JOANNEUM RESEARCH

JOANNEUM RESEARCH

Annual Report 2018

JOANNEUM RESEARCH
Forschungsgesellschaft mbH

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Key innovations for the future

Prof. Dr Wolfgang Pribyl, MBA
CEO

JOANNEUM RESEARCH successfully concluded the financial year 2018, one milestone being the participating interest of the state of Burgenland in April 2018. What strategic and economic benefit will result from this additional participating interest?

The participating interest by the state of Burgenland will further strengthen the southern research axis, which now reaches from Carinthia via Styria into the state of Burgenland, and increase the international visibility of the achievements in research made by JOANNEUM RESEARCH. At the new location in Pinkafeld the "Smart Connected Lighting" research group has been established, which is integrated into MATERIALS, the Institute for Surface Technologies and Photonics. In the next five years up to 15 staff members will be recruited. On the one hand, the share capital was increased by the participating interest and, on the other hand, an annual shareholder contribution will be made.

Financial 2018 was also a year of cooperation projects. What does this mean for JOANNEUM RESEARCH?

A significant innovation drive is obviously our integration into a national and international research network. With the Ministry of the Interior and the Austrian Armed Forces we have important strategic partners for the crucial challenges of the future in the areas of security, information and communication technologies, as well as disaster prevention. We also closely cooperate with all universities (in particular with Graz University of Technology, Medical University of Graz, Karl Franzens University of Graz and Montanuniversität Leoben) and Universities of Applied Sciences at those locations. Additional cooperation agreements with Leopold Franzens University Innsbruck, the University of Klagenfurt and the Università degli Studi di Udine enhance our academic and scientific portfolio.

What do you consider JOANNEUM RESEARCH's role at the interface to the business sector?

We develop our research portfolio according to the requirements of the local industries and support businesses in developing technologies, processes and innovative products. Our aim is to generate sustainable added value through key innovations for our partners, e.g. in the field of metal industries or the semiconductor industry, that creates a competitive edge for our customers and partners. The small and medium-sized enterprises are very important for the location too, and we strengthen and support their innovation capacity.

What is the role of international networking in applied research?

The Austrian economy is largely export-oriented and increasingly faces international competition. Integration into the international innovation system is an indispensable element of the research activities of all research areas of a business. In 2018 approximately one third of the research output of JOANNEUM RESEARCH was generated abroad; around 16% of our staff are foreign nationals.

The success of JOANNEUM RESEARCH is attributable to the staff's commitment and efforts. What importance is attached to developing competences on the job?

I take great personal interest in creating optimal framework conditions for researchers to lay the basis for innovative ideas. Constant development of staff skills will help to secure our success. We offer qualification measures for technical and personal training and continuing education to further individual performance in the best possible way. In connection with our core mission of knowledge transfer we also assume an important continuing training and qualification function, from bachelor theses to doctoral theses, in cooperation with our partner universities, and also by training apprentices.

In your opinion, what areas have the biggest future potential?

The areas of climate and sustainability have great potential, among other factors due to the effects of climate change. Another topic that concerns society as a whole is mobility. Here our research units focus on automated driving and smart mobility. In this connection also the mix of future drive means and fuels is fascinating: hydrogen, electricity, gasoline, gas. In robotics all major research topics are about cooperation between humans and robots, and robot safety. The area of production technologies with the subject of additive manufacturing, in particular 3D printing of metals, constitutes a highly interesting future field for local businesses.

Leading edge due to Styrian top research

With research and development expenditure of more than five per cent, the state of Styria is the number one research state in Austria and belongs to the most innovative regions in Europe. JOANNEUM RESEARCH is a major contributor to this excellent position. The second largest non-university research institution of Austria has long since become a firmly established part of the Styrian and Austrian research landscape.
JOANNEUM RESEARCH reached important milestones in the financial year 2018. The research company celebrated its 50th anniversary and looks back on half a century full of pioneering developments, technologies and innovations. In addition, important courses for the future were set. COREMED was founded in cooperation with the Medical University of Graz as a new research unit in the area of regenerative medicine, which is engaged intensively in wound healing. By means of an participating interest of the state of Burgenland the southern research axis was expanded and strengthened sustainably. Through this newly established cooperation research activities in the south of Austria will be bundled in an even better way, thereby increasing international visibility of Austrian research.
I would like to thank the managing director Wolfgang Pribyl and his entire team for their daily work and commitment and wish them all the best for the future.

Photo: Teresa Rothwangl

Barbara Eibinger-Miedl
Member of the Styrian Government for Economy, Tourism, Europe, Science and Research

Strengthening research in Carinthia

Our participating interest in JOANNEUM RESEARCH in an integral part of the southern research axis, by means of which we want to bring the state of Carinthia on top of Europe‘s research institutions. The fast and internationally noticed successes of such a young Institute as ROBOTICS of JOANNEUM RESEARCH in Klagenfurt show that we are on an excellent path towards achieving this goal. The cooperative approach of the state of Carinthia in the area of research and development is also followed by the units of JOANNEUM RESEARCH at Klagenfurt. An excellent example of this is the innovative “CapSize” project, for which JOANNEUM RESEARCH, Institute of ROBOTICS, has entered into a cooperation with the University of Klagenfurt and Carinthia University of Applied Sciences and which bundles the expertise of those three institutions in the areas of sensor technology, robotics and microelectronics. Twenty researchers already work for the ROBOTICS Institute. The completion of the new research building this year will herald the start of another development stage. Laboratory rooms with a height of six metres in the new building designated for research in the collaboration of robots and humans set new standards and open up new business fields. With the “Urban Living Lab” competence group of LIFE – Centre for Climate, Energy and Society a second important research focus was brought to Klagenfurt and adds further value to the location.
I would like to congratulate JOANNEUM RESEARCH on the successful financial year 2018 and look forward to the continued enhancement of our flourishing cooperation.

Photo: Gernot Gleiss

Dr Gaby Schaunig
Deputy Governor, Carinthia

Innovation drive for the state of Burgenland

In recent years the state of Burgenland has developed to become the number one educational state in Austria in many areas. Nevertheless, in order to secure this development also on a long-term basis and to further consolidate the attractiveness of our business location, expansion in the areas of research, innovation and technological development is indispensable.
A year ago the state of Burgenland acquired a share of 5% in JOANNEUM RESEARCH and has been engaged in the promising research area of “Smart Connected Lighting” since then. Lighting technology is currently undergoing a paradigm shift from a mere light source to comprehensive smart lighting concepts, which operate by sensor technology, controls, regulators, networks and communication. For the next few years it is planned that a team of highly qualified staff in the field of „optoelectronics” will carry out research in coordination with important regional enterprises.
The participating interest is not only an important element for expanding research activities in the state of Burgenland but also means a milestone for Burgenland for investing in applied research. JOANNEUM RESEARCH is an important partner for us, who knows how to implement the results of basic research in practical application by businesses.
I would like to congratulate on the successful financial year 2018 and look forward to continued good cooperation.

