzeuge Ges.m.b.H. (EUR 122,306.25) are presented below the balance sheet.

Pursuant to Section 199 *UGB* guarantees for rent security deposits vis-à-vis Zentrum für Wissens- und Technologietransfer in der Medizin GmbH (EUR 110,890.00), W.E.I.Z. Immobilien GmbH (EUR 38,019.46) and SFL technologies Science Tower GmbH (EUR 36,000.00) as well as retention guarantees vis-à-vis Autobahnen- und Schnellstraßen-Finanzierungs Aktiengesellschaft (EUR 101,001.1) and voestalpine Wire Rod Austria GmbH (EUR 44,550.00) were presented below the balance sheet in the previous year.

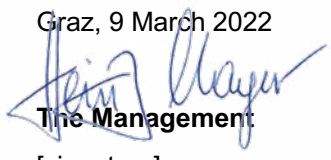
## Other information

Based on the objectives defined in Article 1(3) of the Articles of Association the Company pursues the aim of furtherance of the general public in the fields of research, development and science exclusively and directly in the interest of public welfare. No net profit that may be generated will be distributed.

According to a decision of the Finance Authority for the State of Styria dated 16 January 1995, reference no. 29/31-10/94, JOANNEUM RESEARCH Forschungsgesellschaft mbH belongs to the group of preferential recipients as defined in Section 4(4) No. 5(e) of the Austrian Personal Income Tax Act [*Einkommensteuergesetz/EStG*] 1988 as amended by Art. I No. 4(a) of the Austrian Tax Reform Act [*Steuerreformgesetz*] 1993.

The expenses for the statutory auditor for auditing the annual financial statements amounted to EUR 18,000.00 (previous year: EUR 17,400.00). No other certification services, tax advisory services or other services of the statutory auditor were rendered in the reporting year or in the previous year.

Graz, 9 March 2022



**The Management**

[signature]

**Dr Heinz Mayer**

## JOANNEUM RESEARCH ForschungsgmbH 2021

| DEVELOPMENT OF NON-CURRENT ASSETS | Cost of acquisition | | | | | Accumulated amortisation and depreciation | | | | Carrying amounts | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1 Jan 2021 | Additions | Disposals | Reclassification | 31 Dec 2021 | 1 Jan 2021 | Additions | Disposals | 31 Dec 2021 | 31 Dec 2020 | 31 Dec 2021 |
| **(I) Intangible assets** | | | | | | | | | | | |
| **Software, data transmission rights and other rights** | 3,222,624.04 | 301,756.97 | 27,952.56 | 52,825.00 | 3,549,253.45 | 2,902,010.04 | 298,537.97 | 27,952.56 | 3,172,595.45 | 320,614.00 | 376,658.00 |
| **Total intangible assets** | **3,222,624.04** | **301,756.97** | **27,952.56** | **52,825.00** | **3,549,253.45** | **2,902,010.04** | **298,537.97** | **27,952.56** | **3,172,595.45** | **320,614.00** | **376,658.00** |
| **(II) Property, plant and equipment** | | | | | | | | | | | |
| **(1) Land, rights equivalent to land and buildings, including buildings on land owned by others** | | | | | | | | | | | |
| **(a) Land value** | 2,877,794.02 | 0.00 | 0.00 | 0.00 | 2,877,794.02 | 0.00 | 0.00 | 0.00 | 0.00 | 2,877,794.02 | 2,877,794.02 |
| **(b) Building value** | 17,044,735.33 | 641,070.52 | 0.00 | 1,723,869.96 | 19,409,675.81 | 9,822,551.33 | 705,160.48 | 0.00 | 10,527,711.81 | 7,222,184.00 | 8,881,964.00 |
| **Subtotal land and buildings** | 19,922,529.35 | 641,070.52 | 0.00 | 1,723,869.96 | 22,287,469.83 | 9,822,551.33 | 705,160.48 | 0.00 | 10,527,711.81 | 10,099,978.02 | 11,759,758.02 |
| **(2) Machinery, scientific equipment and EDP systems** | 30,997,216.97 | 1,589,015.86 | 531,808.55 | 98,937.74 | 32,153,362.02 | 25,791,443.97 | 2,178,418.60 | 530,934.55 | 27,438,928.02 | 5,205,773.00 | 4,714,434.00 |
| **(3) Other plant, furniture and fixtures** | 3,741,288.53 | 108,092.38 | 21,689.93 | 0.00 | 3,827,690.98 | 2,997,870.53 | 244,466.38 | 21,371.93 | 3,220,964.98 | 743,418.00 | 606,726.00 |
| **(4) Advances made and construction in progress** | 1,992,095.05 | 483,950.82 | 494.10 | -1,878,068.52 | 597,483.25 | 0.00 | 0.00 | 0.00 | 0.00 | 1,992,095.05 | 597,483.25 |
| **Offsetting of input tax on advances for non-current assets** | -2,435.82 | -55,998.00 | 0.00 | 2,435.82 | -55,998.00 | 0.00 | 0.00 | 0.00 | 0.00 | -2,435.82 | -55,998.00 |
| **Subtotal advances made and construction in progress** | 1,989,659.23 | 427,952.82 | 494.10 | -1,875,632.70 | 541,485.25 | 0.00 | 0.00 | 0.00 | 0.00 | 1,989,659.23 | 541,485.25 |
| **(5) Low-value assets** | 0.00 | 95,623.20 | 95,623.20 | 0.00 | 0.00 | 0.00 | 95,623.20 | 95,623.20 | 0.00 | 0.00 | 0.00 |
| **Total property, plant and equipment** | **56,650,694.08** | **2,861,754.78** | **649,615.78** | **-52,825.00** | **58,810,008.08** | **38,611,865.83** | **3,223,668.66** | **647,929.68** | **41,187,604.81** | **18,038,828.25** | **17,622,403.27** |
| **(III) Financial assets** | | | | | | | | | | | |
| **(1) Shares in affiliates** | 150,000.00 | 0.00 | 0.00 | 0.00 | 150,000.00 | 0.00 | 0.00 | 0.00 | 0.00 | 150,000.00 | 150,000.00 |
| **(2) Participating interests** | 341,688.25 | 9,100.00 | 0.00 | 0.00 | 350,788.25 | 0.00 | 80,000.00 | 0.00 | 80,000.00 | 341,688.25 | 270,788.25 |
| **(3) Investment securities (book-entry securities)** | 1,724,750.00 | 2,078,682.50 | 1,356,750.00 | 0.00 | 2,446,682.50 | 0.00 | 56,532.86 | 0.00 | 56,532.86 | 1,724,750.00 | 2,390,149.64 |
| **Total financial assets** | **2,216,438.25** | **2,087,782.50** | **1,356,750.00** | **0.00** | **2,947,470.75** | **0.00** | **136,532.86** | **0.00** | **136,532.86** | **2,216,438.25** | **2,810,937.89** |
| **TOTAL NON-CURRENT ASSETS** | **62,089,756.37** | **5,251,294.25** | **2,034,318.34** | **0.00** | **65,306,732.28** | **41,513,875.87** | **3,658,739.49** | **675,882.24** | **44,496,733.12** | **20,575,880.50** | **20,809,999.16** |

# MANAGEMENT REPORT FOR THE FINANCIAL YEAR 2021
# JOANNEUM RESEARCH Forschungsgesellschaft mbH, Graz

The Management Report covers the reporting period of the financial year 2021 from 1 January 2021 to 31 December 2021 and is divided into three sections: I. Report on the course of the Company's business and financial position; II. Report on prospective developments and risks of the Company, and III. Report on research and development.

## I. Report on the course of the Company's business and financial position

## I.1 Business organisation

As at 31 December 2021 JOANNEUM RESEARCH was organised in seven research units, which represent the main areas of activities.

| **Research units** |
|---|
| DIGITAL – Institute for Information and Communication Technologies |
| MATERIALS – Institute for Surface Technologies and Photonics |
| ROBOTICS – Institute for Robotics and Mechatronics |
| COREMED - Cooperative Centre for Regenerative Medicine |
| HEALTH – Institute for Biomedicine and Health Sciences |
| LIFE – Institute for Climate, Energy and Society |
| POLICIES – Institute for Economic and Innovation Research |

## I.2 Investment report

As at 31 December 2021 JOANNEUM RESEARCH held corporate investments in the following companies:

### I.2.1 Shares in affiliates

In the balance sheet the limited liability company JR-AquaConSol GmbH, Graz, is presented as an affiliate.

| | **Share in %** |
|---|---|
| JR-AquaConSol GmbH | 100.0 |

### I.2.2 Corporate investments

| | **Share in %** |
|---|---|
| ALP.Lab GmbH | 16.0 |
| decide Clinical Software GmbH | 10.0 |
| DIH SÜD GmbH | 26.0 |
| EPIG GmbH | 25.0 |
| FH JOANNEUM Gesellschaft mbH | 14.9 |
| Geo5 GmbH | 10.0 |
| Holz.Bau Forschungs GmbH | 5.98 |
| Human.technology Styria GmbH | 7.0 |
| Pacemaker Technologies GmbH | 3.0 |
| Rebeat Innovation GmbH | 1.7 |

### I.2.3 Corporate investments - COMET (K1, K2) Competence Center Programme

As at 31 December 2021 the Company owned shares in the following companies, which are funded through the COMET (Competence Centers for Excellent Technologies) Programme of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the Federal Ministry for Digital and Economic Affairs (BMDW):

| | **Share in %** |
|---|---|
| ACIB GmbH | 8.0 |
| BEST-Bioenergy and Sustainable Technologies GmbH | 10.0 |
| CBmed GmbH | 12.5 |
| Know-Center GmbH Research Center for Data-Driven Business & Big Data Analytics | 10.0 |
| Materials Center Leoben Forschung GmbH | 17.5 |
| Polymer Competence Center Leoben GmbH | 17.0 |
| Research Center Pharmaceutical Engineering GmbH | 15.0 |
| Virtual Vehicle Research GmbH | 8.4 |

## I.3 Branches

The Company has no branches.

## I.4 Course of business

As at 31 December 2021 the orders on hand amounted to approximately EUR 80.9 million. The work on hand amounted to approximately EUR 39.1 million, the value of offers submitted was approximately EUR 51.3 million. The profit for the financial year 2021 amounted to approximately EUR 1,222,123.57 (previous year: approximately kEUR 321.9). Accordingly, the calculated self-financing ratio (operating result / total expenses) was 82% (previous year: 78%).

The operating result from contract research projects for the financial year 2021 was approximately EUR 16.8 million (previous year: approximately EUR 15.0 million). Funded research projects generated an operating result of approximately EUR 18.2 million (previous year: approximately EUR 16.8 million).

At an international level JOANNEUM RESEARCH generated revenues from contract research projects and funded research projects of approximately EUR 12.7 million in the

aggregate in the reporting year (previous year: approximately EUR 11.5 million). An amount of approximately EUR 6.2 million thereof (previous year: approximately EUR 5.5 million) is attributable to projects with the European Union and approximately EUR 6.5 million (previous year: approximately EUR 6.0 million) to contract research projects. Due to the participation of JOANNEUM RESEARCH in the programmes of the European Union and calls for proposals by the European Space Agency (ESA) the Company generated total revenues of approximately EUR 2.6 million in the financial year 2021. Under the Horizon 2020 programme projects with a funding volume of approximately EUR 3.0 million were awarded to the Company and in connection with ESA projects an order volume of approximately EUR 1.2 million was solicited.

In the financial year 2021 revenues of approximately EUR 6.8 million (previous year: approximately EUR 6.3 million) were gained through national cooperative research projects related to the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft mbH/FFG).

Under a 2019-2021 funding agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) funds in an amount of EUR 7.8 million were granted. In the reporting period JOANNEUM RESEARCH generated revenues totalling approximately EUR 2.6 million from BMK.

In the financial year 2021 the attributable business share amounted to EUR 15.6 million.

### *I.4.1 Financial position*

The Company's assets and financing structure developed as follows:

As at the balance sheet date, 31 December 2021, JOANNEUM RESEARCH had a balance sheet total of approximately EUR 60.5 million (previous year: approximately EUR 66.0 million). This is comprised of non-current assets in the amount of approximately EUR 20.8 million and current assets (inclusive of prepayments and accrued income, and escrow funds) of approximately EUR 39.7 million.

As at 31 December 2021 shareholders' equity including investment grants amounted to around EUR 12.5 million (thereof investment grants of approximately EUR 1.7 million) or 21% of the balance sheet total compared to around EUR 11.5 million or 16% of the previous year's balance sheet total. Borrowings (inclusive of accruals and deferred income, and escrow liabilities) decreased by approximately EUR 12.2 million to

approximately EUR 48.1 million (previous year: EUR 60.2 million) and amounted to 79% (previous year: 84%) of the balance sheet total.

In the financial year 2021 cash flows from the result as the sum total of generated profit for the year and the income and expense items (the Company's internal financing potential) amounted to approximately EUR 5.8 million (previous year: EUR 3.2 million). Working capital (current assets minus short-term borrowings) was approximately EUR 15.7 million (previous year: approximately EUR 15.6 million).

No derivative financial instruments were used in the past financial year 2021. The financial instruments recognised in the balance sheet are part of the Company's general risk management, which is reflected in the bookkeeping and accounting policies.

### *I.4.2 Financial performance*

In the financial year 2021 the operating result including own work capitalised and other operating income net of shareholder contribution and research tax premium amounted to approximately EUR 35.3 million (previous year: approximately EUR 32.2 million).

Domestic revenues accounted for 61% and international revenues accounted for 39% of the operating result generated in projects. The share of the operating result of 12% generated in projects attributable to Styria did not change compared to the previous year.

In the reporting year for the first time advances received for research projects in the amount of EUR 6.8 million were outstanding, against which services not yet chargeable in the amount of EUR 10.2 million were offset.

The expenses in the amount of approximately EUR 47.3 million (previous year: approximately EUR 45.5 million) are made up of staff costs including statutory social security charges and voluntary social benefits plus allocations to pension provisions (former managing director) and severance payments of approximately EUR 33.2 million (previous year: approximately EUR 31.1 million), cost of materials and other services purchased of approximately EUR 3.6 million (previous year: approximately EUR 3.0 million), amortisation and depreciation of approximately EUR 3.5 million (previous year: approximately EUR 3.4 million) and other operating expenses of approximately EUR 7.0 million (previous year: approximately EUR 8.0 million).

As at the balance sheet date the self-financing ratio was 82% (previous year: 78%). The

shareholder contributions of the State of Styria, the State of Carinthia through Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG), the State of Burgenland through Landesholding Burgenland GmbH, and the Grant Agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) constitute material elements of corporate financing and secure accomplishment of the Company's mission.

The Company closed the financial year 2021 with a profit before taxes (formerly profit or loss on ordinary activities) of EUR 1,151,012.46. Taking into account income taxes of EUR 1,750.00, reversal of reserves in the amount of EUR 273,289.86 and the profit of EUR 385,078.51 carried forward from the previous year, the net profit for the year is EUR 1,607,202.08.