Photo: viaMas photography

Mag.ª Astrid Eisenkopf
Member of the Burgenland Government for Research and Innovation

Successful research at the forefront

JOANNEUM RESEARCH looks back on a very positive financial year 2018. Financial performance was very successful and creates a good basis for future projects. The company also excels scientifically. Numerous applications for registration of inventions, patents and publications were filed and granted and renowned awards were achieved in Austria and abroad, impressively reflecting the capabilities of JOANNEUM RESEARCH.
I would especially like to mention the participation of the state of Burgenland of establishing the "Smart Connected Lighting" research group in Pinkafeld. Thanks to the new ownership structure the attractiveness of the states of Styria, Carinthia and Burgenland as business locations can be strengthened even further. This shows the value and attractiveness of the company.
Around 450 staff members carry out research at the forefront and support the economy by implementing ideas. For this purpose it is indispensable not only to recruit the smartest minds but also to have the necessary research infrastructure in place. As the supervisory board chairman I therefore consider it important that the link between politics, businesses and research is warranted at all times and that research will be provided with the necessary time and funds for the welfare of mankind.
I look forward to another successful year in 2019 and to numerous new impulses and initiatives.

Photo: DI Martin Steinthaler | tinefoto.com

Dr Martin Wiedenbauer
Chairman of the
Supervisory Board

Excellence by competence and internationality

The financial year 2018 was characterised by a number of positive developments for JOANNEUM RESEARCH, which will have a sustainable positive impact on the research portfolio in the next few years. The participating interest of the state of Burgenland has allowed us to intensify the area of light technology by establishing a new location. Like in Carinthia additional positive effects are to be expected for all other research units as well. Alongside strategic planning also the research units located in Styria have developed numerous new projects and ideas which promise a positive development. Cooperation with the Styrian research institutions is very constructive and positive and in the case of the Medical University of Graz was made visible by the new foundation of COREMED, the Cooperative Centre for Regenerative Medicine. The successful acquisition of new research projects at a national and an international level was also very gratifying. The projects we have been awarded by competition and the many staff from different countries as well as the large number of international research and cooperation projects clearly show the strong scientific capabilities of the company.
As the chairman of the scientific advisory board of JOANNEUM RESEARCH I can therefore definitely underline the introductory sentence to the annual research programme 2019: "JOANNEUM RESEARCH is heading in the right direction".

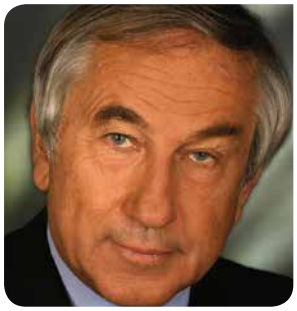


Photo: Sissi Furgler

Prof. Dr Dr Gerald Schöpfer
Chairman of the Scientific
Advisory Board

Facts and Figures

JOANNEUM RESEARCH Forschungsgesellschaft mbH develops solutions and technologies for a broad spectrum of industries and is engaged in top research at an international level.
With its focus on applied research and technology development the INNOVATION COMPANY holds a key position in technology and knowledge transfer.

7 research units

approx. **450** staff members

3 owners

State of Styria (80.75 %)

BABEG – Kärntner Betriebsansiedlungs- & Beteiligungsgesellschaft mbH (14.25 %)

Landesholding Burgenland GmbH (5%)

EUR **9.4** million shareholder contribution

80 % self-financing ratio

EUR **43.3** million research output

Scientific excellence

JOANNEUM RESEARCH serves to secure and enhance competitiveness of the research, innovation and business location with a focus on applied research and technological development. Scientific excellence and the performance of the staff of JOANNEUM RESEARCH are decisive elements for fulfilling the entrepreneurial tasks assigned by the owners and for the company's success.

194 **publications in technical journals, books, proceedings etc.**

299 **scientific lectures**

30 **patents (thereof 12 issued, 18 pending)**

14 **awards (thereof 9 national, 5 international)**

80 **academic theses (bachelor, master, doctoral)**

MATERIALS
Institute for Surface Technologies and Photonics

HEALTH
Institute for Biomedicine and Health Sciences

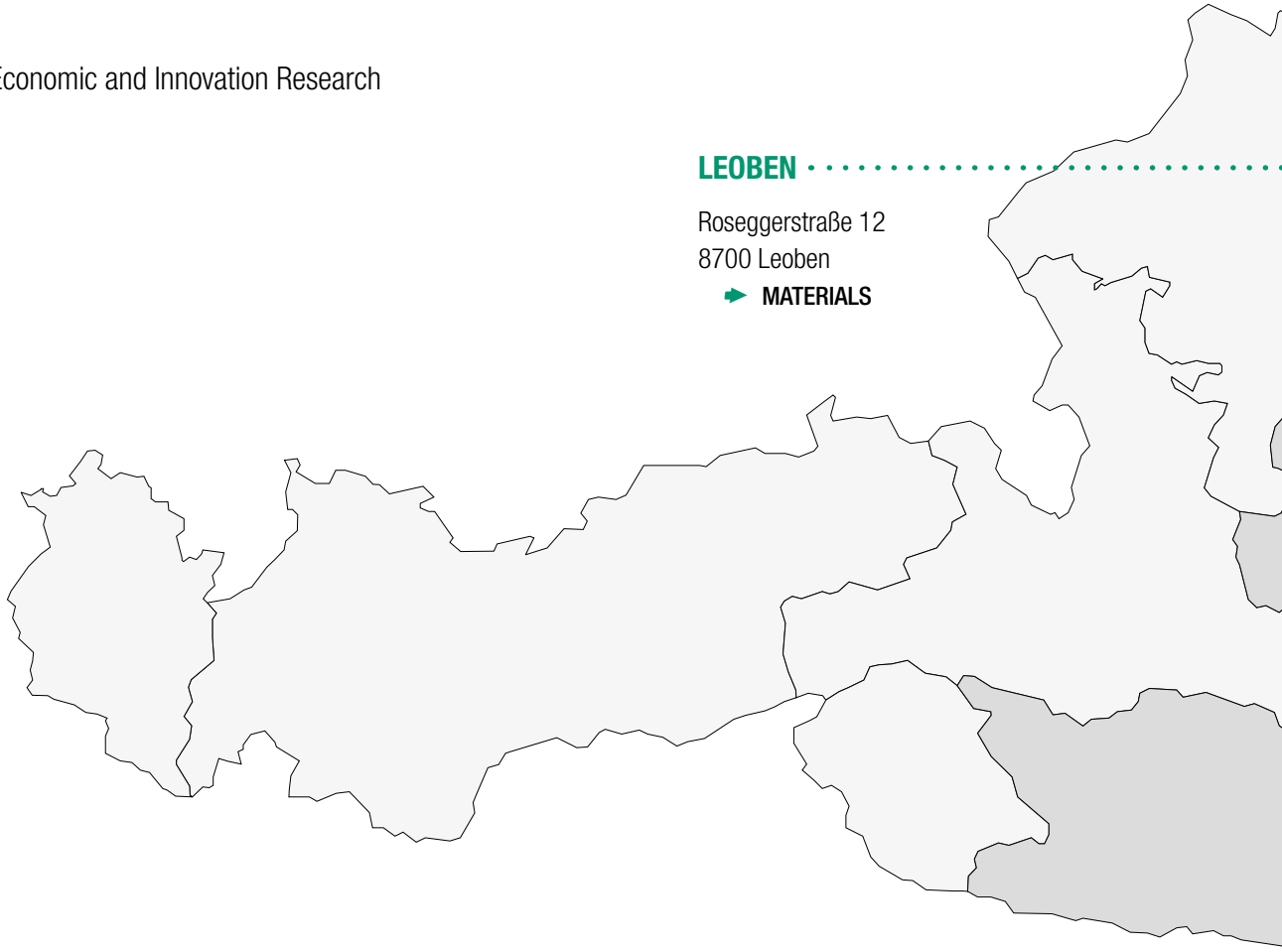
DIGITAL
Institute for Information and Communication Technologies

POLICIES
Institute for Economic and Innovation Research

ROBOTICS
Institute for Robotics and Mechatronics

LIFE
Centre for Climate, Energy and Society

COREMED
Cooperative Centre for Regenerative Medicine



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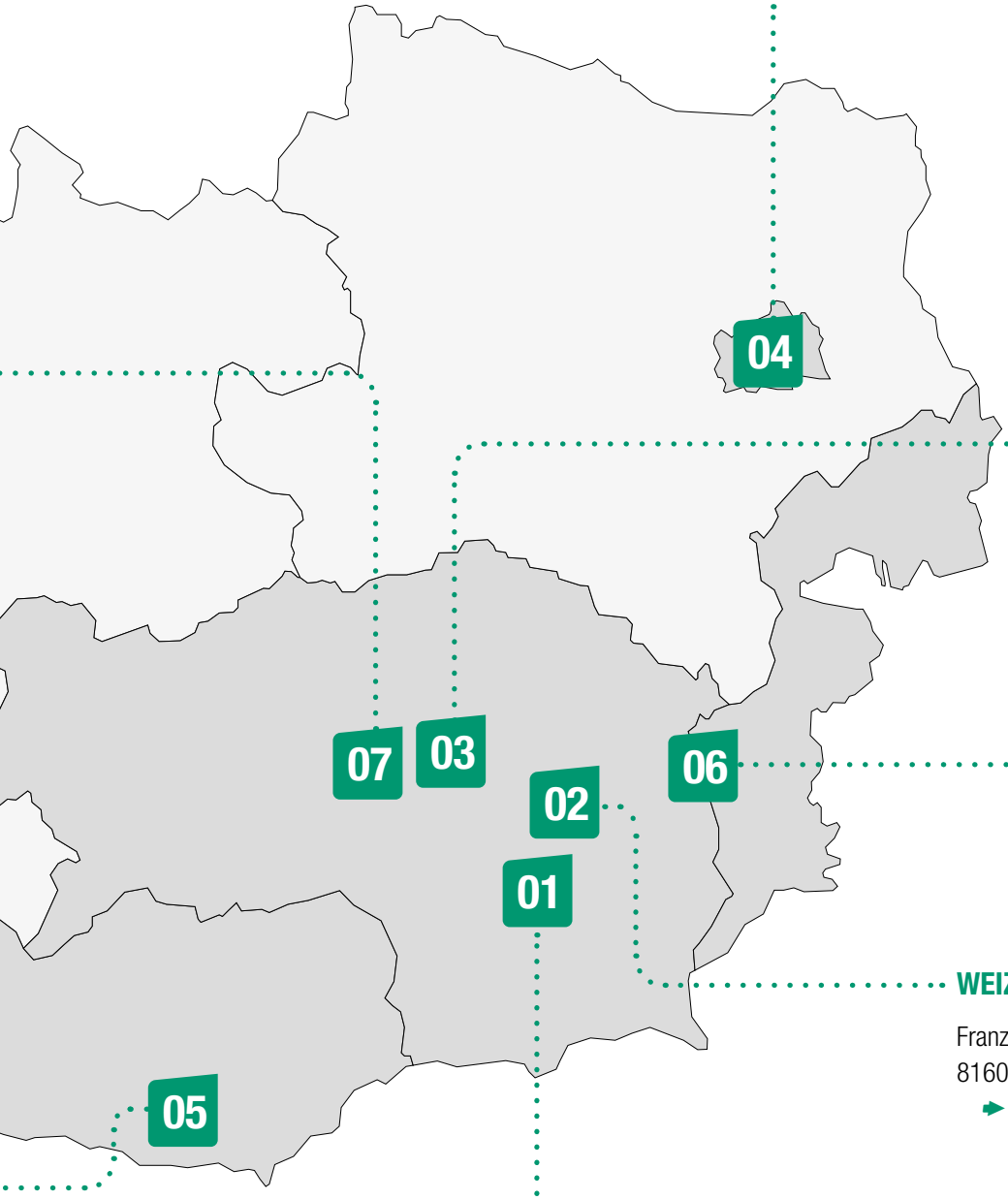
- POLICIES
- ROBOTICS

Research units and locations

as of: December 2018



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- **POLICIES**

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- **MATERIALS**

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- **MATERIALS**

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- **MATERIALS**

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- **Corporate Departments**
- **POLICIES**

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- **HEALTH**

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- **DIGITAL**

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- **LIFE**

»In financial year 2018 our important strategic cooperation with industrial and academic partners was intensified, in particular with the Graz University of Technology in the area of material sciences and nanotechnology. Due to our range of targeted offers for the business sector we have managed to bring the developed technologies up to even higher technology readiness level.«

Prof. Dr Paul Hartmann
Director MATERIALS

MoMiFlu@Foil

Under the FFG Project (Research Studio Austria) “MoMiFlu@Foil” manufacturing methods for integrated microfluidic systems on foils that are suitable for industrial application have been developed. Manufacturing is based on large-area embossing processes (step+repeat embossing, roll stamping), one of the institute‘s core research fields. A strategic goal is to establish the interdisciplinary research topic of “microfluidics” with a focus on “lab-on-foil” at the MATERIALS institute. Now the topic is firmly embedded in the institute strategy by subsequent funded projects and a number of projects commissioned by the industry.

SLM-AmorphMetMed

The objective of the feasibility study carried out for Fuchshofer Präzisionstechnik GmbH was a technical and commercial evaluation of the applicability of the SLM (selective laser melting) 3D printing technology for the manufacturing of products from amorphous metals (metallic glasses) for medical engineering. The main result can be described as the successful manufacturing of demonstrator components from medical engineering from an amorphous zirconium alloy by means of SLM. It was possible to prove amorphousness and to achieve material densities of more than 99.7%.

JOANNEUM RESEARCH MATERIALS

MATERIALS Institute for Surface Technologies and Photonics

Using modern technologies and processes based on miniaturisation, integration and material optimisation MATERIALS offers interdisciplinary solution approaches for the entire value-added chain. This includes large-scale microstructures and nanostructures, biosensors and chemical sensors, light technologies, functionalised surfaces and laser processes.