After the accounts for the financial year 2021 had been closed no other significant events occurred which would have affected the financial position or financial performance in the financial year 2021.

### *I.4.3 Capital expenditure report*

In the financial year 2021 approximately EUR 2.9 million (previous year: approximately EUR 4.1 million) were invested in property, plant and equipment (scientific equipment, electronic data processing systems, furniture and fixtures, land with buildings).

### *I.4.4 Staff report*

As at the balance sheet date the Company had 478 employees (182 women and 296 men), -1.04% (-0.34% women and -2.15% men) compared to the previous year's figures. This is equal to 400.4 full-time equivalents as at 31 December 2021, i.e. an increase by 0.59% compared to the previous year.

With 76 new employees (35 women and 41 men), and 81 employees who left the Company (39 women and 42 men) in the reporting period the fluctuation regarding active employees was approximately 16.95% (21.43% regarding women and 14.19% regarding men). This figure has increased compared to the previous year (12.63%).

The average age of the Company's employees is 42.1 years and has therefore changed only slightly compared to the previous year (41.8 years).

As at 31 December 2021 the share of graduates from universities or universities of applied sciences was 69.87% (33.53% women); the share of grammar school graduates was 19.25%.

As at the balance sheet date 6 apprentices, 2 female and 4 male, were undergoing training at JOANNEUM RESEARCH.

In the reporting period a total of 16 interns (7 women, 9 men) were employed, who completed their compulsory internships in connection with their studies at universities of applied sciences or universities or international exchange programmes. In addition, 22 students (7 female and 15 male) were granted an opportunity to write their diploma or doctoral theses in an employment relationship with JOANNEUM RESEARCH in cooperation with the relevant universities.

## II. Report on prospective developments and risks of the Company

*Economic policy framework conditions for research and development (R&D)*

From an economic policy perspective also in 2021 the covid-19 pandemic was the decisive factor preventing a significant and sustainable positive development of the world economy. Due to the repeated, sometimes massive waves of infection and the different countermeasures taken by the governments (lockdowns, travel restrictions, industry-specific restrictions, more rigorous checks) international trade in goods and services is still adversely affected to a considerable extent. This becomes particularly apparent in supply bottlenecks and shortage of materials in the steel, electronics and automotive industry as well as in the building industry. In total, world trade declined by 1.1% compared to the previous quarter and countries like China and Japan saw noticeable declines in economic activity (WIFO [Austrian Institute of Economic Research] Monthly Report 12/2021, p 859-866).

In the eurozone at least a modest recovery in terms of economic growth of 2.2% compared to the previous quarter's GDP was recorded. However, as early as in mid-2021 the recovery began to slow down, *inter alia* in Germany, which was due to the lack of upstream products in critical sectors, such as the automotive industry. The economic upturn clearly slowed down in the USA, where in autumn 2021 GDP was only 0.5% higher than three months earlier. In this context high energy prices and the markedly increasing inflation play a significant role.

Also in Austria entrepreneurs are still unsettled and the planning ability for the next few months is limited accordingly. Nevertheless, Austria experiences considerable economic growth at a national level and for the third quarter of 2021 GDP growth of 3.8% was calculated compared to the second quarter. Accordingly, for the first time economic performance was higher than before the start of the pandemic. However, since also in Austria commodity prices and inflation constantly are at a high level and thus constitute an increasing burden on private household income it has to be expected that the catch-up effects of private consumption will become weaker and weaker.

In 2021 because of uncertainties owed to the pandemic no global estimate of R&D expenditure in Austria was made for the second year in a row. The current estimate of the research share for 2020 is 3.23% (STATISTICS AUSTRIA of 8 July 2021 and 1 December 2021), with the increase being attributable to a relatively stronger decline in overall economic performance compared to R&D expenditure. Now gross domestic expenditure on R&D for 2020 is estimated at EUR 12.1 billion, 41.4% of which was made by business enterprises, 40.5% by the public sector and 16.5% by foreign investors (other: 1.6%).

*Shareholder contribution from the State of Styria*

The Government of the State of Styria provided JOANNEUM RESEARCH with a shareholder contribution of EUR 7,700,000.00 for 2021 as a contribution to recurring expenses.

For 2022 an amount of EUR 7,700,000.00 will be provided as a shareholder contribution to recurring expenses.

To cover pro-rata additional funds required due to covid-19 the State of Styria as the majority shareholder made an additional one-off shareholder contribution of EUR 200,000.00.

*Shareholder contribution from Kärntner Betriebsansiedlungs- und Beteiligungs-gesellschaft m.b.H. (BABEG)*

For the financial years 2021-2024 a new agreement was concluded, under which BABEG has agreed to grant an annual shareholder contribution of EUR 1,504,000.00 to further develop the location of Carinthia.

For 2021 BABEG made a shareholder contribution of EUR 1,504,000.00. In addition, for the period until 30 September 2022 BABEG will make another shareholder contribution in the amount of EUR 100,000.00 for building up and expanding scientific know-how in

the area of Next-Generation Robot Networks.

In addition, also taking into account its participating interest, BABEG granted a one-off shareholder contribution of EUR 35,000.00 to cover pro-rata additional funds required due to covid-19.

*Shareholder contribution from the State of Burgenland*

Under the Participation and Cooperation Agreement between the State of Styria, Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG) and Landesholding Burgenland GmbH (LHB) the State of Burgenland agreed to grant JOANNEUM RESEARCH a shareholder contribution of EUR 464,500.00 for the term of the investment.

In addition, also taking into account its participating interest, the State of Burgenland granted LHB a one-off shareholder contribution of EUR 12,500.00 to cover pro-rata additional funds required due to covid-19.

Landesholding Burgenland GmbH has announced that its share in JOANNEUM RESEARCH Forschungsgesellschaft mbH will be contributed to Wirtschaftsagentur Burgenland GmbH. The shareholders agreed to such contribution of the shares.

*Grant Agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)*

In financial 2021 BMK provided funding in a total amount of EUR 2,227,200.00 for near-basic research projects under the current Grant Agreement 2019-2021.

The continuing Grant Agreement 2022-2024 for fundamental research projects with a total funding of EUR 7.755 million was concluded with BMK.

The shareholder contributions of the State of Styria, Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG) and the State of Burgenland and the Grant Agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) are significant financing tools of JOANNEUM RESEARCH.

*Risks and prospective development*

The framework conditions for research enterprises are still characterised by tougher competition. Research enterprises are in general exposed to a project risk, which increasingly manifests itself due to the pandemic. Defaults of customers or project partners are increasingly noticeable.

The pandemic and the forecast economic upswing are also factors that further intensify competition for the greatest minds.

In 2021 JOANNEUM RESEARCH started a strategic process with the aim to align the Company's strategic focus with the changed framework conditions in the best possible way.

JOANNEUM RESEARCH expects a solid business development for the financial year 2022.

*IT security at JOANNEUM RESEARCH*

Money is the motive for most cybercrimes. From a global point of view cybercrime is one of the main branches of organised crime, generating revenues of EUR 1.6 trillion each year.

For 2021 a study on this subject showed that 60% of 417 surveyed entities had been victims of cyberattacks (previous year: 57%; comparison of the KPMG studies on "Cyber security in Austria" for 2021 and 2020).

Three fourths of the entities were exposed to attacks which spied out log-in data (phishing), more than one half of the entities believe that attacks on government players have increased. Cyberattacks have become commonplace and are a constant threat, which is why around three fourths of all enterprises invest in precautionary measures. The share of enterprises who have taken out cyber insurance has risen to 31% because in the case of an attack professional support becomes more and more important.

In terms of the psychological factor gullibility of the victims, lack of awareness of the need for security measures and the increasing prominence of digital equipment in everyday life are used as attack vectors. Increased teleworking leads to decentralisation, which offers additional points of attack.

Quantifying the damage caused to Austrian business enterprises is difficult; according to the study figures differ widely, with major losses easily amounting to millions of euros. Apart from that, JOANNEUM RESEARCH has learned from talks with cyber insurance companies in 2020 that with respect to service providers loss calculation is very difficult because it mainly concerns frustrated expenses (working time).

The Director General for Public Security especially mentioned espionage and sabotage attacks on government-related players, which was confirmed by 53% of the surveyed enterprises. Those attacks are highly professional, difficult to ward off and may cause

major damage by at the same time being hardly recognisable as they tap into important information unnoticed and without attracting attention. Only much later will competitors be noticed in the market who offer astonishingly similar products or services or are surprisingly awarded international contracts.

Since more people work from home due to the pandemic the Company has taken supplementary IT measures. Encrypted VPN connections, systems for video conferencing, online trainings and online webinars have optimally supplemented online systems that had existed before.

Eighty per cent (80%) of the surveyed enterprises stated that their own staff had identified the cyberattack, which confirms the importance of training staff and raising awareness among them.

As in the past, more than three fourths of the enterprises surveyed in 2021 demanded stronger support by the government. For many years JOANNEUM RESEARCH has cooperated with the Directorate for State Security and Intelligence (DSN) at the Ministry of the Interior, the former Federal Agency for State Protection and Counter Terrorism (BVT).

JOANNEUM RESEARCH is integrated in the information service for the protection of critical infrastructure (CIP). Thus, appropriate measures can be taken early and staff can be informed accordingly, where necessary.

CIP is part of the national implementation of the European Programme for Critical Infrastructure Protection (EPCIP) to improve Europe's resilience against a diverse spectrum of disturbances. Within the scope of the new cybersecurity strategy of the European Union other EU directives to improve resilience are being implemented, such as, e.g., the NIS2 directive and the RCE directive.

As a company that generates knowledge JOANNEUM RESEARCH faces worldwide competition in specific research areas. Accordingly, there is a strategic risk of trade secrets being spied out by competitors who possess significant resources, or by government-related agencies. In order to prevent that, the Company invests in creating strong awareness among its staff, in comprehensive authorisation concepts, a strict password policy, a private cloud, encryption, and much more.

In summary it can be said that JOANNEUM RESEARCH has further improved and enhanced its IT security measures. In implementing new technical standards and legislation, measures are regularly taken throughout the Company which enhance security, on the one hand, and require capital expenditure, on the other hand.

# III. Report on research and development

## III.1 Research units

### DIGITAL – Institute for Information and Communication Technologies

*Activities planned for financial 2022*

DIGITAL is one of the internationally leading applied research partners in the area of information and communication technologies (ICT). With its comprehensive competences in the areas of sensor technology, data analysis and their combination in professional applications DIGITAL is one of the most efficient national ICT research centres of international visibility and intends to expand this position in 2022. Intelligent sensor systems constitute an important technological basis of the institute. Linking of data volumes is the focus of communication technology. Not only data volumes but also algorithms are linked increasingly and more flexibly. The solutions provided range from concept studies via development projects up to prototypes or micro-series. For the software, which may be optimised for the hardware where necessary, state-of-the-art development paradigms are used.

### MATERIALS – Institute for Surface Technologies and Photonics

*Activities planned for financial 2022*

MATERIALS is one of the largest centres for nanotechnology, surface technologies and photonics in Austria. Also in 2022 the institute continues to be a trustworthy partner for its customers, providing concepts and implementing cooperative research and development projects up to technology transfer. Important goals and strategic focuses in financial 2022 will be to implement the services offered for the R2R pilot line for pilot line customers, further development of the core competences in the technological fields with a USP and ultraprecise laser micro-machining and manufacturing that is suitable for industrial manufacturing for technology and product development together with business partners. In 2022 a special highlight will be the processing of the ongoing Smart@Surface and CAMED (Clinical Additive Manufacturing for Medical Applications) COMET projects.

## ROBOTICS – Institute for Robotics and Mechatronics

*Activities planned for financial 2022*

In 2022 the research and business activities of ROBOTICS will address the challenges of digitalisation, including but not limited to automated production and value-added processes of regional and supraregional trade and industry. ROBOTICS' consistent further development of topics focuses on embedding robotics in the digitalisation projects of an industry 4.0 transformation. The facility in Klagenfurt with its core activities in the areas of ICT, sensor technology and AI at the Lakeside Science & Technology Park and at the University of Klagenfurt offers a qualified research, development and networking environment for this purpose. Apart from that, bilateral research, development and innovation projects with regional and supraregional business partners are carried out by way of direct contract research and constitute a planned focus of its business activities.

## COREMED - Cooperative Centre for Regenerative Medicine

*Activities planned for financial 2022*

COREMED is a very young research units, which is why its profile has not been fully developed yet. Also in 2022 COREMED's close cooperation with HEALTH and the Medical University of Graz will be at the core of its strategic focus. On the one hand, the research focus will continue to be on the development and validation of pre-clinical models (in vitro, ex vivo and in vivo) for wound healing and wound healing disorders (chronic wounds, hypertrophic scars). On the other hand, it is planned to validate and further develop new dressing materials and wound therapies by means of the established in-vitro skin models. In financial 2022, among others, clinic-related contract research projects will be implemented together with the Medical University of Graz. Established pre-clinical models and models being developed are intended to serve the purpose of soliciting contract research projects and research projects funded by third parties.

## HEALTH – Institute for Biomedicine and Health Sciences

*Activities planned for financial 2022*

HEALTH acts as the link between basic medical research and industrial application and offers interdisciplinary overall solutions in R&D services for the pharmaceutical and medtech industry. The institute, which is located at MedCampus Graz, can resort to a strong local, national and international network of academic and commercial facilities and players in the area of life science. In 2022 HEALTH will primarily work in the field of contract research for the pharmaceutical industry and also for the public sector in healthcare and will be able to provide support as a contract research organisation (CRO) by using its key technologies, such as OFM, bioanalytics, metabolomics, data management, biostatistics, etc. throughout the product lifecycle of drugs. Another area of specialisation is the development of and obtaining approval for topical generic drugs.

## LIFE – Institute for Climate, Energy and Society

*Activities planned for financial 2022*

JOANNEUM RESEARCH bundles most of its research work in the area of climate and energy at LIFE. The institute is a strong signal for the mission of dedicating its work not only to technological development but also to dealing intensively with the social dimensions of the same. In 2022 LIFE will continue to proactively research into topics of the future and intensively communicate its activities. The clear mission for 2022 is to continue to strengthen resilience against climate and weather risks and to design the transition to a climate-neutral economy/society by 2040. For the rest, the cooperation with business partners is mainly characterised by preferential business partners and preferential policy partners, jointly serving calls and programmes of funded research.

**POLICIES – Institute for Economic and Innovation Research**

*Activities planned for financial 2022*

The mission of POLICIES is to provide information and analyses for evidence-based policies and business decisions. In 2022 major focus areas will be research into the effects of evidence-based reaction to the covid and climate crisis. Another goal is to support and advise political parties and businesses in regional and national strategic processes. In addition, POLICIES offers services in the field of user-oriented and responsible technological development and innovation (responsible research and innovation, gender-sensitive research and innovation). Modelling and assessing policy measures by means of the regional input-output model or in simulation and statistical modelling of production processes, as well as providing and using large amounts of information and large information systems round off the portfolio of activities.

Graz, 9 March 2022

**The Management:**

**Dr Heinz Mayer**

# Auditor's Report

## Report on the Financial Statements

## Audit Opinion

We have audited the financial statements of

**JOANNEUM RESEARCH Forschungsgesellschaft mbH,**

**Graz.**

These financial statements comprise the statement of financial position as of December 31, 2021, with an equity of EUR 10,790,831.59, the income statement for the fiscal year then ended and the notes.

Based on our audit the accompanying financial statements were prepared in accordance with the legal regulations and present fairly, in all material respects, the assets and the financial position of the Company as of December 31, 2021 and its financial performance for the year then ended in accordance with Austrian Generally Accepted Accounting Principles.

### Basis for Opinion

We conducted our audit in accordance with Austrian Standards on Auditing. Those standards require that we comply with International Standards on Auditing (ISA). Our responsibilities under those regulations and standards are further described in the "Auditor's Responsibilities for the Audit of the Financial Statements" section of our report. We are independent of the Company in accordance with the Austrian General Accepted Accounting Principles and professional requirements and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained until the date of this auditor's report is sufficient and appropriate to provide a basis for our opinion by this date.

### Responsibilities of Management and of the Audit Committee for the Financial Statements

Management is responsible for the preparation of the financial statements in accordance with Austrian Generally Accepted Accounting Principles, for them to present a true and fair view of the assets, the financial position and the financial performance of the Company and for such internal controls as management determines are necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the financial statements, management is responsible for assessing the Company's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Company or to cease operations, or has no realistic alternative but to do so.

The Audit Committee is responsible for overseeing the Company's financial reporting process.

**Auditor's Responsibilities for the Audit of the Financial Statements**

Our objectives are to obtain reasonable assurance about whether the financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with International Standards on Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these financial statements.

As part of an audit in accordance with Austrian Standards on Auditing, which require the application of ISA, we exercise professional judgment and maintain professional scepticism throughout the audit.

We also:

- identify and assess the risks of material misstatement of the financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Company's internal control.
- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.

- conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Company's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Company to cease to continue as a going concern.
- evaluate the overall presentation, structure and content of the financial statements, including the disclosures, and whether the financial statements represent the underlying transactions and events in a manner that achieves fair presentation.

We communicate with the Audit Committee regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

**Comments on the Management Report for the Company**

Pursuant to Austrian Generally Accepted Accounting Principles, the management report is to be audited as to whether it is consistent with the financial statements and as to whether the management report was prepared in accordance with the applicable legal regulations.

Management is responsible for the preparation of the management report in accordance with Austrian Generally Accepted Accounting Principles.

We conducted our audit in accordance with Austrian Standards on Auditing for the audit of the management report.

### *Opinion*

In our opinion, the management report for the Company was prepared in accordance with the valid legal requirements and is consistent with the financial statements.

### *Statement*

Based on the findings during the audit of the financial statements and due to the thus obtained understanding concerning the Company and its circumstances no material misstatements in the management report came to our attention.

Vienna, March 9, 2022

Crowe SOT Wirtschaftsprüfung GmbH

Dr. Anton Schmidl Mag. Andreas Maier

Wirtschaftsprüfer (auditors)

This report is a translation of the original report in German, which is solely valid.
Publication or sharing with third parties of the financial statements together with our auditor's opinion is only allowed if the financial statements and the management report are identical with the German audited version. This audit opinion is only applicable to the German and complete financial statements with the management report. Section 281 paragraph 2 UGB (Austrian Company Code) applies to alternated versions.

# CONSOLIDATED FINANCIAL STATEMENT

# CONSOLIDATED BALANCE SHEET
as at 31 December 2021

## Assets

| | | | 31 Dec 2021<br>EUR | 31 Dec 2020<br>EUR |
|---|---|---|---|---|
| **A.** | **Non-current assets** | | | |
| | I. Intangible assets | | | |
| | 1. Rights and licences | | 395,068.01 | 337,014.02 |
| | II. Property, plant and equipment | | | |
| | 1. Land and buildings | | 11,764,501.66 | 10,105,595.34 |
| | 2. Technical plant and machinery | | 4,810,337.43 | 5,285,605.20 |
| | 3. Other plant, furniture and fixtures | | 629,021.70 | 774,278.44 |
| | 4. Advances made and construction in progress | | 542,885.66 | 1,989,659.23 |
| | | | 17,746,746.45 | 18,155,138.21 |
| | III. Financial assets | | | |
| | 1. Shares in affiliates | | 0.00 | 0.00 |
| | 2. Participating interests | | 270,788.25 | 341,688.25 |
| | 3. Investment securities (book-entry securities) | | 2,390,149.64 | 1,724,750.00 |
| | | | 2,660,937.89 | 2,066,438.25 |
| | | | **20,802,752.35** | **20,558,590.48** |
| **B.** | **Current assets** | | | |
| | I. Inventories | | | |
| | 1. Raw materials and supplies | | 3,412.90 | 3,638.10 |
| | 2. Finished products and goods | | 23,851.35 | 36,000.00 |
| | 3. Services not yet chargeable | | 11,196,752.51 | 9,297,293.33 |
| | less advances received | | -7,798,386.90 | -6,643,100.60 |
| | 4. Advances made | | 32,189.46 | 1,891.22 |
| | | | 3,457,819.32 | 2,695,722.05 |
| | II. Receivables and other assets | | | |
| | 1. Trade receivables | | 1,358,955.12 | 1,891,666.81 |
| | *(thereof due within 1 year* | *1,358,955.12* | | *1,891,666.81)* |
| | 2. Receivables from undertakings with which the company is linked by virtue of participating interests | | 68,544.70 | 42,923.59 |
| | *(thereof due within 1 year* | *68,544.70* | | *42,923.59)* |
| | 3. Receivables from proprietor | | 0.00 | 110,000.00 |
| | *(thereof due within 1 year* | *0.00* | | *110,000.00)* |
| | 4. Receivables from subsidies and project grants | | 5,133,817.79 | 4,435,394.65 |
| | *(thereof due within 1 year* | *5,133,817.79* | | *4,435,394.65)* |

# CONSOLIDATED BALANCE SHEET
as at 31 December 2021

## Assets

| | | 31 Dec 2021<br>EUR | 31 Dec 2020<br>EUR |
|---|---|---|---|
| 5. Other receivables and assets | | 11,935,271.94 | 13,430,872.75 |
| *(thereof due within 1 year* | *11,932,871.94* | | *13,428,472.75)* |
| *(thereof due after more than 1 year* | *2,400.00* | | *2,400.00)* |
| | | 18,496,589.55 | 19,910,857.80 |
| *(thereof due within 1 year* | *18,494,189.55* | | *19,908,457.80)* |
| *(thereof due after more than 1 year* | *2,400.00* | | *2,400.00)* |
| III. Securities and shares | | | |
| 1. Other securities and shares | | 853,997.86 | 1,624,100.00 |
| IV. Cash and balances at banks | | 12,177,608.56 | 13,691,897.90 |
| | | **34,986,015.29** | **37,922,577.75** |
| **C. Prepayments and accrued income** | | **3,150,088.70** | **3,291,115.50** |
| **D. Escrow funds** | | **3,055,956.60** | **5,845,290.34** |
| **Total assets** | | **61,994,812.94** | **67,617,574.07** |

## Liabilities and shareholders' equity

| | | 31 Dec 2021<br>EUR | 31 Dec 2020<br>EUR |
|---|---|---|---|
| **A. Equity** | | | |
| I. Share capital called in and paid up | | 3,600,000.00 | 3,600,000.00 |
| II. Capital reserves | | | |
| 1. Appropriated | | 4,135,961.85 | 4,396,531.71 |
| 2. Unappropriated | | 362,637.44 | 362,637.44 |
| | | 4,498,599.29 | 4,759,169.15 |
| III. Retained earnings | | | |
| 1. Statutory reserves | | 360,000.00 | 159,571.25 |
| 2. Other reserves (free reserves) | | 875,030.22 | 922,750.22 |
| | | 1,235,030.22 | 1,082,321.47 |
| IV. Net profit for the year | | 2,665,391.36 | 1,384,364.59 |
| *(thereof profit carried forward* | *1,384,364.59* | | *1,226,642.15)* |
| | | **11,999,020.87** | **10,825,855.21** |
| **B. Investment grants** | | **1,698,672.80** | **1,792,330.57** |
| **C. Provisions** | | | |
| 1. Provisions for severance pay | | 5,774,300.00 | 5,561,900.00 |
| 2. Provisions for pensions | | 5,711,790.00 | 5,610,020.00 |
| 3. Tax provisions | | 7,019,750.00 | 6,649,774.00 |
| 4. Other provisions | | 10,369,300.00 | 10,132,100.00 |
| | | **28,875,140.00** | **27,953,794.00** |
| **D. Liabilities** | | | |
| 1. Bank borrowings | | 1,484,625.30 | 1,580,333.71 |
| *(thereof due within 1 year* | *712,193.77* | | *712,193.77)* |
| *(thereof due after more than 1 year* | *772,431.53* | | *868,139.94)* |
| 2. Advances received on orders | | 2,375,100.72 | 2,516,198.14 |
| *(thereof due within 1 year* | *360,778.11* | | *1,534,893.95)* |
| *(thereof due after more than 1 year* | *2,014,322.61* | | *981,304.19)* |
| 3. Trade payables | | 1,930,898.73 | 2,286,581.67 |
| *(thereof due within 1 year* | *1,032,739.69* | | *1,419,488.31)* |
| *(thereof due after more than 1 year* | *898,159.04* | | *867,093.36)* |
| 4. Payables to undertakings with which the company is linked by virtue of participating interests | | 42,000.00 | 0.00 |
| *(thereof due within 1 year* | *42,000.00* | | *0.00)* |
| 5. Other liabilities | | 10,364,096.07 | 14,624,834.14 |
| *(thereof due within 1 year* | *1,481,365.63* | | *4,342,837.29)* |
| *(thereof due after more than 1 year* | *8,882,730.44* | | *10,281,996.85)* |
| *(thereof for taxes* | *416,704.30* | | *555,084.27)* |
| *(thereof for social security* | *746,691.14* | | *1,050,996.82)* |
| | | **16,196,720.82** | **21,007,947.66** |
| *(thereof due within 1 year* | *3,629,077.20* | | *8,009,413.32)* |
| *(thereof due after more than 1 year* | *12,567,643.62* | | *12,998,534.34)* |
| **E. Accruals and deferred income** | | **169,301.85** | **192,356.29** |
| **F. Escrow liabilities** | | **3,055,956.60** | **5,845,290.34** |
| **Total liabilities** | | **61,994,812.94** | **67,617,574.07** |

# CONSOLIDATED INCOME STATEMENT

1 January 2021 to 31 December 2021

| | | 2021<br>EUR | 2020<br>EUR |
|---|---|---|---|
| **1. Revenue** | | **16,431,760.31** | **15,783,423.56** |
| **2. Changes in the amount of services not yet chargeable** | | **1,899,459.27** | **792,773.40** |
| **3. Project-related other income** | | **17,735,679.09** | **16,504,165.80** |
| **4. Shareholder contribution** | | **10,051,000.00** | **9,816,017.71** |
| **5. Other own work capitalised** | | **52,360.00** | **23,367.64** |
| **6. Other operating income** | | | |
| (a) Income from disposal of non-current assets except for financial assets | | 2,840.01 | 19,959.62 |
| (b) Income from reversal of provisions | | 590,209.80 | 660,690.06 |
| (c) Income from reversal of investment grants | | 396,873.13 | 315,882.57 |
| (d) Other | | 3,397,695.92 | 3,480,112.81 |
| | | **4,387,618.86** | **4,476,645.06** |
| **7. Cost of materials and other services purchased** | | | |
| (a) Cost of materials | | 2,323,393.33 | 1,669,171.98 |
| (b) Costs of services purchased | | 1,664,481.99 | 1,597,700.50 |
| | | **3,987,875.32** | **3,266,872.48** |
| **8. Cost of staff** | | | |
| (a) Wages | | 4,615.64 | 9,535.78 |
| (b) Salaries | | 26,064,945.42 | 24,156,577.63 |
| *(thereof COVID-19 short-time work allowance* | *0.00* | | *-421,873.48)* |
| (c) Social benefits | | | |
| (aa) Expenses for old-age provision | | 450,761.14 | 528,697.31 |
| (bb) Expenses for severance pay and contributions to Severance Pay and Pension Funds | | 684,901.66 | 903,948.27 |
| (cc) Expenses for statutory social security contributions and payroll-related taxes and compulsory contributions | | 7,029,879.10 | 6,715,388.11 |
| (dd) Other social benefits | | 144,279.08 | 145,698.50 |
| | | **34,379,382.04** | **32,459,845.60** |
| **9. Amortisation of intangible non-current assets and depreciation of property, plant and equipment** | | **3,581,839.33** | **3,469,750.93** |
| **10. Other operating expenses** | | | |
| (a) Taxes, other than taxes stated in line 19 | | 11,204.36 | 10,467.47 |
| (b) Other | | 7,165,970.71 | 8,210,404.67 |
| | | **7,177,175.07** | **8,220,872.14** |
| **11. Subtotal lines 1 to 10 (Operating result)** | | **1,431,605.77** | **-20,947.98** |

# CONSOLIDATED INCOME STATEMENT

1 January 2021 to 31 December 2021

| | 2021<br>EUR | 2020<br>EUR |
|---|---|---|
| **12. Income from investments** | **3,602.10** | **0.00** |
| **13. Income from other securities** | **14,055.00** | **23,450.00** |
| **14. Other interest and similar income** | **8,742.35** | **18,968.19** |
| **15. Expenses for financial assets and securities held as current assets** | | |
| (a) Write-downs | 158,885.00 | 7,900.00 |
| (b) Other | 46,224.69 | 19,953.87 |
| | **205,109.69** | **27,853.87** |
| **16. Interest and similar expenses** | **36,073.87** | **47,938.38** |
| **17. Subtotal lines 12 to 16 (Financial result)** | **-214,784.11** | **-33,374.06** |
| **18. Profit or loss before tax (Subtotal lines 11 and 17)** | **1,216,821.66** | **-54,322.04** |
| **19. Income taxes** | **8,656.00** | **37,789.00** |
| **20. Profit or loss for the year = profit or loss after tax** | **1,208,165.66** | **-92,111.04** |
| **21. Reversal of capital reserves** | | |
| (a) Appropriated | **260,569.86** | **237,113.48** |
| **22. Reversal of retained earnings** | | |
| (a) Other reserves (free reserves) | **12,720.00** | **12,720.00** |
| **23. Allocation to retained earnings** | | |
| (a) Statutory retained earnings | **-200,428.75** | **0.00** |
| **24. Profit carried forward from previous year** | **1,384,364.59** | **1,226,642.15** |
| **25. Net profit for the year** | **2,665,391.36** | **1,384,364.59** |