RESEARCH GROUPS

- Hybrid Electronics and Patterning
- Light and Optical Technologies
- Laser and Plasma Technologies
- Sensors and Functional Printing
- Smart Connected Lighting

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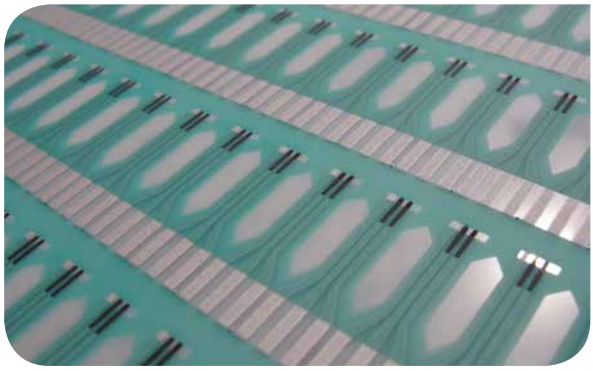

Flex-Si-Sens

The objective of the project, which is being carried out jointly with Infineon Technologies AG, SteadySense GmbH, CTR Carinthian Tech Research AG and SCIO Holding GmbH, is the development of smart electrochemical disposable sensors on test strips based on a microchip as a platform for measuring physiological parameters. The test strips are equipped with microfluidics for transporting samples, and with a capture of red blood cells. One of the first applications is planned to be measuring of potassium in the medical sector and the measuring of lactate in the lifestyle sector.

Picture: iStock

TraceFATT

Obesity is one of the biggest challenges the health economy will have to face in the next few decades. Increasing energy consumption by changing the composition of adipose tissue is a new promising treatment alternative for adiposis. This can also be induced by medication. In TraceFATT, a project under the funding agreement with the Federal Ministry of Transport, Innovation and Technology, new methods based on stable isotope marked intermediate metabolic products have been developed, which may be used alone or in combination to analyse energy flows in the body.

JOANNEUM RESEARCH HEALTH

»With its core technologies the HEALTH institute is a world-wide provider of top research for the researching and manufacturing pharmaceutical industry and public health care. However, 2018 has once again shown: if you want to improve medical care you need a good amount of staying power.«

Prof. Dr Thomas Pieber
Dr Frank Sinner
Directors HEALTH

RESEARCH GROUPS

- Biomedical Tissue Monitoring
- Bioanalysis and Metabolomics
- Health Sciences
- Competence Group Clinical Decision Support
- Competence Group Medical Sensors

HEALTH Institute for Biomedicine and Health Sciences

HEALTH acts as the link between basic medical research and industrial application. Due to the proximity to the Medical University of Graz and the University Hospital Graz we are able to offer holistic solutions.

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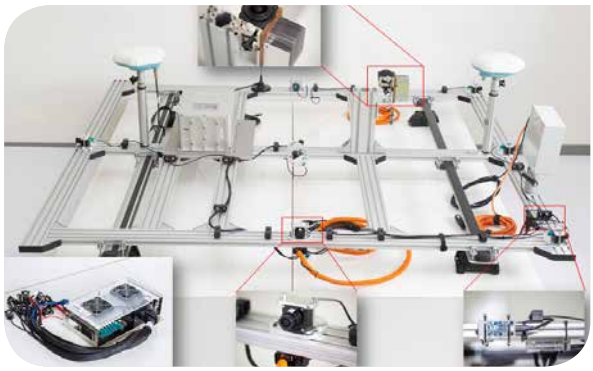
»Nowadays digitisation affects all areas of our life and business dealings. Digital technologies have become the key technology in many industries. DIGITAL pro-actively helps to shape this euphoric mood. This concerns automated driving and the areas of security, defence, new space and new data economy models in remote sensing alike.«

Dr Heinz Mayer
Direktor DIGITAL

AeroChannel

Receiving satellite signals on aircraft may be strongly influenced by reflections. Software models allow the planning of appropriate satellite connections. On behalf of the European Space Association (ESA) a study was carried out jointly with the German Aerospace Center and the University of Vigo, Spain, to verify model calculations by flight measurements. The Austrian Armed Forces carried out the flight experiments. The team won the “Best Paper Award in Propagation” for the results at an international conference (EuCAP 2018).



Fusion

It‘s not longer possible to imagine life without satellite-based navigation systems (GNSS). However, there may be conditions under which the systems do not operate, sometimes not at all, such as in tunnels, or only insufficiently, as in an urban environment. Geolocating with guaranteed accuracies is absolutely necessary for certain applications, such as automated driving. Therefore, a system has been developed under a project of the Federal Ministry of Transport, Innovation and Technology, which, on the basis of alternative sensor technology (including camera systems, radar) and of sensor fusion with GNSS as well as of taking into account digital urban models, significantly improve geolocating and navigation.

JOANNEUM RESEARCH DIGITAL

RESEARCH GROUPS

- Remote Sensing and Geoinformation
- Machine Vision Applications
- Space and Communication Technology
- Connected Computing
- Intelligent Acoustic Solutions
- Competence Group Cyber Security and Defence

DIGITAL Institute for Information and Communication Technologies

DIGITAL is a reliable partner for digital innovation and transformation and develops practice-oriented high-tech solutions for the business segments of Mobility, Space, Industry, Security and Defence, Energy and Environment, AAL and Digital Care and Culture and Creative Industries.

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Evaluating health research

The Health Research Framework Programme (2010 – 2018) serves the purpose of strategically designing the health research policy in Germany. Together with Prognos AG POLICIES and HEALTH have evaluated the implementation and effects and identified future thrusts in the area of health research, which were discussed with an international board of experts. Recommendations were made, most of which were taken up by the Federal Ministry of Education and Research when the Framework Programme was revised.

gendERC

The objective of this project was to identify potential gender-specific influences on the evaluation of ERC (European Research Council) Starting Grants. For this purpose the design of scientific excellence and the peer review process in general as well as the composition of the review panel were analysed. The results show that actually the lower success ratios of female applicants compared to male applicants cannot be explained by poorer past performance.

JOANNEUM RESEARCH POLICIES

»POLICIES is significantly involved in developing ‚mission-oriented' policies in the EU and in Austria, by which politicians are looking for answers to big social challenges.«

Wolfgang Polt
Director POLICIES

FORSCHUNGSGRUPPEN

- Technology, Innovation and Policy Consulting
- Data Analytics and Statistical Modelling
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POLICIES
Institute for Economic and Innovation Research

POLICIES supports businesses, politicians, research institutions and organisations with regard to their technology and innovation strategies, evidence-based policies or regional location assessments as well as in data-based innovation projects. Entrepreneurial or political decisions can thus be made on the basis of objective facts.

CapSize – Collaborative human-robot work areas

In 2018 the “CapSize” project was launched. Its objective is to develop a modular “human-robot work area” where a person will be able to collaborate and interact safely and intuitively with a robot. Here an innovative sensor system for environmental perception that is integrated into the human-robot working cell is used. This project is carried out by ROBOTICS in cooperation with the University of Klagenfurt and the Carinthia University of Applied Sciences and co-funded by the European Regional Development Fund (ERDF).

DR.KORS – Dynamic reconfigurability of collaborative robot systems

Together with industrial and academic partners ROBOTICS is engaged in realising flexible and safe use of collaborative robots, such as enclosed industrial robots, and sensitive mobile manipulation in a broad industrial context. In future collaborative robot systems should be able to adapt quickly to changing work environments or quickly solve new tasks after a modification of their movement, always with the proviso that they act safely and do not put human colleagues in danger.