JOANNEUM RESEARCH
Forschungsgesellschaft mbH

**CONSOLIDATED CASH FLOW STATEMENT**
from 1 January 2021 to 31 December 2021

| | | | 2021<br>EUR | 2020<br>EUR |
|---|---|---|---|---|
| 1 | | Profit or loss before tax | 1,216,821.66 | -54,322.04 |
| 2 | +/- | Depreciation, amortisation, write-downs/write-ups of investment assets | 3,719,039.62 | 3,469,750.93 |
| 3 | -/+ | Gain/loss on disposal of investment assets | 8,096.09 | 221,925.38 |
| 4 | -/+ | Investment income, income from other securities and loans held as financial assets and other interest and similar income/interest and similar expenses | 66,676.93 | 33,374.06 |
| 5 | +/- | Other non-cash expenses/income, unless concerning items 7 to 9 | -427,660.18 | -303,400.28 |
| 6 | | Cash flow from profit or loss | 4,582,974.12 | 3,367,328.05 |
| 7 | -/+ | Increase/decrease in inventories, trade receivables and other assets | 1,563,299.92 | 6,724,935.51 |
| 8 | +/- | Increase/decrease in provisions | 921,346.00 | 474,974.00 |
| 9 | +/- | Increase/decrease in trade payables and other liabilities | -4,738,572.87 | 4,818,208.15 |
| 10 | | Net cash flow from profit or loss before tax | 2,329,047.17 | 15,385,445.71 |
| 11 | - | Income taxes paid | -8,656.00 | -37,789.00 |
| **12** | | **Net cash flow from operating activities** | **2,320,391.17** | **15,347,656.71** |
| 13 | + | Cash inflow from disposal of non-current assets (excluding financial assets) | 340.01 | 19,959.62 |
| 14 | + | Cash inflow from disposal of financial assets and other financial investments | 1,350,000.00 | 0.00 |
| 15 | - | Cash used for additions to non-current assets (excluding financial assets) | -3,233,855.09 | -4,314,103.49 |
| 16 | - | Cash used for additions to financial assets and other financial investments | -2,087,782.50 | -368,000.00 |
| 17 | + | Cash inflow from investment grants | 299,002.41 | 428,449.74 |
| 18 | + | Interest received and similar income | 22,797.35 | 42,418.19 |
| **19** | | **Net cash flow from investing activities** | **-3,649,497.82** | **-4,191,275.94** |
| 20 | + | Cash inflow from profit distributions | 3,602.10 | 0.00 |
| | - | Cash used for profit distributions | 0.00 | 0.00 |
| 21 | + | Cash inflow from taking out finance loans | 0.00 | 0.00 |
| 22 | - | Cash used to redeem bonds and finance loans | -95,708,41 | -2,094,311.40 |
| 23 | - | Interest paid and similar expenses | -93,076.38 | -75,792.25 |
| **24** | | **Net cash flow from financing activities** | **-185,182.69** | **-2,170,103.65** |
| **25** | | **Cash change in cash and cash equivalents** (lines 12+17+24) | **-1,514,289.34** | **8,986,277.12** |
| 26 | +/- | Cash and cash equivalents | **0.00** | **0.00** |
| 27 | + | Cash and cash equivalents, beginning of period | 13,691,897.90 | 4,705,620.78 |
| **28** | | **Cash and cash equivalents, end of period** | **12,177,608.56** | **13,691,897.90** |

## JOANNEUM RESEARCH Forschungsgesellschaft mbH

### Consolidated statement of changes in equity

| | Share capital | Capital reserves | Retained earnings | Net profit for the year | **Total group share** |
|---|---|---|---|---|---|
| **As at 1 January 2020** | **3,600,000.00** | **4,996,282.63** | **1,082,559.18** | **1,226,642.15** | **10,905,483.96** |
| Profit or loss for the year | | | | -92,111.04 | **-92,111.04** |
| Changes in reserves | | -237,113.48 | -12,720.00 | 249,833.48 | **0.00** |
| Change in reserves through the income statement item 'Shareholder contribution' | | | 12,482.29 | | **12,482.29** |
| Distributions | | | | | **0.00** |
| Acquisition of subsidiaries | | | | | **0.00** |
| **As at 31 December 2020** | **3,600,000.00** | **4,759,169.15** | **1,082,321.47** | **1,384,364.59** | **10,825,855.21** |

### Consolidated statement of changes in equity

| | Share capital | Capital reserves | Retained earnings | Net profit for the year | **Total group share** |
|---|---|---|---|---|---|
| **As at 1 January 2021** | **3,600,000.00** | **4,759,169.15** | **1,082,321.47** | **1,384,364.59** | **10,825,855.21** |
| Profit or loss for the year | | | | 1,208,165.66 | **1,208,165.66** |
| Changes in reserves | | -260,569.86 | 187,708.75 | 72,861.11 | **0.00** |
| Change in reserves through the income statement item 'Shareholder contribution' | | | -35,000.00 | | **-35,000.00** |
| Acquisition of subsidiaries | | | | | **0.00** |
| **As at 31 December 2021** | **3,600,000.00** | **4,498,599.20** | **1,235,030.22** | **2,665,391.36** | **11,999,020.87** |

# Notes to the consolidated financial statements for the financial year 2021
# of
# JOANNEUM RESEARCH Forschungsgesellschaft mbH, Graz

## ACCOUNTING AND VALUATION POLICIES

Consolidated financial statements in accordance with Section 244 *et seq.* of the Austrian Business Code [*Unternehmensgesetzbuch/UGB*] were prepared for the first time for the financial year 2019. They are comprised of JOANNEUM RESEARCH Forschungsgesellschaft mbH, Leonhardstrasse 59, 8010 Graz, and JR-AquaConSol GmbH, Steyrergasse 21, 8010 Graz. The total share capital of JR-AquaConSol GmbH in the amount of EUR 150,000.00 is held by JOANNEUM RESEARCH Forschungsgesellschaft mbH. It is fully consolidated in the consolidated financial statements.

### General principles

The consolidated company's balance sheet date is 31 December 2021 and the company applies the Group's standard accounting and valuation policies.

The consolidated annual financial statements were prepared in compliance with the provisions of the Austrian Business Code as amended, in accordance with generally accepted accounting principles and the general principle of presenting a true and fair view of the company's financial position and financial performance.

When preparing the consolidated financial statements the principle of completeness was complied with.

Assets and liabilities were measured on a going concern basis according to the principle of item-by-item valuation.

The principle of prudent valuation was taken account of by recognising only the profits realised as at the balance sheet date. All recognisable risks and anticipated losses were taken into consideration.

#### Consolidation measures

The capital was consolidated at the time of foundation of the subsidiary on 9 June 2016. No differences have resulted from initial consolidation of JR-AquaConSol GmbH in financial 2016. In the course of debt consolidation receivables from and payables to the fully consolidated entity were eliminated. Intra-group expenses and income of the entities included in the consolidated financial statements were segregated. In

the case of intra-group deliveries and services the interim results are eliminated, where necessary. In financial 2021 there were no material interim results.

## Non-current assets

### Intangible assets

Intangible assets are recognised at cost plus incidental acquisition costs less cash discounts deducted and after amortisation on a straight-line basis. The useful life applied is three to five years (20%-33%).

### Property, plant and equipment

Property, plant and equipment is recognised at cost plus incidental acquisition costs less cash discounts deducted and after depreciation.

Public subsidies for non-current assets are presented on the liabilities side as investment grants from public funds. Those investment grants are used for non-current assets analogously to the depreciation of non-current assets.

Amortisation and depreciation is calculated on a straight-line basis according to the following useful lives and rates:

| | Useful life in years | Depreciation rate in % |
|---|---|---|
| Buildings, including buildings on land owned by others | 10 - 40 | 2.5 - 10 |
| Machinery, scientific equipment and electronic data processing systems | 3 - 10 | 10 - 33 |
| Other plant, furniture and fixtures | 4 - 10 | 10 - 25 |

Full annual depreciation is applied to additions made in the first half of the financial year, and half the yearly rate is applied to additions made during the second half of the year.

Low-value assets as defined in Section 13 of the Austrian Personal Income Tax Act [*Einkommensteuergesetz/EStG*] 1988, i.e. the cost of acquisition of which is less than or equal to EUR 800 per asset, are fully written off in the year of acquisition and presented as additions and disposals in the non-current assets movement schedule.

### Financial assets

**Investment securities** are recognised at the lower of cost or fair value at the balance sheet date.

In the reporting year a write-down of financial assets was made.

## Current assets

### Inventories

**Consumables** were measured at the lower of cost or market.

**Services not yet chargeable** in connection with contract research are calculated on the basis of cost accounting. Project costs are recognised on the basis of an itemisation by cost centre and direct cost statements. Item-by-item valuation at cost of production or acquisition as defined in Section 206 *UGB* is applied. Apart from the costs attributable according to the costs-by-cause principle, production costs also include pro rata production overheads that can be capitalised and portions of social expenses as defined in the second to last sentence of Section 206(3) *UGB*. Interest expenses and the research risk are not accounted for.

Due to the Company's project structure administrative overheads must be capitalised for projects with a term of more than twelve months. In order to give a true and fair view of the Company's financial position and financial performance, the option right (cf. Section 206(3) *UGB*) was exercised.

If losses are anticipated in connection with orders or if additional costs are expected to be incurred for services that have been invoiced already, semi-finished products are discounted or provisions are set up. For contingent warranty obligations in connection with contract research provisions are recognised in the balance sheet as well.

### Receivables and other assets

**Receivables and other assets** are measured at nominal value unless the lower fair value is recognised in the case of specific recognisable risks. Provisions for general credit risks are made in the form of general allowances at a rate of 2% (previous year: 2%) of total net receivables.

## Provisions

**Provisions for severance pay** are calculated according to principles of financial mathematics on the basis of the 10-year average interest rate with a term of fifteen years. Calculation of the provision for severance pay was based on an interest rate of 1.87% (previous year: 2.30%) as at 31 December 2021, a salary trend of 2.78% (previous year: 2.70%) and a retirement age of 65 years on a going-concern basis.

No fluctuation discount was recognised.

The **pension provision** is calculated in the amount of the actuarial cover requirement on the basis of the provisions of Section 198 and Section 211 *UGB* as amended by the *RÄG* 2014 in compliance with the AFRAC Opinion on "Provisions for pension, severance pay, long-service bonus and comparable long-term obligations under *UGB* provisions" of June 2016. The calculation was based on the Pagler & Pagler reference tables. The calculatory interest rate used was the 10-year average interest rate of 1.62% (previous year: 1.84%) with an average remaining term of ten years.

**Other provisions** take into account all recognisable risks and liabilities the amount of which is contingent and are recognised at the amounts which, according to best estimate, must be used to fulfil the obligation. No provisions other than those provided for by law are set up.

Changes in provisions concerning a reversal of provisions are recognised in item 6(b) and allocations to provisions are stated in item 8(c) if they are attributable to staff costs; all others are recognised as other operating expenses in item 10(b) of the income statement.

## Liabilities

Liabilities are recognised at the settlement value in compliance with the principle of prudence.

## Currency translation

Receivables and payables are measured at the mean rate of exchange at the date of the transaction and according to the lower of cost or market principle or higher of cost or market principle at the balance sheet date, respectively.

# NOTES TO THE BALANCE SHEET

# A S S E T S

## NON-CURRENT ASSETS

As to the development of the different non-current assets and the breakdown of annual amortisation and depreciation reference is made to the non-current assets movement schedule (Annex to the Notes). As at the balance sheet date non-current assets amounted to EUR 20,802,752.35 (previous year: kEUR 20,558.6) in total. In the financial year 2021 capital expenditure amounted to a total of EUR 5.321.637,59 (previous year: kEUR 4,682.4) and amortisation and depreciation amounted to EUR 3,719,039.62 (previous year: kEUR 3,470.0). In the financial year 2021 disposals at historical cost amounted to EUR 2,051,690.70 (previous year: kEUR 449.1).

**Intangible assets** include software and data transmission rights of a carrying amount of EUR 395,068.01 (previous year: kEUR 337.0). Additions in the amount of EUR 314,256.99 (previous year: kEUR 204.3) are attributable to the acquisition of licences and various software.

As at the balance sheet date **property, plant and equipment** amounted to EUR 17,746,746.45 (previous year: kEUR 18,155.1). The land value was EUR 2,877,794.02 (previous year: kEUR 2,877.8). The building value of land with buildings and buildings on land owned by others of EUR 8,886,707.64 (previous year: kEUR 7,227.8) is made up of the net building value of EUR 3,751,902.00 (previous year: kEUR 3,255.2) and structural improvements worth EUR 3,065,585.00 (previous year: kEUR 1,736.8), i.e. EUR 6,817,487.00 (previous year: kEUR 4,992.0) are attributable to buildings on land owned by the Company and an amount of EUR 2,069,220.64 (previous year: kEUR 2,235.8) is attributable to capital expenditure on buildings owned by others. Additions in a total amount of EUR 2,919,598.10 (previous year: kEUR 4,110.1) mainly concern the provision of modern scientific equipment for the Company's research activities and further expansion of the IT infrastructure. Disposals at historical cost in the amount of EUR 666,988.14 (previous year: kEUR 235.1) mainly concern disposals or, to a small extent, sale of scientific equipment, electronic data processing systems and various office equipment. No impairment losses were recognised.