JOANNEUM RESEARCH ROBOTICS

»Establishing ROBOTICS in Klagenfurt am Wörthersee, on the one hand, has a national effect due to the local business partners in joint research projects and, on the other hand, an international effect due to the strong appearance together with the University of Klagenfurt in the global research environment.«

Dr Michael Hofbaur
Director ROBOTICS

RESEARCH GROUPS

- Cognitive Robotics
- Mechatronic Systems
- Robotic Systems
- Competence Group ROBOTICS Evaluation Lab

ROBOTICS Institute for Robotics and Mechatronics

ROBOTICS primarily works on research topics concerning collaboration and interaction between humans and robots in innovative production processes and on robot safety.
In addition, topics of mobile robotics in the areas of industrial manufacturing and logistics and serve robotics in general are dealt with.

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Picture: iStock

Critical raw materials for electric vehicles

Under the “Hybrid & Electric Vehicle Technology Collaboration Programme” of the International Energy Agency (IEA) LIFE is developing future scenarios for critical raw materials in the area of electromobility. In this programme potential aspects of future provision of critical raw materials for electric vehicles are highlighted that in the sense of the European or Austrian battery initiative allow sustainable production of batteries and integration into vehicles as a competitive advantage.

Picture: iStock

COMPILE – research on non-central energy systems

The “COMPILE” project is being implemented to develop Local Energy Communities (LEC) in five EU countries. LEC enhance the current concept of microgrids by expanding the technical level by the level of the players and corresponding business models. As accompanying research LIFE evaluates the climate effect of solutions by means of a life cycle analysis, promotes the development of new business models and regulatory framework conditions and analyses social factors.

»With our research tasks, the central focus of which is monitoring the effects of climate change at an ecological, economic and social level, we are at the cutting edge, which is also shown by the successful conclusion of the past financial years.«

Dr Franz Prettenthaler, M.Litt
Director LIFE

RESEARCH GROUPS

- Weather and Climate Risk Management
- Future Energy Systems and Lifestyle
- International Climate Policy and Economics
- Competence Group Urban Living Lab

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LIFE
Centre for Climate, Energy and Society

LIFE deals with crucial issues of climate change. The clear social mission of LIFE includes the strengthening of resilience to climate and weather risks and the transition to a low-carbon economy and society by 2050.

Topical administration of haemoglobin: a safety study

With this project COREMED and its partners have been able to show very clearly that the topical administration of haemoglobin by means of a bag-on-valve system is safe. With this special form of “spray application” neither nanoparticles nor dust are released. Moreover, the concentrations of measured particles in the air were considerably below the permitted limits defined by Austrian law. Accordingly, the application is considered safe and suitable for medical use if a bag-on-valve system is used.

Antiseptic wound dressings: easy to use

Wound infections after burn injuries are a dreaded “complication”. The aim was to develop an antiseptic wound pad which can be quickly and easily adapted to various needs (e.g. bacterial spectrum etc.). It has been proved that a special BNC (bacterial nanocellulose)-based wound pad is suitable for this purpose as it can be loaded with different antiseptic solutions and under clinical conditions within 30 minutes and will then have a sufficient “bactericidal” effect.

JOANNEUM RESEARCH COREMED

»As early as in the first year after its foundation COREMED has been perceived as an important partner for interdisciplinary overall solutions in R&D services, e.g. for the pharmaceutical and medtech industry. Here, COREMED has deliberately positioned itself at the interface between medicine and technology with a strong orientation towards users and for the long-term benefit of society.«

Prof. Dr Lars-Peter Kamolz, MSc
Director COREMED

COREMED Cooperative Centre for Regenerative Medicine

COREMED covers basic medical research and preclinical and clinical research in the area of regenerative medicine, in particular wound healing and tissue regeneration, in close coordination and cooperation with the Medical University of Graz.

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Events and conferences

7 March 2018

8th Future Conference and 50th anniversary

The general topic of the event was "internationalisation" and research in a global context was presented. The principal lecturer, Dr Franz M. Androsch, Head of R&D and Innovation of voestalpine AG, talked about strategies leading a company to success by means of global R&D partnerships. Following the Future Conference a ceremony was held on the occasion of the 50th anniversary of JOANNEUM RESEARCH.

13 April 2018

Long Night of Research

Around 27,000 people contributed to a new visitor record at the Long Night of Research at 34 locations in Graz, Kapfenberg and Leoben. JOANNEUM RESEARCH coordinated the event on behalf of the state of Styria and delighted the visitors to the Centre for Knowledge and Technology Transfer in Medicine with life-prolonging smoothies and the opportunity to slip into the role of a surgeon, which was made possible jointly with the Medical University of Graz.

16 to 19 April 2018

Transport Research Arena

Under the theme "A Digital ERA for Transport – Solutions for Society, Economy and Environment" around 3,000 international experts met at Europe's biggest transport research conference to discuss developments in the area of mobility and most recent research results. DIGITAL presented the acoustic tunnel monitoring AKUT.

23 to 27 April 2018

Hanover Fair

MATERIALS and DIGITAL presented the PyzoFlex® technology at the world's biggest industrial fair in Hanover with more than 210,000 trade visitors, more than 5,000 exhibitors and 75 participating nations.

Events and conferences

19 to 22 June 2018

automatica

Attracting around 900 exhibitors and more than 46,000 international trade visitors automatica is the leading fair for intelligent automation and robotics. DIGITAL and ROBOTICS presented the results of their joint "Collaborative Robotics" project by means of an applied use case for interaction between humans and robots.

20 July 2018

Groundbreaking ceremony for Lakeside

After the groundbreaking ceremony for the fifth construction stage of the Klagenfurt Lakeside Science & Technology Park laboratories are being set up for the ROBOTICS institute. The new building allows establishing a testing institute for robot safety.

20 July 2018

Decoration of honour

On the occasion of the groundbreaking ceremony for the Klagenfurt Lakeside Science & Technology Park managing director Prof. Dr Wolfgang Pribyl was awarded the state of Carinthia's Grand Decoration of Honour in Gold by the Governor of Carinthia, Dr Peter Kaiser.

15 to 30 August 2018

European Forum Alpbach

The theme of the European Forum Alpbach 2018 was "diversity and resilience". As part of the health talks the HEALTH institute invited guests to a session entitled "Disease Management Programmes and Digitisation of Medicine". The POLICIES institute organised a working group on the topic of "disparity and resilience in the digital economy".

Events and conferences

12 September 2018

Fast Forward Award

JOANNEUM RESEARCH received the Fast Forward Award for the MATERIALS project of “diagnostics for comprehensive early detection of antibiotic-resistant germs” in the category “universities and research facilities/institutions of applied research and development”.

21 September 2018

Cooperation with the Austrian Armed Forces

On 21 September 2018 the five-year-long cooperation between the Austrian Armed Forces and JOANNEUM RESEARCH was renewed for another five years in the presence of Federal Minister Mario Kurnasek. The Austrian Armed Forces are an important strategic partner for challenges in the areas of security, information and communication technologies and in the area of disaster prevention.

25 September 2018

59th Digital Dialogue: focusing on robot safety

On 25 September 2018 the 59th Digital Dialogue on the topic of physical and cyberphysical robot safety was held at Klagenfurt. The event of the Silicon Alps Cluster was organised by JOANNEUM RESEARCH as the lead partner. In his keynote speech Federico Vicentini, PhD, from the National Research Council of Italy addressed critical issues of collaboration between humans and robots.