According to the statement of investments the following **participating interests** are held:

**Statement of Investments as at 31 December 2021**

| | Interest | | Equity | Net profit | Balance sheet |
|---|---|---|---|---|---|
| | EUR | % | EUR | or loss in EUR | date |
| ACIB GmbH | 16,000.00 | 8.00% | 4,818,978.80 | 550,396.36 | 31 Dec 2020 |
| ALP.Lab GmbH | 5,600.00 | 16.00% | 60,959.32 | 25,959.32 | 31 Dec 2020 |
| BEST - Bioenergy and Sustainable Technologies GmbH | 20,000.00 | 10.00% | 1,127,770.04 | 892,416.11 | 31 Mar 2021 |
| CBmed GmbH | 25,000.00 | 12.50% | 2,195,156.84 | 1,995,156.84 | 31 Dec 2020 |
| decide Clinical Software GmbH | 42,500.00 | 10.00% | 90,993.63 | -334,006.37 | 31 Dec 2020 |
| DIH SÜD GmbH | 9,100.00 | 26.00% | n.a. | n.a. | founded in 2021 |
| EPIG GmbH | 8,750.00 | 25.00% | 288,170.07 | 253,170.07 | 31 Dec 2020 |
| FH JOANNEUM Gesellschaft mbH | 10,828.25 | 14.90% | 4,000,000.00 | 0.00 | 30 Jun 2021 |
| Geo5 GmbH | 8,000.00 | 10.00% | 104,098.98 | 24,098.98 | 31 Dec 2020 |
| Holz.Bau Forschungs GmbH | 3,500.00 | 5.98% | 410,615.01 | 352,115.01 | 31 Dec 2020 |
| Human.technology Styria GmbH | 2,450.00 | 7.00% | 200,343.29 | -320.54 | 31 Dec 2020 |
| Know-Center GmbH Research Center for Data-Driven Business & Big Data Analytics | 14,540.00 | 10.00% | 2,000,319.92 | 0.00 | 31 Dec 2020 |
| Materials Center Leoben Forschung GmbH | 51,100.00 | 17.50% | 7,007,250.32 | 443,883.32 | 31 Dec 2020 |
| Pacemaker Technologies GmbH | 1,050.00 | 3.00% | 212.36 | -34,787.64 | 31 Dec 2020 |
| Polymer Competence Center Leoben GmbH | 34,000.00 | 17.00% | 6,059,389.17 | 1,601,935.77 | 31 Dec 2020 |
| Rebeat Innovation GmbH | 80,000.00 | 1.70% | -617,214.01 | -1,757,592.62 | 31 Dec 2020 |
| Research Center Pharmaceutical Engineering GmbH | 15,000.00 | 15.00% | 5,347,820.77 | 812,920.77 | 30 Jun 2021 |
| Virtual Vehicle Research GmbH | 10,640.00 | 8.40% | 6,647,983.82 | 1,078,779.49 | 31 Dec 2020 |

As at the balance sheet date a write-down of that item of EUR 80,000.00 (previous year: kEUR 0.0) was made.

As at the balance sheet date the carrying amount of **investment securities** was EUR 2,390,149.64 (previous year: kEUR 1,724.8).

In the reporting year a write-down of financial assets of EUR 56,532.86 (previous year: kEUR 0.0) was made.

Amortisation and depreciation of the remaining non-current assets completely result from ordinary amortisation and depreciation.

## CURRENT ASSETS

### Inventories

The item **raw materials and supplies** in the amount of EUR 3,412.90 (previous year: kEUR 3.6) is made up of consumables (mainly toners, computer network cards, laser printer spare parts and various small items of equipment).

The item **services not yet chargeable** in connection with contract research includes work in progress and services not yet chargeable in the amount of EUR 3,457,819.32 (previous year: kEUR 2,695.7), under which administrative overheads of EUR 2,002,681.18 (previous year: kEUR 1,716.4) were capitalised for contracts the execution of which lasts more than twelve months. The Company's project structure requires such capitalisation of administrative overheads to present a true and fair as well as a continuous view of the Company.

In the reporting year advances received were stated separately for the first time due to the constantly increasing project volumes and the advances received for research projects in the amount of EUR 7,798,386.90 (previous year: kEUR 6,646.1) included therein. The excess amount of EUR 2,375,100.72 (previous year: kEUR 2,516.2) was recognised on the liabilities side. The figure for the reference period 2020 was restated.

**Advances made** on inventories amounted to EUR 32,189.46 (previous year: kEUR 1.9).

## Receivables and other assets

| | Receivables as at 31 Dec 2021 (31 Dec 2020) | thereof due after more than 1 year | thereof evidenced by bills of exchange | Capitalised accruals Section 225(3) *UGB* | General allowance |
|---|---|---|---|---|---|
| | EUR | EUR | EUR | EUR | EUR |
| Trade receivables | 1,358,955.12 | 0.00 | 0.00 | 0.00 | 21,400.00 |
| | (1,891,668.819 | (0.00) | (0.00) | (0.00) | (32,700.00) |
| Receivables from undertakings with which the Company is linked by virtue of participating interests | 68,544.70 | 0.00 | 0.00 | 0.00 | 0.00 |
| or book-entry securities | (42,923.59) | (0.00) | (0.00) | (0.00) | (0.00) |
| Receivables from the owners | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| | (110,000.00) | (0.00) | (0.00) | (110,000.00) | (0.00) |
| Receivables from subsidies | 5,133,817.79 | 0.00 | 0.00 | 5,133,817.79 | 0.00 |
| and project grants | (4,435,394.65) | (0.00) | (0.00) | (4,435,394.65) | (0.00) |
| Receivables from the liability commitment | 5,600,000.00 | 0.00 | 0.00 | 5,600,000.00 | 0.00 |
| of the State of Styria | (5,600,000.00) | (0.00) | (0.00) | (5,600,000.00) | (0.00) |
| Other receivables and assets | 6,335,271.94 | 2,400.00 | 0.00 | 6,254,222.58 | 0.00 |
| | (7,830,872.75) | (2,400.00) | (0.00) | (7,631,706.24) | (0.00) |
| | 18,496,589.55 | 2,400.00 | 0.00 | 16,988,040.37 | 21,400.00 |
| TOTAL | (19,910,859.80) | (2,400.00) | (0.00) | (17,777,100.89) | (32,700.00) |

Itemised allowances in the amount of EUR 1,014,716.96 (previous year: kEUR 1,045.7) were made for doubtful **trade receivables** and deducted from the assets.

**Receivables from subsidies and project grants** concern grant approvals from various funding agencies. Due to the fact that processing, including receipt of payment, takes more than three months, a discount in the amount of EUR 8,100.00 (previous year: kEUR 9.7) was made. The calculatory interest rate was 0.4% (previous year: 0.47%).

**Other receivables and assets** mainly include claims vis-à-vis the Tax Office for Large Enterprises, various interest accrued, as well as refunds and aids. This item also includes a liability commitment of the State of Styria in the amount of EUR 5,600,000.00 (previous year: kEUR 5,600.0) to cover the loss from the tax audit by the Tax Office of Graz-Stadt, and claims vis-à-vis the Tax Office of Graz-Stadt from research allowances in the amount of EUR 5,962,572.46 (previous year: kEUR 6,068.6).

### Securities held as current assets

**Securities held as current assets** in the amount of EUR 853,997.86 (previous year: kEUR 1,624.1) concern bonds with a base term until the end of October 2026, which may, however, be sold at short notice.

### Cash and balances at banks

This item in the amount of EUR 12,177,608.56 (previous year: kEUR 13,691.9) is made up of **cash** in the amount of EUR 7,712.67 (previous year: kEUR 9.9) and **bank balances** of EUR 12,169,895.89 (previous year: kEUR 13,682.0).

## PREPAYMENTS AND ACCRUED INCOME

**Prepayments and accrued income** in the amount of EUR 3,150,088.70 (previous year: kEUR 3,291.1) include payments made in the financial year 2021 which have to be charged as expenses in the following year and mainly concern prepayments of maintenance expenses, various subscriptions and membership fees, insurance premiums and congress fees. In addition, this item includes a prepayment of rent in the amount of EUR 2,878,437.41 (previous year: kEUR 2,954.7).

## ESCROW FUNDS

**Escrow funds** include balances at banks for projects with the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft mbH) and the European Commission, where JOANNEUM RESEARCH Forschungsgesellschaft mbH acts as the coordinator and holds the funds in escrow and manages payments for the project partners (see escrow liabilities).

# LIABILITIES AND SHAREHOLDERS' EQUITY

## SHAREHOLDERS' EQUITY

The Company's **share capital** amounts to EUR 3,600,000.00 (previous year: kEUR 3,600.0), of which 80.75% (previous year: 80.75%) or EUR 2,907,000.00 (previous year: kEUR 2,907.0) are held by the State of Styria and 14.25% (previous year: 14.25%) or EUR 513,000.00 (previous year: kEUR 513.0) by BABEG - Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. and 5% (previous year: 5%) or EUR 180,000.00 (previous year: kEUR 180.0) are held by Landesholding Burgenland GmbH.

In the reporting year allocations were made to statutory retained earnings up to the maximum amount of EUR 360,000.00 (previous year: EUR 159,571.25).

Taking into account the **profit for the year** of EUR 1,281,026.77 (previous year: EUR 157,722.44) and the profit carryforward in the amount of EUR 1,384,364.59 (previous year: EUR 1,266,642.15) the resulting **net profit for the year** is EUR 2,655,391.36 (previous year: EUR 1,384,364.59).

## APPROPRIATED CAPITAL RESERVE

Both in the Participation and Cooperation Agreement with Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG) of 18 December 2014 and in the Participation and Cooperation Agreement with Landesholding Burgenland GmbH of 20 April 2018 the shareholders agreed that the **appropriated capital reserve** be reversed as stipulated.

## SPECIAL ITEMS FOR INVESTMENT GRANTS FROM PUBLIC FUNDS

In the reporting year **investment grants from public funds** developed as follows:

| | As at 1 Jan 2021 | Additions | Consumption according to depreciation | Reversal | Reclassifi-cation or corrections | As at 31 Dec 2021 |
|---|---|---|---|---|---|---|
| | EUR | EUR | EUR | EUR | EUR | EUR |
| **Property, plant and equipment** | | | | | | |
| 1. Buildings, including buildings on land owned by others | 1,019,833.65 | 61,460.45 | -129,606.02 | 0.00 | 125,624.92 | 1,077,313.00 |
| 2. Machinery, scientific equipment and electronic data processing systems | 643,994.00 | 227,148.09 | -261,025.88 | 0.00 | 0.00 | 610,116.21 |
| 3. Other plant, furniture and fixtures | 128,502.92 | 10,393.87 | -2,028,28 | 0.00 | -125,624.92 | 11,243.59 |
| **Financial assets** | | | | | | |
| 1. Financial assets | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **Total** | **1,792,330.57** | **299,002.41** | **-392,660.18** | **0.00** | **0.00** | **1,698,672.80** |

Applications for covid-19 investment grants were filed and taken into account also in the reporting year 2021.

## PROVISIONS

An amount of EUR 118,626.00 (previous year: kEUR 274.9) of the **provisions for severance pay** was used and an amount of EUR 115,800.00 (previous year: kEUR 0.0) was reversed. In order to meet the cover requirement of EUR 5,774,300.00 (previous year: kEUR 5,561.9), an amount of EUR 446,826.00 (previous year: kEUR 276.9) was allocated to the provision.

An amount of EUR 330,539.10 (previous year: kEUR 267.1) of the **pension provisions** (for former managing directors) was used for pension payments and an amount of EUR 0.00 (previous year: kEUR 146.4) was reversed. In order to meet the actuarial cover requirement of EUR 5,711,790.00 (previous year: kEUR 5,610.0), an amount of EUR 432,309.10 (previous year: kEUR 450.5) had to be allocated to the provision.

The item **provision for taxes** concerns additional tax claims resulting from the tax audit in connection with the temporary loss of the status of a non-profit organisation in the amount of EUR 4,731,700.00 (previous

year: kEUR 4,731.7), additional tax claims in the amount of EUR 2,192,500.00 (previous year: kEUR 1,787.2) resulting from the tax audit in connection with the division of input taxes into a business part and a non-business part, and additional tax claims resulting from the tax audit in connection with VAT treatment of services provided for the State of Styria in the field of "locational positioning" in the amount of EUR 95,300.00 (previous year: kEUR 95.3).

**Other provisions** include as main items the provision for unconsumed annual leave in the amount of EUR 2,489,800.00 (previous year: kEUR 2,458.6), provisions for potential claims for refund of various funding parties in the amount of EUR 1,175,100.00 (previous year: kEUR 1,277.2), the provision for working time credits in the amount of EUR 840,400.00 (previous year: kEUR 657.7) and the provision for anticipated losses or costs of work in progress in the amount of EUR 730,300.00 (previous year: kEUR 580.3).

This item also includes the **provision for the tax audit** by the Tax Office of Graz-Stadt in the amount of EUR 3,980,700.00 (previous year: kEUR 3,980.7).

## LIABILITIES

The item **bank borrowings** in the amount of EUR 1,484,625.30 (previous year: kEUR 1,580.3) includes an export fund credit line of EUR 712,193.77 (previous year: kEUR 712.2) and a loan for the acquisition of the property EZ [folio number] 458 GB [Land Register] 60340 in Niklasdorf with a remaining term of more than five years in the amount of EUR 772,431.53 (previous year: kEUR 868.1).

**Advances received** on orders that may be deducted from inventories amounted to a net amount of EUR 2,375,100.72 (previous year: kEUR 2,516.2). For the first time in the reporting year 2021 advances received in connection with services not yet chargeable were offset against the relating items of inventories.

As at the balance sheet date **trade payables** were EUR 1,961,822.65 (previous year: kEUR 2,286.6), predominantly to Austrian suppliers.

**Other liabilities** include the profit-participating loan granted by the State of Styria on 1 November 2004 in the amount of EUR 1,387,477.00 (previous year: kEUR 1,387.5). In addition, this item mainly includes clearing funds with the Austrian Health Insurance Fund [*Österreichische Gesundheitskasse/ÖGK*] and other necessary deferrals. For the first time this item also includes advances of EUR 7,509,860.76 (previous year: kEUR 10,907.9) made by funding parties.

**Other liabilities** include expenses in the amount of EUR 1,524,599.58 (previous year: kEUR 2,279.4), which will be paid only after the balance sheet date.

**Other financial obligations**

Based on the Grant Agreement of the Office of the Styrian Government, Department 8, Health, Care and Science, by decision of the Styrian Government of 29 April 2021, reference number: ABT08-129749/2021-6, funding of a shareholder contribution of JOANNEUM RESEARCH Forschungsgesellschaft mbH to DIH Süd GmbH of a total amount of EUR 900,000.00 for the period from 1 April 2021 to 31 March 2024 was approved and granted.

Obligations arising from use of property, plant and equipment not presented in the balance sheet:

| | for the next financial year | for financial years 2022 to 2026 |
|---|---|---|
| | EUR | EUR |
| Room rents | 933,699.00 | 4,668,497.00 |
| (previous year) | (897,659.00) | (4,488,295.00) |
| Equipment rents | 91,896.00 | 347,381.00 |
| (previous year) | (61,904.00) | (215,122.00) |
| Lease payments | 0.00 | 0.00 |
| (previous year) | (10,269.00) | (10,269.00) |
| Total | 1,025,595.00 | 5,015,878.00 |
| (previous year) | (969,832.00) | (4,713,686.00) |

## ACCRUALS AND DEFERRED INCOME

**Accruals and deferred income** in the amount of EUR 169,301.85 (previous year: kEUR 192.4) mainly concern price gains not yet realised.

## ESCROW LIABILITIES

**Escrow liabilities** result from projects with the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft mbH) or the European Commission, where JOANNEUM RESEARCH Forschungsgesellschaft mbH acts as the coordinator and holds the funds in escrow and manages payments for the project partners (see escrow funds).

## CONTINGENT LIABILITIES

(cf. in this respect Other disclosures, Contingencies).