17 October 2018

Forum JOANNEUM RESEARCH

On 17 October 2018 another JOANNEUM RESEARCH Forum was held at JOANNEUM RESEARCH, this year‘s topic being “European Research: a contribution to strengthening European identity and belonging”. A large interested audience followed the keynote speech given by Richard Kühnel, representative of the European Commission in Germany, and discussed questions regarding the added value for Austria and the society generated by research and development and what measures Europe would be required to take.

Events and conferences

4 October 2018

Inauguration of the Pinkafeld location

On 4 October 2018 the inauguration of the new location in Pinkafeld was celebrated at the Burgenland Technology Centre in the presence of Federal Minister Norbert Hofer and Governor Hans Niessl. The “Smart Connected Lighting” research group has been positively received by businesses and research institutions in the state of Burgenland.

8 November 2018

Cooperation with the Università degli Studi di Udine

The cooperation agreement with the Università degli Studi di Udine also includes an exchange of expertise, joint academic events and conferences, project work and publications. An exchange of academic staff is also part of the cooperation.

15 November 2018

“Work & Production” exhibition

Know-how of MATERIALS and ROBOTICS was also in demand at the “Work & Production” exhibition at the Technical Museum of Vienna. MATERIALS presented innovations from the 3D laser printer. ROBOTICS contributed substantial content to the “Human & Robot” area of the exhibition.

4 to 6 December 2018

ICT 2018: Imagine Digital – Connect Europe

JOANNEUM RESEARCH presented itself at the ICT 2018, the European key event for research and innovation in information and communication technology (ICT) at the Austria Center Vienna.

Steirisches Know-how im Technischen Museum

Wenn Metallkugeln springen

In der aktuellen Ausstellung im Technischen Museum Wien ist das Know-how der JOANNEUM RESEARCH gefragt.

Die MATERIALS-Forschungsgruppe „Laser- und Plasmatechnologien" am Standort Niklasdorf der heimischen Forschungsschmiede JOANNEUM RESEARCH lieferte für die neue, Mitte November eröffnete Ausstellung *Arbeit & Produktion* im Technischen Museum Wien ein viel beachtetes Ausstellungsstück, nämlich eine Metallkugel aus dem 3D-Laserdrucker. Die hohle, strukturierte Metallkugel hat eine besondere Eigenschaft: Wird sie fallen gelassen, springt sie aufgrund ihrer elastischen Struktur. Zur Herstellung dieser Struktur verwendeten die Experten von MATERIALS die additive Fertigungstechnologie des sogenannten „Selektiven Laserschmelzens". Mit Hilfe dieses Pulverbettverfahrens können beliebige Geometrien aus Metall durch iteratives, also wiederholendes Aufschmelzen von Pulverschichten mithilfe eines Lasers hergestellt werden. Aufgrund der nahezu grenzenlosen geometrischen Designfreiheit und Flexibilität des Verfahrens kommt es vor allem in den Bereichen Prototypenfertigung, Produktion von Spezialwerkstücken und Herstellung maßgeschneiderter Implantate zum Einsatz.

Mensch & Roboter

Auch das Institut ROBOTICS lieferte zur Gestaltung des Ausstellungsbereiches „Mensch & Roboter" wesentliche inhaltliche Beiträge. So wurde die Expertise von ROBOTICS im Bereich der messtechnischen Erfassung der Robotersicherheit in ein „greifbares" Ausstellungsstück umgesetzt. Dieses Exponat veranschaulicht, wie sich eine ungewollte Mensch-Roboter-Kollision auf die unterschiedlichen Körperteilen auswirkt, indem es anhand von Druckknöpfen die zulässige Krafteinwirkung demonstriert. So können sich die Besucher in die Rolle des Roboters versetzen und eben diese Kräfte als Hands-on-Experiment erfühlen bzw. „erdrücken". In einer Videobotschaft erklärt Univ.-Doz. DI Dr. Michael Hofbaur, Direktor des Instituts ROBOTICS, Forschungsthemen zum Thema Produktion der Zukunft mit roboterbasierter Automatisierung und spricht über die Grenzen der aktuellen Robotertechnologie. ■

www.joanneum.at

JOANNEUM RESEARCH

Raffinierte Scanner am Autodach

Erstmals in Österreich: ein System, das im Fahren die Umgebung vermisst, wurde nun von Joanneum Research angeschafft.

Der Automobilsektor treibt auch im 21. Jahrhundert die Forschung voran, derzeit gewinnt das Thema „autonomes Fahren" immer mehr an Bedeutung. Um hier den Anschluss zu behalten bzw. sich an die Spitze zu setzen, hat auch die Forschungsgesellschaft Joanneum Research, die im Besitz des Landes Steiermark ist, ihre Infrastruktur aufgerüstet.

Mit Landeshilfe (Forschungs-Landesrätin Barbara Eibinger-Miedl) wurde ein „Mobile Mapping System" im Wert von 500.000 Euro von der renommierten Firma Leica gekauft, JR-Chef Wolfgang Pribyl konnte das System – es ist das erste derartige in Österreich – kürzlich entgegennehmen. Damit können vom Autodach aus statische Objekte erfasst und vermessen werden – eine Grundvoraussetzung dafür, dass ein autonom fahrendes Fahrzeug seinen Weg findet. Diese Daten werden zu präzisen Karten weiterverarbeitet.

Das System besteht aus einem Laserscanner, aus 360-Grad-Kameras und aus Geräten zur Auswertung hochgenauer Satellitennavigationsdaten. Arbeiten wird man damit am Institut für Informations- und Digitalisierungstechnologien unter Leitung von Heinz Mayer.

Pribyl (JR), Landesrätin Eibinger-Miedl, Mayer (JR) LAND STMK

Vertrauen zur Maschine fassen. „Die wichtigste Grundvoraussetzung für die Kollaboration von Mensch und Maschine ist, die Sicherheit des Menschen zu gewährleisten", sagt Michael Hofbaur vom Joanneum-Institut für Robotics. (Joanneum Research)

Robotik. Von Mr. Data aus „Star Trek", der (fast) wie ein Mensch agiert, sind wir weit entfernt. Bei Robotern, die im Industriebereich eingesetzt werden, handelt es sich vorwiegend um Greifarme.

Vertrauen zur Maschine fassen

VON LISBETH LEGAT

Zwei Millionen Industrieroboter sind derzeit im Einsatz. Bis 2020 sollen es etwa drei Millionen sein. Das Robotics-Institut der Joanneum Research Forschungsgesellschaft in Klagenfurt beschäftigt sich intensiv mit den Möglichkeiten der Zusammenarbeit von Mensch und Roboter – hauptsächlich, aber nicht nur – im Industriebereich.

„Die wichtigste Grundvoraussetzung für eine solche Kollaboration ist, die Sicherheit des Menschen zu gewährleisten. Das heißt, der Roboter, meist geht es hier um Greifarme, muss so programmiert sein, dass er seine Umgebung nicht nur sensorisch erfassen, sondern auch dementsprechend auf sie reagieren kann", erläutert Institutsleiter Michael Hofbaur. Das Thema ist ein äußerst komplexes, da es letztlich auch die Wirtschaftlichkeit einer Mensch-Roboter-Kollaboration umfasst.

„Wenn ein Roboter neben oder mit Menschen arbeitet, muss sich das auch wirtschaftlich rechnen – und da beginnen dann oft die Schwierigkeiten, denn es gibt einen sehr strikten Normenrahmen, was die Sicherheit betrifft. Das kann aber zum Beispiel bedeuten, dass ein Roboter wesentlich langsamer arbeiten muss, als es eigentlich möglich wäre", erklärt Hofbaur einen Teil der Problematik.

Schwer zu stoppende Riesen

Das größte Problem im Industriebereich sei, einen Roboter rechtzeitig zu stoppen. „Das ist eine durchaus herausfordernde Aufgabe für einen schweren Industrieroboter, da man ja die Gesetze der Physik nicht außer Kraft setzen kann." Einen Roboter näher als einen halben Meter an einen Menschen heranzulassen, ist schwierig. Die installierten Kameras arbeiten meist nur bei größeren Distanzen zuverlässig.

Die Forschungstätigkeit von Hofbaurs Team nimmt aber auch das Umfeld in den Blick. „Um eine Zusammenarbeit mit dem Menschen zu ermöglichen oder zu erleichtern, kann man sich etwa überlegen, wie die Arbeitsabläufe sind, wie das Werkzeug, mit dem der Roboter arbeitet, ausschaut, wie Werkstücke gehalten werden oder ob man die Bewegungen der Maschine ändern soll", sagt Hofbaur. Dass sich hier in den vergangenen Jahren viel getan hat, ist unbestritten. „Lange Zeit waren etwa Zwei-Finger-Greifer nicht sicher. Heute kann man sie so programmieren, dass genau definiert werden kann, was sie ergreifen müssen und selbst bemerken, wenn sie etwas Falsches in der Hand haben. Man muss immer bedenken, dass ein Roboter seine Aufgabe überwiegend blind ausführen muss", so Hofbaur über die Fortschritte in dem Feld.

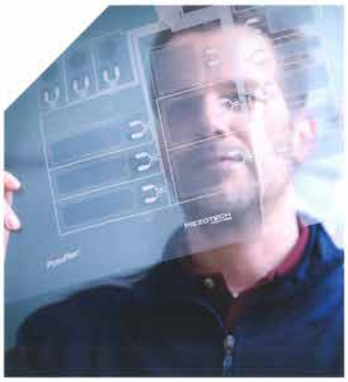
Am Klagenfurter Institut beschäftigen sich die Forscher zudem mit Leichtbaurobotern. Ihr Vorteil ist, wie schon ihr Name verrät, dass sie nicht mehr so schwer und die Gelenkverbindungen nicht mehr so starr wie bei herkömmlichen Robotern sind. Ihr Nachteil – sie arbeiten nicht ganz so präzise – wird durch die Regelungstechnik kompensiert. Hofbaur: „Durch diese Bauweise kann man dem Roboter auch neue Aufgaben übertragen, wie die Manipulation mit weichen Bauteilen, etwa Schläuchen, oder man kann ihn auch etwas polieren lassen."

Der nächste Schritt ist die Entwicklung eines Roboterarms auf einem mobilen Roboter. „Das brächte mehr Flexibilität, der Roboter könnte dann seinen Arbeitsplatz wechseln, Hilfsdienste ausführen, etwa Bauteile zum Arbeitsplatz bringen oder den Arbeitsplatz sauber halten", denkt Hofbaur weiter. „Die größte Schwierigkeit ist und bleibt aber der physische Kontakt zwischen Roboter und Mensch."

LEXIKON

Unter Roboter versteht man im technischen Bereich einen (mit Greifarmen ausgerüsteten) Automaten, der ferngesteuert oder nach Sensorsignalen bzw. einprogrammierten Befehlsfolgen bestimmte mechanische Tätigkeiten verrichtet.

Die Robotik beschäftigt sich mit der Entwicklung und Steuerung von Robotern. Sie umfasst Teilgebiete der Informatik, Elektrotechnik und des Maschinenbaus.



„DER EINZIGE NACHTEIL DER TECHNOLOGIE IST ZUGLEICH IHR VORTEIL: ES GIBT SIE NICHT VON DER STANGE, SONDERN NUR MASSGESCHNEIDERT FÜR DEN ZWECK."

GREGOR SCHEIPL
JOANNEUM RESEARCH MATERIALS

DER NAME PYZOFLEX

Der piezoelektrische Effekt (von altgr. piezein = drücken, pressen) beschreibt die Änderung der elektrischen Polarisation und somit das Auftreten einer elektrischen Spannung an Festkörpern, wenn sie elastisch verformt werden.

Der pyroelektrische Effekt (von altgr. pyreia = brennen) ist die Eigenschaft einiger piezoelektrischer Kristalle, auf eine Temperaturänderung mit Ladungstrennung zu reagieren, also elektrische Energie freizusetzen.

PyzoFlex produziert die Spannung für die Signalverarbeitung selbst und ist somit energieautark. Angesichts des massiven Energiebedarfs im Zuge der Digitalisierung, der die Industrie zunehmend vor Herausforderungen stellt, ist das ein schlagkräftiges Argument.

ELEKTRONISCHER TIEFSCHLAF

Benötigen konkurrierende Sensoren ein konstantes elektrisches Feld, um Bewegung wahrzunehmen, liegt die Elektronik bei PyzoFlex im Tiefschlaf. Spannung tritt erst dann auf, wenn der Sensor aktiv wird. Pluspunkt: kein unnötiger Elektrosmog. Während andere Materialien zudem empfindlich auf Umwelteinflüsse reagieren und beispielsweise bei Feuchtigkeit fehleranfällig werden, verhält sich das PyzoFlex-Polymer ähnlich wie Teflon und ist extrem widerstandsfähig – wesentlich für den Einsatz in Fahrzeugen oder Kleidung.

ROHDIAMANT

Den Startschuss für die Innovation gab die Dissertation des Mineralogen und PyzoFlex-Masterminds Martin Zirkl im Jahr 2007. Eher zufällig stieß Gregor Scheipl zum Projekt, denn er studierte ursprünglich Gesteinschemiker an der Grazer Karl-Franzens-Universität und kam erst im Zuge seiner Diplomarbeit ans Joanneum-Institut in Weiz. Erfolgten die ersten Schritte noch vorwiegend im Forschungsumfeld, sprich: Labor, so kam 2014 der erste öffentliche Durchbruch. *„Wir stellten PyzoFlex auf der Technologiemesse in Hannover vor. Die Resonanz war enorm. Da wurde uns klar, dass wir einen echten Rohdiamanten in den Händen halten"*, berichtet Scheipl. Polymertinte und Sensoraufbau sind patentiert, drei weitere Komponenten zum Patent angemeldet.

AUTODIDAKTIK

Um mit der Technologie marktfähig zu werden, musste das nunmehr zehnköpfige PyzoFlex-Team über die klassische Forschung hinausdenken und Strategien der Produktentwicklung erlernen: *„Und zwar weitgehend autodidaktisch"*, erklärt Gregor Scheipl. *„Dieser Schritt von der Technologieforschung im Labor zur marktfähigen Innovation ist eine Herausforderung."* Intern arbeiten im Entwicklungsteam Chemiker, Physiker, Elektrotechniker und Toningenieure Hand in Hand, extern kooperiert(e) man im Rahmen geförderter Projekte mit internationalen Partnern aus

Computer holt Hilfe und erinnert an das Trinken

Steirisches Wissenschaftspanorama

Ein „Wunderding" von Joanneum Research ermöglicht es älteren Menschen, länger in ihren eigenen vier Wänden zu bleiben. Getestet wird das System noch bis Herbst.