## NOTES TO THE INCOME STATEMENT

**Revenues** generated in the financial year 2021 are classified according to areas of activity and divided into domestic and international revenues:

| Amounts in EUR | Financial year 2021 | Financial year 2020 |
|---|---|---|
| **Domestic revenues** | | |
| Research | 7,004,011.47 | 7,552,412.52 |
| Royalties | 994,723.96 | 702,551.84 |
| Congress fees | 2,289.40 | 3,919.11 |
| Other | 1,657,647.53 | 1,437,785.68 |
| **Total domestic revenues** | **9,658,672.36** | **9,696,669.15** |
| **International revenues** | | |
| Research | 6,650,379.45 | 6,061,664.08 |
| Royalties | 84,516.00 | 19,593.33 |
| Congress fees | 0.00 | 0.00 |
| Other | 38,192.50 | 5,497.00 |
| **Total international revenues** | **6,773,087.95** | **6,086,754.41** |
| **Total revenues** | **16,431,760.31** | **15,783,423.56** |

The expenses of EUR 684,901.66 (previous year: kEUR 903.9) stated in item 8.(bb) include contributions to Severance Pay and Pension Funds in the amount of EUR 290,077.73 (previous year: kEUR 263.0) and expenses for severance payments in the amount of EUR 394,823.93 (previous year: kEUR 640.9). The previous year's comparative figures concerning staff costs were reclassified under item 8 'Staff costs' for the financial year 2021. The reclassification mainly concerns item (c) social benefits, reclassification of sub-item (bb) expenses for severance pay and contributions to Severance Pay and Pension Funds, concerning sub-item (cc) expenses for statutory social security contributions and payroll-related taxes and compulsory contributions in the amount of EUR 248,159.78.

# OTHER DISCLOSURES

## Shares in affiliates and participating interests

As at the balance sheet date, 31 December, a participating interest of 25% of the shares or EUR 8,750.00 (previous year: kEUR 8.8) was held in EPIG GmbH.

The annual financial statements for the year ended 31 December 2020 show equity of EUR 288,170.07 (previous year: EUR 216,286.06), which includes a net profit for the year of EUR 253,170.07 (previous year: EUR 181,286.06).

By notarial deed dated 28 May 2021 the Articles of Association of DIH SÜD GmbH, another investment of 26% or EUR 9,100.00, was signed. According to the Articles of Association the balance sheet day is 31 December.

All other participating interests were below 20%.

## Staff

As at the balance sheet date the Company had 497 (previous year: 504) employees; taking part-time employees into account on a pro rata basis, the number of staff was 414.5 (previous year: 413.9). Taking part-time employees into account on a pro rata basis, the average number of employees was 414.8 (previous year: 410.0).

In application of the provisions of Section 242(4) *UGB* no itemisation of salaries, severance payments or pensions for the management as defined in Section 239(1) *UGB* was made.

Pensions in the amount of EUR 450,761.14 (previous year: kEUR 262.1) were paid to former members of bodies.

No loans or advances were granted to members of the management or of the supervisory board. No liability in favour of that group of persons was assumed either.

The cost of remuneration of members of the Scientific Advisory Board and of the supervisory board amounted to EUR 110,238.96 (previous year: kEUR 109.2) in total.

## Results after the balance sheet date

After closing of the accounts for the financial year 2021 no other significant events occurred which would have affected the financial position or financial performance in the financial year 2021.

**Bodies of the parent in the financial year 2021:**

## SCIENTIFIC ADVISORY BOARD

Prof. Dr Dr Gerald SCHÖPFER
Chairman

Prof. Dr Gerhard FRIEDRICH
Deputy Chairman

Prof. Dr Gernot HANREICH
Deputy Chairman

Prof. Dr Hansjörg ALBRECHER

Prof. Dr Horst BISCHOF

Dr Michaela FRITZ

Prof. Dr Günter GETZINGER

Prof. Dr Dr Manfred HUSTY

Dr Mario MÜLLER

Michael PATAK

Reinhard PETSCHACHER

Herbert RITTER, MBA

Prof. Dr Karin SCHAUPP

Waltraud SCHINKO-NEUROTH

Caroline SCHOBER

Dr Stefan TASCH

Prof. Dr Frank UHLIG

## Management:

Prof. Dr Wolfgang PRIBYL, MBA
(until 1 September 2021)

Dr Heinz MAYER (since 1 September 2021)

## SUPERVISORY BOARD

Dr Martin WIEDENBAUER
Chairman

Prof. Fritz SPERL
Deputy Chairman

Dr Erlfried TAURER
Deputy Chairman

Klaus HATZL, MA

Prof. Dr Werner HAUSER

Alexandra HÖRMANN (since 28 April 2021)

Michaela KRENN

Dr Rupert PICHLER (since 28 April 2021)

Ingolf SCHÄDLER (until 28 April 2021)

Dr Birgit STRIMITZER-RIEDLER

Ursula STROHMAYER (until 28 April 2021)

## Members delegated to the supervisory board by the works council:

Ferdinand GOLJA, Chairman of the Works Council

Clemens HABSBURG-LOTHRINGEN, MAS

Helen HASENAUER, MSc

Maria HINGSAMER

Gertrude MATZER, BA MSc

## Contingencies

Pursuant to Section 199 *UGB* guarantees for rent security deposits vis-à-vis Zentrum für Wissens- und Technologietransfer in der Medizin GmbH (EUR 110,890.00), W.E.I.Z. Immobilien GmbH (EUR 38,019.46) and SFL technologies Science Tower GmbH (EUR 36,000.00) as well as retention guarantees vis-à-vis Autobahnen- und Schnellstraßen-Finanzierungs Aktiengesellschaft (EUR 73,706.27) and a payment guarantee vis-à-vis Stummer Kommunalfahrzeuge Ges.m.b.H. (EUR 122,306.25) are presented below the balance sheet.

Pursuant to Section 199 *UGB* guarantees for rent security deposits vis-à-vis Zentrum für Wissens- und Technologietransfer in der Medizin GmbH (EUR 110,890.00), W.E.I.Z. Immobilien GmbH (EUR 38,019.46) and SFL technologies Science Tower GmbH (EUR 36,000.00) as well as retention guarantees vis-à-vis Autobahnen- und Schnellstraßen-Finanzierungs Aktiengesellschaft (EUR 101,001.1) and voestalpine Wire Rod Austria GmbH (EUR 44,550.00) were presented below the balance sheet in the previous year.

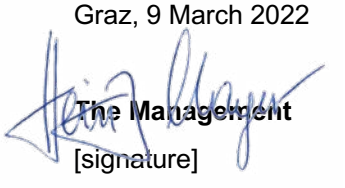
## Other information

Based on the objectives defined in Article 1(3) of the Articles of Association the Company pursues the aim of furtherance of the general public in the fields of research, development and science exclusively and directly in the interest of public welfare. No net profit that may be generated will be distributed.

According to a decision of the Finance Authority for the State of Styria dated 16 January 1995, reference no. 29/31-10/94, JOANNEUM RESEARCH Forschungsgesellschaft mbH belongs to the group of preferential recipients as defined in Section 4(4) No. 5(e) of the Austrian Personal Income Tax Act [*Einkommensteuergesetz/EStG*] 1988 as amended by Art. I No. 4(a) of the Austrian Tax Reform Act [*Steuerreformgesetz*] 1993.

The expenses for the statutory auditor for auditing the annual financial statements amounted to EUR 18,000.00 (previous year: EUR 17,400.00). No other certification services, tax advisory services or other services of the statutory auditor were rendered in the reporting year or in the previous year.

Graz, 9 March 2022



**The Management**
[signature]

**Dr Heinz Mayer**

## Consolidated non-current assets movement schedule JOANNEUM RESEARCH ForschungsgmbH 2021

| | Cost of acquisition | | | | | Accumulated amortisation and depreciation | | | | Carrying amounts | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| DEVELOPMENT OF NON-CURRENT ASSETS | 1 Jan 2021 | Additions | Disposals | Reclassifi-cation | 31 Dec 2021 | 1 Jan 2021 | Additions | Disposals | 31 Dec 2021 | 31 Dec 2020 | 31 Dec 2021 |
| **(I) Intangible assets** | | | | | | | | | | | |
| **Software, data transmission rights and other rights** | 3,248,879.37 | 314,256.99 | 27,952.56 | 52,825.00 | 3,588,008.80 | 2,911,865.35 | 309,028.00 | 27,952.56 | 3,192,940.79 | 337,014.02 | 395,068.01 |
| **Total intangible assets** | **3,248,879.37** | **314,256.99** | **27,952.56** | **52,825.00** | **3,588,008.80** | **2,911,865.35** | **309,028.00** | **27,952.56** | **3,192,940.79** | **337,014.02** | **395,068.01** |
| **(II) Property, plant and equipment** | | | | | | | | | | | |
| **(1) Land, rights equivalent to land and buildings, including buildings on land owned by others** | | | | | | | | | | | |
| **(a) Land value** | 2,877,794.02 | 0.00 | 0.00 | 0.00 | 2,877,794.02 | 0.00 | 0.00 | 0.00 | 0.00 | 2,877,794.02 | 2,877,794.02 |
| **(b) Building value** | 17,053,989.55 | 641,070.52 | 0.00 | 1,723,869.96 | 19,418,930.03 | 9,826,188.23 | 706,034.16 | 0.00 | 10,532,222.39 | 7,227,801.32 | 8,886,707.64 |
| **Subtotal land and buildings** | 19,931,783.57 | 641,070.52 | 0.00 | 1,723,869.96 | 22,296,724.05 | 9,826,188.23 | 706,034.16 | 0.00 | 10,532,222.39 | 10,105,595.34 | 11,764,501.66 |
| **(2) Machinery, scientific equipment and EDP systems** | 31,167,561.51 | 1,634,156.44 | 531,808.55 | 98,937.74 | 32,368,847.14 | 25,881,956.31 | 2,207,487.95 | 530,934.55 | 27,558,509.71 | 5,285,605.20 | 4,810,337.43 |
| **(3) Other plant, furniture and fixtures** | 3,830,208.17 | 110,397.18 | 30,064.76 | 0.00 | 3,910,540.59 | 3,055,929.73 | 255,335.92 | 29,746.76 | 3,281,518.89 | 774,278.44 | 629,021.70 |
| **(4) Advances made and construction in progress** | 1,992,095.05 | 485,351.23 | 494.10 | -1,878,068.52 | 598,883.66 | 0.00 | 0.00 | 0.00 | 0.00 | 1,992,095.05 | 598,883.66 |
| **Offsetting of input tax on advances for non-current assets** | -2,435.82 | -55,998.00 | 0.00 | 2,435.82 | -55,998.00 | 0.00 | 0.00 | 0.00 | 0.00 | -2,435.82 | -55,998.00 |
| **Subtotal advances made and construction in progress** | 1,989,659.23 | 429,353.23 | 494.10 | -1,875,632.70 | 542,885.66 | 0.00 | 0.00 | 0.00 | 0.00 | 1,989,659.23 | 542,885.66 |
| **(5) Low-value assets** | 0.00 | 104,620.73 | 104,620.73 | 0.00 | 0.00 | 0.00 | 104,620.73 | 104,620.73 | 0.00 | 0.00 | 0.00 |
| **Total property, plant and equipment** | **56,919,212.48** | **2,919,598.10** | **666,988.14** | **-52,825.00** | **59,118,997.44** | **38,764,074.27** | **3,273,478.76** | **665,302.04** | **41,372,250.99** | **18,155,138.21** | **17,746,746.45** |
| **(III) Financial assets** | | | | | | | | | | | |
| **(1) Shares in affiliates** | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **(2) Participating interests** | 341,688.25 | 9,100.00 | 0.00 | 0.00 | 350,788.25 | 0.00 | 80,000.00 | 0.00 | 80,000.00 | 341,688.25 | 270,788.25 |
| **(3) Investment securities (book-entry securities)** | 1,724,750.00 | 2,078,682.50 | 1,356,750.00 | 0.00 | 2,446,682.50 | 0.00 | 56,532.86 | 0.00 | 56,532.86 | 1,724,750.00 | 2,390,149.64 |
| **Total financial assets** | **2,066,438.25** | **2,087,782.50** | **1,356,750.00** | **0.00** | **2,797,470.75** | **0.00** | **136,532.86** | **0.00** | **136,532.86** | **2,066,438.25** | **2,660,937.89** |
| **TOTAL NON-CURRENT ASSETS** | **62,234,530.10** | **5,321,637.59** | **2,051,690.70** | **0.00** | **65,504,476.99** | **41,675,939.62** | **3,719,039.62** | **693,254.60** | **44,701,724.64** | **20,558,590.48** | **20,802,752.35** |

# GROUP MANAGEMENT REPORT FOR THE FINANCIAL YEAR 2021
# JOANNEUM RESEARCH Forschungsgesellschaft mbH, Graz

The Management Report covers the reporting period of the financial year 2021 from 1 January 2021 to 31 December 2021 and is divided into three sections: I. Report on the course of the Company's business and financial position; II. Report on prospective developments and risks of the Company, and III. Report on research and development.

## I. Report on the course of the Company's business and financial position

## I.1 Business organisation

As at 31 December 2021 JOANNEUM RESEARCH was organised in seven research units, which represent the main areas of activities.

| **Research units** |
|---|
| DIGITAL – Institute for Information and Communication Technologies |
| MATERIALS – Institute for Surface Technologies and Photonics |
| ROBOTICS – Institute for Robotics and Mechatronics |
| COREMED - Cooperative Centre for Regenerative Medicine |
| HEALTH – Institute for Biomedicine and Health Sciences |
| LIFE – Institute for Climate, Energy and Society |
| POLICIES – Institute for Economic and Innovation Research |

In financial 2021 JR-AquaConSol GmbH (JR-AquaConSol), being a wholly-owned subsidiary of JOANNEUM RESEARCH, was divided into the areas of services in water resource management, hydrogeochemistry, and laboratory analytics with a focus on measuring stable isotopes of the water cycle and lysimeter systems.

## I.2 Investment report

As at 31 December 2021 the parent company held corporate investments in the following companies:

### I.2.1 Corporate investments

| | Share in % |
|---|---|
| ALP.Lab GmbH | 16.0 |
| decide Clinical Software GmbH | 10.0 |
| DIH SÜD GmbH | 26.0 |
| EPIG GmbH | 25.0 |
| FH JOANNEUM Gesellschaft mbH | 14.9 |
| Geo5 GmbH | 10.0 |
| Holz.Bau Forschungs GmbH | 5.98 |
| Human.technology Styria GmbH | 7.0 |
| Pacemaker Technologies GmbH | 3.0 |
| Rebeat Innovation GmbH | 1.7 |

### I.2.2 Corporate investments - COMET (K1, K2) Competence Center Programme

As at 31 December 2021 the Company owned shares in the following companies, which are funded through the COMET (Competence Centers for Excellent Technologies) Programme of the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) and the Federal Ministry for Digital and Economic Affairs (BMDW):

| | Share in % |
|---|---|
| ACIB GmbH | 8.0 |
| BEST-Bioenergy and Sustainable Technologies GmbH | 10.0 |
| CBmed GmbH | 12.5 |
| Know-Center GmbH Research Center for Data-Driven Business & Big Data Analytics | 10.0 |
| Materials Center Leoben Forschung GmbH | 17.5 |
| Polymer Competence Center Leoben GmbH | 17.0 |
| Research Center Pharmaceutical Engineering GmbH | 15.0 |
| Virtual Vehicle Research GmbH | 8.4 |

## I.3 Branches

The Company has no branches.

## I.4 Course of business

As at 31 December 2021 the orders on hand amounted to approximately EUR 85.5 million. The work on hand amounted to approximately EUR 39.9 million, the value of offers submitted was approximately EUR 52.5 million. In the financial year 2021 (after changes in reserves) the profit amounted to approximately kEUR 1,281.0 (previous year: approximately kEUR 157.7).

The operating result from contract research projects was approximately EUR 18.7 million for the financial year 2021. Funded research projects generated an operating result of approximately EUR 18.2 million.

At an international level the Group solicited contract research projects and funded research projects worth approximately EUR 12.9 million in the aggregate in the reporting year. An amount of EUR 6.1 million thereof is attributable to projects with the European Union and approximately EUR 6.8 million to contract research projects. Due to the participation of the Group in the programmes of the European Union and calls for proposals by the European Space Agency (ESA) total revenues of approximately EUR 2.6 million were generated in the financial year 2021. Under the Horizon 2020 programme projects with a funding volume of approximately EUR 3.0 million were awarded to the Company and in connection with ESA projects an order volume of approximately EUR 1.2 million was solicited.

In the financial year 2021 revenues of approximately EUR 6.8 million were generated through national cooperative research projects related to the Austrian Research Promotion Agency (Österreichische Forschungsförderungsgesellschaft mbH/FFG).

Under a 2019-2021 funding agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) funds in an amount of EUR 7.8 million were granted. In the reporting period the Group generated revenues totalling approximately EUR 2.6 million from BMK

### *I.4.1 Financial position*

The Group's assets and financing structure developed as follows:

As at the balance sheet date, 31 December 2021, the Group had a balance sheet total of approximately EUR 62.0 million (previous year: approximately EUR 67.6 million). This is comprised of non-current assets in the amount of approximately EUR 20.8 million and current assets (inclusive of prepayments and accrued income, and escrow funds) of approximately EUR 41.2 million.

As at 31 December 2021 shareholders' equity including investment grants amounted to around EUR 13.7 million (thereof investment grants of approximately EUR 1.7 million) or 22% of the balance sheet total compared to around EUR 12.6 million or 19% of the previous year's balance sheet total. Borrowings (inclusive of accruals and deferred income, and escrow liabilities) decreased by approximately EUR 6.7 million to approximately EUR 48.3 million (previous year: EUR 55.0 million) and amounted to 78% (previous year: 81%) of the balance sheet total.

In the financial year 2021 cash flows from the profit or loss as the sum total of generated profit for the year and the income and expense items (the Group's internal financing potential) amounted to approximately EUR 4.6 million. Working capital (current assets minus short-term borrowings) was approximately EUR 17.0 million (previous year: approximately EUR 16.2 million).

No derivative financial instruments were used in the past financial year 2021. The financial instruments recognised in the balance sheet are part of the Company's general risk management, which is reflected in the bookkeeping and accounting policies.

### *I.4.2 Financial performance*

In the financial year 2021 the operating result including own work capitalised and other operating income net of shareholder contribution and research tax premium amounted to approximately EUR 37.2 million (previous year: approximately EUR 34.3 million).

Domestic revenues accounted for 63% and international revenues accounted for 37% of the operating result generated in projects. The share of the operating result generated in projects attributable to Styria was approximately 11%.

As at 31 December 2021 services not yet chargeable amounted to approximately EUR 3.4 million [approximately EUR 11.2 million less approximately EUR 7.8 million advances received;

previous year: approximately EUR 2.7 million (approximately EUR 9.3 million less approximately EUR 6.6 million advances received)].

The expenses in the amount of approximately EUR 49.1 million (previous year: approximately EUR 47.4 million) are made up of staff costs including statutory social security charges and voluntary social benefits plus allocations to pension provisions (former managing director) and severance payments of approximately EUR 34.4 million (previous year: approximately EUR 32.4 million), cost of materials and other services purchased of approximately EUR 4.0 million (previous year: approximately EUR 3.3 million), amortisation and depreciation of approximately EUR 3.6 million (previous year: approximately EUR 3.5 million) and other operating expenses of approximately EUR 7.1 million (previous year: approximately EUR 8.2 million).

The shareholder contributions of the State of Styria, the State of Carinthia through Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG), the State of Burgenland through Landesholding Burgenland GmbH, and the Grant Agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) constitute material parts of parent financing and secure accomplishment of its mission.

The Group closed the financial year 2021 with a profit before taxes (formerly profit or loss on ordinary activities) of EUR 1,216,821.66. Taking into account income taxes of EUR 8,656.00, reversal of reserves in the amount of EUR 273,289.86, the allocation to statutory retained earnings in the amount of EUR 200,428.75 and the profit of EUR 1,384,364.59 carried forward from the previous year, the net profit for the year is EUR 2,665,391.36.

After the accounts for the financial year 2021 had been closed no other significant events occurred which would have affected the financial position or financial performance in the financial year 2021.

### *I.4.3 Capital expenditure report*

In the financial year 2021 approximately EUR 2.9 million (previous year: approximately EUR 4.1 million) were invested in property, plant and equipment (scientific equipment, electronic data processing systems, furniture and fixtures, land with buildings).

### *I.4.4 Staff report*

As at the balance sheet date 497 staff members (189 women and 308 men) were employed. This is equal to 414.5 full-time equivalents as at 31 December 2021.

With 77 new employees (35 women and 42 men), and 84 employees (39 women and 45 men) who left the Group in the reporting period the fluctuation regarding active employees was approximately 16.90% (20.63% regarding women and 14.61% regarding men).

The average age of the Group's employees is 42.3 years.

As at 31 December 2021 the share of graduates from universities or universities of applied sciences was 69.62% (32.95% women); the share of grammar school graduates was 19.52%.

As at the balance sheet date 6 apprentices, 2 female and 4 male, were undergoing training at the Group.

In the reporting period a total of 16 interns (7 women, 9 men) were employed, who completed their compulsory internships in connection with their studies at universities of applied sciences or universities or international exchange programmes. In addition, 22 students (7 female and 15 male) were granted an opportunity to write their diploma or doctoral theses in an employment relationship with the Group in cooperation with the relevant universities.

## II. Report on prospective developments and risks of the Group

*Economic policy framework conditions for research and development (R&D)*

From an economic policy perspective also in 2021 the covid-19 pandemic was the decisive factor preventing a significant and sustainable positive development of the world economy. Due to the repeated, sometimes massive waves of infection and the different countermeasures taken by the governments (lockdowns, travel restrictions, industry-specific restrictions, more rigorous checks) international trade in goods and services is still adversely affected to a considerable extent. This becomes particularly apparent in supply bottlenecks and shortage of materials in the steel, electronics and automotive industry as well as in the building industry. In total, world trade declined by

1.1% compared to the previous quarter and countries like China and Japan saw noticeable declines in economic activity (WIFO [Austrian Institute of Economic Research] Monthly Report 12/2021, p 859-866).

In the eurozone at least a modest recovery in terms of economic growth of 2.2% compared to the previous quarter's GDP was recorded. However, as early as in mid-2021 the recovery began to slow down, *inter alia* in Germany, which was due to the lack of upstream products in critical sectors, such as the automotive industry. The economic upturn clearly slowed down in the USA, where in autumn 2021 GDP was only 0.5% higher than three months earlier. In this context high energy prices and the markedly increasing inflation play a significant role.

Also in Austria entrepreneurs are still unsettled and the planning ability for the next few months is limited accordingly. Nevertheless, Austria experiences considerable economic growth at a national level and for the third quarter of 2021 GDP growth of 3.8% was calculated compared to the second quarter. Accordingly, for the first time economic performance was higher than before the start of the pandemic. However, since also in Austria commodity prices and inflation constantly are at a high level and thus constitute an increasing burden on private household income it has to be expected that the catch-up effects of private consumption will become weaker and weaker.

In 2021 because of uncertainties owed to the pandemic no global estimate of R&D expenditure in Austria was made for the second year in a row. The current estimate of the research share for 2020 is 3.23% (STATISTICS AUSTRIA of 8 July 2021 and 1 December 2021), with the increase being attributable to a relatively stronger decline in overall economic performance compared to R&D expenditure. Now gross domestic expenditure on R&D for 2020 is estimated at EUR 12.1 billion, 41.4% of which was made by business enterprises, 40.5% by the public sector and 16.5% by foreign investors (other: 1.6%).

*Specific framework conditions for the parent company*

*Shareholder contribution from the State of Styria*

The Government of the State of Styria provided JOANNEUM RESEARCH with a shareholder contribution of EUR 7,700,000.00 for 2021 as a contribution to recurring expenses.

For 2022 an amount of EUR 7,700,000.00 will be provided as a shareholder contribution to recurring expenses.

To cover pro-rata additional funds required due to covid-19 the State of Styria as the majority shareholder made an additional one-off shareholder contribution of EUR 200,000.00.

*Shareholder contribution from Kärntner Betriebsansiedlungs- und Beteiligungs-gesellschaft m.b.H. (BABEG)*

For the financial years 2021-2024 a new agreement was concluded, under which BABEG has agreed to grant an annual shareholder contribution of EUR 1,504,000.00 to further develop the location of Carinthia.

For 2021 BABEG made a shareholder contribution of EUR 1,504,000.00. In addition, for the period until 30 September 2022 BABEG will make another shareholder contribution in the amount of EUR 100,000.00 for building up and expanding scientific know-how in the area of Next-Generation Robot Networks.

In addition, also taking into account its participating interest, BABEG granted a one-off shareholder contribution of EUR 35,000.00 to cover pro-rata additional funds required due to covid-19.

*Shareholder contribution from the State of Burgenland*

Under the Participation and Cooperation Agreement between the State of Styria, Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG) and Landesholding Burgenland GmbH (LHB) the State of Burgenland agreed to grant JOANNEUM RESEARCH a shareholder contribution of EUR 464,500.00 for the term of the investment.

In addition, also taking into account its participating interest, the State of Burgenland granted LHB a one-off shareholder contribution of EUR 12,500.00 to cover pro-rata additional funds required due to covid-19.

Landesholding Burgenland GmbH has announced that its share in JOANNEUM RESEARCH Forschungsgesellschaft mbH will be contributed to Wirtschaftsagentur Burgenland GmbH. The shareholders agreed to such contribution of the shares.

*Grant Agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK)*

In financial 2021 BMK provided funding in a total amount of EUR 2,227,200.00 for near-basic research projects under the current Grant Agreement 2019-2021.

The continuing Grant Agreement 2022-2024 for fundamental research projects with a total funding of EUR 7.755 million was concluded with BMK.

The shareholder contributions of the State of Styria, Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG), the State of Burgenland, and the Grant Agreement with the Federal Ministry for Climate Action, Environment, Energy, Mobility, Innovation and Technology (BMK) are significant financing tools of the parent.

*Risks and prospective development of the Group*

The framework conditions for the Group are still characterised by tougher competition. Research enterprises are in general exposed to a project risk, which increasingly manifests itself due to the pandemic. Defaults of customers or project partners are increasingly noticeable.

The pandemic and the forecast economic upswing are also factors that further intensify competition for the greatest minds.

In 2021 JOANNEUM RESEARCH started a strategic process with the aim to align the Company's strategic focus with the changed framework conditions in the best possible way.

JOANNEUM RESEARCH expects a solid business development for the financial year 2022.

The positive development of JR-AquaConSol GmbH in the financial year 2021, which was above expectations, constitutes a good basis for the financial year 2022. JR-AquaConSol expects moderate growth of the operating result for 2022. In the area of water resource management the market is expected to develop favourably. In addition, lysimeter production is intended to be expanded to manufacturing and distribution of small lysimeters.

*IT security within the Group*

Money is the motive for most cybercrimes. From a global point of view cybercrime is one of the main branches of organised crime, generating revenues of EUR 1.6 trillion each year.

For 2021 a study on this subject showed that 60% of 417 surveyed entities had been victims of cyberattacks (previous year: 57%; comparison of the KPMG studies on "Cyber security in Austria" for 2021 and 2020).

Three fourths of the entities were exposed to attacks which spied out log-in data (phishing), more than one half of the entities believe that attacks on government players have increased. Cyberattacks have become commonplace and are a constant threat, which is why around three fourths of all enterprises invest in precautionary measures. The share of enterprises who have taken out cyber insurance has risen to 31% because in the case of an attack professional support becomes more and more important.

In terms of the psychological factor gullibility of the victims, lack of awareness of the need for security measures and the increasing prominence of digital equipment in everyday life are used as attack vectors. Increased teleworking leads to decentralisation, which offers additional points of attack.

Quantifying the damage caused to Austrian business enterprises is difficult; according to the study figures differ widely, with major losses easily amounting to millions of euros. Apart from that, JOANNEUM RESEARCH has learned from talks with cyber insurance companies in 2020 that with respect to service providers loss calculation is very difficult because it mainly concerns frustrated expenses (working time).

The Director General for Public Security especially mentioned espionage and sabotage attacks on government-related players, which was confirmed by 53% of the surveyed enterprises. Those attacks are highly professional, difficult to ward off and may cause major damage by at the same time being hardly recognisable as they tap into important information unnoticed and without attracting attention. Only much later will competitors be noticed in the market who offer astonishingly similar products or services or are surprisingly awarded international contracts.

Since more people work from home due to the pandemic the Company has taken supplementary IT measures. Encrypted VPN connections, systems for video conferencing, online trainings and online webinars have optimally supplemented online systems that had existed before.

Eighty per cent (80%) of the surveyed enterprises stated that their own staff had identified the cyberattack, which confirms the importance of training staff and raising awareness among them.

As in the past, more than three fourths of the enterprises surveyed in 2021 demanded stronger support by the government. For many years JOANNEUM RESEARCH has cooperated with the Directorate for State Security and Intelligence (DSN) at the Ministry of the Interior, the former Federal Agency for State Protection and Counter Terrorism (BVT).

JOANNEUM RESEARCH is integrated in the information service for the protection of critical infrastructure (CIP). Thus, appropriate measures can be taken early and staff can be informed accordingly, where necessary.

CIP is part of the national implementation of the European Programme for Critical Infrastructure Protection (EPCIP) to improve Europe's resilience against a diverse spectrum of disturbances. Within the scope of the new cybersecurity strategy of the European Union other EU directives to improve resilience are being implemented, such as, e.g., the NIS2 directive and the RCE directive.

As a company that generates knowledge JOANNEUM RESEARCH faces worldwide competition in specific research areas. Accordingly, there is a strategic risk of trade secrets being spied out by competitors who possess significant resources, or by government-related agencies. In order to prevent that, the Company invests in creating strong awareness among its staff, in comprehensive authorisation concepts, a strict password policy, a private cloud, encryption, and much more.

In summary it can be said that JOANNEUM RESEARCH has further improved and enhanced its IT security measures. In implementing new technical standards and legislation, measures are regularly taken throughout the Company which enhance security, on the one hand, and require capital expenditure, on the other hand.

# III. Report on research and development

## III.1 Research units of the parent company

### DIGITAL – Institute for Information and Communication Technologies

*Activities planned for financial 2022*

DIGITAL is one of the internationally leading applied research partners in the area of information and communication technologies (ICT). With its comprehensive competences in the areas of sensor technology, data analysis and their combination in professional applications DIGITAL is one of the most efficient national ICT research centres of international visibility and intends to expand this position in 2022. Intelligent sensor systems constitute an important technological basis of the institute. Linking of data volumes is the focus of communication technology. Not only data volumes but also algorithms are linked increasingly and more flexibly. The solutions provided range from concept studies via development projects up to prototypes or micro-series. For the software, which may be optimised for the hardware where necessary, state-of-the-art development paradigms are used.

### MATERIALS – Institute for Surface Technologies and Photonics

*Activities planned for financial 2022*

MATERIALS is one of the largest centres for nanotechnology, surface technologies and photonics in Austria. Also in 2022 the institute continues to be a trustworthy partner for its customers, providing concepts and implementing cooperative research and development projects up to technology transfer. Important goals and strategic focuses in financial 2022 will be to implement the services offered for the R2R pilot line for pilot line customers, further development of the core competences in the technological fields with a USP and ultraprecise laser micro-machining and manufacturing that is suitable for industrial manufacturing for technology and product development together with business partners. In 2022 a special highlight will be the processing of the ongoing Smart@Surface and CAMED (Clinical Additive Manufacturing for Medical Applications) COMET projects.

**ROBOTICS – Institute for Robotics and Mechatronics**

*Activities planned for financial 2022*

In 2022 the research and business activities of ROBOTICS will address the challenges of digitalisation, including but not limited to automated production and value-added processes of regional and supraregional trade and industry. ROBOTICS' consistent further development of topics focuses on embedding robotics in the digitalisation projects of an industry 4.0 transformation. The facility in Klagenfurt with its core activities in the areas of ICT, sensor technology and AI at the Lakeside Science & Technology Park and at the University of Klagenfurt offers a qualified research, development and networking environment for this purpose. Apart from that, bilateral research, development and innovation projects with regional and supraregional business partners are carried out by way of direct contract research and constitute a planned focus of its business activities.

**COREMED - Cooperative Centre for Regenerative Medicine**

*Activities planned for financial 2022*

COREMED is a very young research units, which is why its profile has not been fully developed yet. Also in 2022 COREMED's close cooperation with HEALTH and the Medical University of Graz will be at the core of its strategic focus. On the one hand, the research focus will continue to be on the development and validation of pre-clinical models (in vitro, ex vivo and in vivo) for wound healing and wound healing disorders (chronic wounds, hypertrophic scars). On the other hand, it is planned to validate and further develop new dressing materials and wound therapies by means of the established in-vitro skin models. In financial 2022, among others, clinic-related contract research projects will be implemented together with the Medical University of Graz. Established pre-clinical models and models being developed are intended to serve the purpose of soliciting contract research projects and research projects funded by third parties.

**HEALTH – Institute for Biomedicine and Health Sciences**

*Activities planned for financial 2022*

HEALTH acts as the link between basic medical research and industrial application and offers interdisciplinary overall solutions in R&D services for the pharmaceutical and medtech industry. The institute, which is located at MedCampus Graz, can resort to a strong local, national and international network of academic and commercial facilities

and players in the area of life science. In 2022 HEALTH will primarily work in the field of contract research for the pharmaceutical industry but also for the public sector in healthcare and will be able to provide support as a contract research organisation (CRO) by using its key technologies, such as OFM, bioanalytics, metabolomics, data management, biostatistics, etc. throughout the product lifecycle of drugs. Another area of specialisation is the development of and obtaining approval for topical generic drugs.

**LIFE – Institute for Climate, Energy and Society**

*Activities planned for financial 2022*

JOANNEUM RESEARCH bundles most of its research work in the area of climate and energy at LIFE. The institute is a strong signal for the mission of dedicating its work not only to technological development but also to dealing intensively with the social dimensions of the same. In 2022 LIFE will continue to proactively research into topics of the future and intensively communicate its activities. The clear mission for 2022 is to continue to strengthen resilience against climate and weather risks and to design the transition to a climate-neutral economy/society by 2040. For the rest, cooperation with business partners is mainly characterised by preferential business partners and preferential policy partners, jointly serving calls and programmes of funded research.

**POLICIES – Institute for Economic and Innovation Research**

*Activities planned for financial 2022*

The mission of POLICIES is to provide information and analyses for evidence-based policies and business decisions. In 2022 major focus areas will be research into the effects of evidence-based reaction to the covid and climate crisis. Another goal is to support and advise political parties and businesses in regional and national strategic processes. In addition, POLICIES offers services in the field of user-oriented and responsible technological development and innovation (responsible research and innovation, gender-sensitive research and innovation). Modelling and assessing policy measures by means of the regional input-output model or in simulation and statistical modelling of production processes, as well as providing and using large amounts of information and large information systems round off the portfolio of activities.

## III.2 JR-AquaConSol GmbH

*Activities planned for financial 2022*

In the financial year 2022 the focus of research activities is on lysimeter systems, on the topical field of "atmosphere, soil and unsaturated zone", on developing numerical models for agricultural irrigation and developing models for data-based and model-based control systems for water supply companies.

Graz, 9 March 2022

**The Management:**

**Dr Heinz Mayer**

# Auditor's Report

## Report on the Consolidated Financial Statements

## Audit Opinion

We have audited the consolidated financial statements of

**JOANNEUM RESEARCH Forschungsgesellschaft mbH,**

**Graz,**

and of its subsidiaries (the group). These consolidated financial statements comprise the consolidated balance sheet as of December 31, 2021, with an equity of EUR 11,999,020.87, the consolidated income statement, the consolidated statement of changes in equity and the consolidated statement of cash flows for the fiscal year then ended and the notes to the consolidated financial statements.

Based on our audit the accompanying consolidated financial statements were prepared in accordance with the legal regulations and present fairly, in all material respects, the assets and the financial position of the group as of December 31, 2021 and its financial performance for the year then ended in accordance with Austrian Generally Accepted Accounting Principles.

## Basis for Opinion

We conducted our audit in accordance with Austrian Standards on Auditing. Those standards require that we comply with International Standards on Auditing (ISA). Our responsibilities under those regulations and standards are further described in the "Auditor's Responsibilities for the Audit of the Financial Statements" section of our report. We are independent of the Company in accordance with the Austrian General Accepted Accounting Principles and professional requirements and we have fulfilled our other ethical responsibilities in accordance with these requirements. We believe that the audit evidence we have obtained until the date of this auditor's report is sufficient and appropriate to provide a basis for our opinion by this date.

## Responsibilities of Management and of the Audit Committee for the Financial Statements

Management is responsible for the preparation of the consolidated financial statements in accordance with Austrian Generally Accepted Accounting Principles, for them to present a true and fair view of the assets, the financial position and the financial performance of the Group and for such internal controls as management

determines are necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

In preparing the consolidated financial statements, management is responsible for assessing the Group's ability to continue as a going concern, disclosing, as applicable, matters related to going concern and using the going concern basis of accounting unless management either intends to liquidate the Group or to cease operations, or has no realistic alternative but to do so.

The Audit Committee is responsible for overseeing the Group's financial reporting process.

**Auditor's Responsibilities for the Audit of the Consolidated Financial Statements**

Our objectives are to obtain reasonable assurance about whether the consolidated financial statements as a whole are free from material misstatement, whether due to fraud or error, and to issue an auditor's report that includes our opinion. Reasonable assurance is a high level of assurance, but is not a guarantee that an audit conducted in accordance with International Standards on Auditing will always detect a material misstatement when it exists. Misstatements can arise from fraud or error and are considered material if, individually or in the aggregate, they could reasonably be expected to influence the economic decisions of users taken on the basis of these consolidated financial statements.

As part of an audit in accordance with Austrian Standards on Auditing, which require the application of ISA, we exercise professional judgment and maintain professional scepticism throughout the audit.

We also:

- identify and assess the risks of material misstatement of the consolidated financial statements, whether due to fraud or error, design and perform audit procedures responsive to those risks, and obtain audit evidence that is sufficient and appropriate to provide a basis for our opinion. The risk of not detecting a material misstatement resulting from fraud is higher than for one resulting from error, as fraud may involve collusion, forgery, intentional omissions, misrepresentations, or the override of internal control.
- obtain an understanding of internal control relevant to the audit in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the Group's internal control.

- evaluate the appropriateness of accounting policies used and the reasonableness of accounting estimates and related disclosures made by management.
- conclude on the appropriateness of management's use of the going concern basis of accounting and, based on the audit evidence obtained, whether a material uncertainty exists related to events or conditions that may cast significant doubt on the Group's ability to continue as a going concern. If we conclude that a material uncertainty exists, we are required to draw attention in our auditor's report to the related disclosures in the consolidated financial statements or, if such disclosures are inadequate, to modify our opinion. Our conclusions are based on the audit evidence obtained up to the date of our auditor's report. However, future events or conditions may cause the Group to cease to continue as a going concern.
- evaluate the overall presentation, structure and content of the consolidated financial statements, including the disclosures, and whether the consolidated financial statements represent the underlying transactions and events in a manner that achieves fair presentation.
- obtain sufficient appropriate audit evidence regarding the financial information of the entities or business activities within the Group to express an opinion on the consolidated financial statements. We are responsible for the direction, supervision and performance of the group audit. We remain solely responsible for our audit opinion.

We communicate with the Audit Committee regarding, among other matters, the planned scope and timing of the audit and significant audit findings, including any significant deficiencies in internal control that we identify during our audit.

**Comments on the Management Report for the Group**

Pursuant to Austrian Generally Accepted Accounting Principles, the group management report is to be audited as to whether it is consistent with the consolidated financial statements and as to whether it was prepared in accordance with the applicable legal regulations.

Management is responsible for the preparation of the group management report in accordance with Austrian Generally Accepted Accounting Principles.

We conducted our audit in accordance with Austrian Standards on Auditing for the audit of the group management report.

### *Opinion*

In our opinion, the management report for the Group was prepared in accordance with the valid legal requirements and is consistent with the consolidated financial statements.

### *Statement*

Based on the findings during the audit of the consolidated financial statements and due to the thus obtained understanding concerning the Group and its circumstances no material misstatements in the group management report came to our attention.

Vienna, March 9, 2022

Crowe SOT Wirtschaftsprüfung GmbH

Dr. Anton Schmidl Mag. Andreas Maier

Wirtschaftsprüfer (auditors)

# JOANNEUM RESEARCH Forschungsgesellschaft mbH

as of January 2021

## Executive Board, Corporate Staff and Departements

## Thematic Areas and Research Units

### Information and Production Technologies

**DIGITAL** – Institute for Surface Technologies and Photonics
- Remote Sensing and Geoinformation 01
- Machine Vision Applications 01
- Space and Communication Technology 01
- Connected Computing 01
- Intelligent Acoustic Solutions 01
- Cyber Security and Defence 01

**MATERIALS** – Institute for Surface Technologies and Photonics
- Hybrid Electronics and Patterning 02
- Light and Optical Technologies 02
- Laser and Plasma Processing 03
- Sensors and Functional Printing 02
- Smart Connected Lighting 06

**ROBOTICS** – Institute for Robotics and Mechatronics
- Robot Systems Technologies 05
- Competence Group ROBOTICS Evaluation Lab 05
- ROBOTICS Training Center 05

### Human Technology and Medicine

**COREMED** – Cooperative Centre for Regenerative Medicine
- Tissue Regeneration Technologies 01

**HEALTH** – Institute for Biomedicine and Health Sciences
- Biomedical Tissue Monitoring 01
- Bioanalytics and Metabolomics 01
- Competence Group Data Management and Biostatistics 01
- Kompetenzgruppe Klinische Entscheidungsunterstützung 01
- Competence Group Medical Sensors 01

### Society and Sustainability

**LIFE** – Institute for Climate, Energy and Society
- Weather and Climate Risk Management 01 04
- Future Energy Systems and Lifestyle 01
- International Climate Policy and Economics 01
- Competence Group Urban Living Lab 01 05

**POLICIES** – Institute for Economic and Innovation Research
- Technology, Innovation and Policy Consulting 01 04
- Data Analytics and Statistical Modelling 01 05
- Regional Economics and Structural Policy 01 05

Standorte: 01 Graz 02 Weiz 03 Niklasdorf 04 Wien 05 Klagenfurt 06 Pinkafeld

## Equity Holdings

**Affiliated Company**
- JR-AquaConSol GmbH

**Shareholdings**
- EPIG GmbH
- FH JOANNEUM Gesellschaft mbH
- Holz.Bau Forschungs GmbH
- Human.technology Styria GmbH

**Commercial utilization/Spin-offs**
- ALP.Lab GmbH
- decide Clinical Software GmbH
- Geo5 GmbH
- Pacemaker Technologies GmbH
- Rebeat Innovation GmbH

**Shareholdings COMET-Centres**
- ACIB GmbH
- BEST – Bioenergy and Sustainable Technologies GmbH
- CBmed GmbH
- Know-Center GmbH Research Center for Data-Driven Business & Big Data Analytics
- Virtual Vehicle Research GmbH
- Materials Center Leoben Forschung GmbH
- Polymer Competence Center Leoben GmbH
- Research Center Pharmaceutical Engineering GmbH

# JOANNEUM RESEARCH Forschungsgesellschaft mbH

as of January 2022

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Institute for Information and Communication Technologies

- Remote Sensing and Geoinformation 01
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Institute for Surface Technologies and Photonics

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- ROBOTICS Training Center 05

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**COREMED**
Cooperative Centre for Regenerative Medicine

- Tissue Regeneration Technologies 01

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Institute for Biomedicine and Health Sciences

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- Bioanalytics and Metabolomics 01
- Competence Group Data Management and Biostatistics 01
- Competence Group Clinical Decision Support 01
- Competence Group Medical Sensors 01

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- Polymer Competence Center Leoben GmbH
- Research Center Pharmaceutical Engineering GmbH

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