GERALD SCHWAIGER

Sicher zuhause: Eine Innovation erleichtert älteren Menschen, die zuhause bleiben wollen, das tägliche Leben.

Foto: Zoe Karapetyan / Good Life Crew

Das Schlagwort der Stunde ist zweifelsohne „Digitalisierung". Das Thema zieht sich durch viele Lebens- und Arbeitsbereiche, einer davon ist das selbstbestimmte Leben im Alter. Bei Digital, dem Institut für Informations- und Kommunikationstechnologien der steirischen Joanneum Research, ist einer der Forschungsschwerpunkte „Active & Assisted Living", in dessen Rahmen Technologien für ältere oder beeinträchtigte Menschen erforscht werden.

Die entsprechenden Testregionen sind der Raum Graz, Leibnitz und Deutschlandsberg. Ziel des Projekts ist es, Senioren dabei zu unterstützen, dass sie länger in ihrer gewohnten Umgebung wohnen können.

„Wichtig ist uns dabei, Technologien herauszufiltern, die von den älteren Menschen auch wirklich angenommen werden", erklärt Projektleiter Kurt Majcen.

Bei diesem Projekt kooperiert Joanneum Research mit dem Pflegewohnheim Kirschallee, dem Sozialverein Deutschlandsberg, den Geriatrischen Gesundheitszentren der Stadt Graz sowie einem Elektrotechnik-Unternehmen.

Wie das innovative System funktioniert

Und so funktioniert's: Auf einem Tablet (also einem handlichen Computer) können Daten wie Gewicht, Blutdruck und Puls selbst eingegeben und bereits eingegebene Werte wieder angesehen werden. Der Verlauf der Messungen kann dem Pflegepersonal oder Angehörigen gezeigt werden, damit diese einen Eindruck vom Gesundheitszustand des Heimbewohners erhalten. Via Tablet oder Smartwatch (einer Uhr) werden die Studienteilnehmer mit einer kurzen Nachricht erinnert, wenn es Zeit für die Medikamenteneinnahme ist oder dass wieder getrunken werden soll.

„Die RegionAAL Smartwatch zeigt aber nicht nur die Uhrzeit an. Sie misst auch die Anzahl der Schritte und erkennt, wenn jemand gestürzt ist. In diesem Fall ruft die Uhr eine Vertrauensperson an", erklären die Organisatoren.

Weitere Technologien für die Sicherheit zu Hause sind der mobile Funk-Gong, der ein akustisches und ein Licht-Signal aktiviert, sobald jemand an der Eingangstüre läutet sowie das Licht, das sich in der Nacht beim Aufstehen automatisch einschaltet und den Weg zum Bad oder WC mit angenehmem Licht erhellt.

Hat man die Herdplatte abzudrehen vergessen, wird der Herd von der automatischen Abschaltung – durch Bewegungs- und Temperatur-Sensoren gesteuert – auf „Aus" gestellt.

Video-Telefonate mit den Verwandten

Wohnen die Verwandten weiter entfernt? Video-Telefonate sind so einfach wie normale Telefonate. Neben den Erinnerungs- und Kommunikationsfunktionen sind zur Unterhaltung auch Spiele installiert.

Die einjährige Testphase in mehr als 100 Testhaushalten in der Steiermark läuft noch bis Herbst, sie wird auch wissenschaftlich begleitet. Ein positives Beispiel für Digitalisierung, das zeigt, dass diese das Leben der Menschen positiv beeinflussen kann!

Computertechnik unterstützt steirische Senioren im Alltag. Die Uhr (links oben) misst Schritte und erkennt auch Stürze

WISSENSCHAFT IN KÜRZE

Leoben forscht

Biogene Materialien stehen an der Montanuni Leoben im Fokus: Der Forschungsbereich „Renewable Materials Processing" erhält den Zuschlag für die Projekte „ReNOx 2.0" und „Bio-HTL" mit einem Gesamtvolumen von gut 1,6 Millionen Euro. Unter der Leitung von Markus Ellersdorfer beschäftigen sich die Forscher mit dem Einsatz biogener Roh- und Reststoffe in industriellen Prozessen.

Jugend forscht

„Wissenschaft hautnah" – unter diesem Motto stehen die „Science Days" des Kinderbüros, in deren Rahmen Schulen und Kindergärten eingeladen werden, eine Forschungseinrichtung kennenzulernen. Kürzlich besuchten Kinder der VS Mitterdorf und der VS Weizberg Joanneum Research am Standort Weiz und erlebten einen spannenden Vormittag rund um das Thema Licht.

Foto: Manuela Schwarzl

Forschung zum Angreifen in Weiz

Pinkafeld

Standort der JOANNEUM RESEARCH eröffnet

Das Burgenland beteiligte sich im April 2018 mit fünf Prozent an der JOANNEUM RESEARCH und engagiert sich im zukunftsträchtigen Forschungsbereich „Smart Connected Lighting". Der neue Forschungsstandort Pinkafeld wurde vor wenigen Tagen im Technologiezentrum Burgenland eröffnet. Bundesminister Norbert Hofer sprach von einem „Quantensprung für die burgenländische F&E-Quote" und einem „echten Smart Move" für die Region Pinkafeld. LH Hans Niessl bezeichnete das Projekt als „Meilenstein für das Burgenland, in angewandte Forschung zu investieren." Mit der Beteiligung an der JOANNEUM RESEARCH und dem neuen burgenländischen Forschungszentrum in Pinkafeld profitierten viele heimische Unternehmen, werde der Wissenschafts- und Forschungsstandort Burgenland aufgewertet und die Forschungsquote weiter steigen.

Neue Forschung in Pinkafeld: BM **Norbert Hofer**, LH **Hans Niessl**, JR-Geschäftsführer **Wolfgang Pribyl**, IV-Präsident **Manfred Gerger** und Forschungsgruppenleiter **Franz-Peter Wenzl** (v. l. n. r.)

Leuchten bekommen ein immer komplexeres Innenleben – Sensoren und Datenübertragung ergänzen die LED-Technologie

JOANNEUM RESEARCH/BERGMANN (3)

FORSCHUNG UND DESIGN

Wie Licht zum Infoträger für jedermann wird

Am Standort Pinkafeld entsteht ein modernes Lichtlabor für rund 15 Forscher

…terentwicklung der LED-Technologie, mit der man sich bei JR seit 2005 intensiv beschäftigt. Am Standort Weiz findet sich eine ausgeklügelte Labor- und Entwicklungslandschaft, zusammengefasst im Institut für Oberflächentechnologien und Photonik. Seit einigen Wochen ist auch das neue „Lichtzentrum" in Pinkafeld im Burgenland im Aufbau. Burgenland hat sich im Frühjahr mit fünf Prozent an JR beteiligt und steuert nun die langjährige Expertise im Bereich „Smart Connected Light" unter Leitung von Franz-Peter Wenzl bei.

Derzeit beträgt die Gruppe vier Personen; 15 Forscher werden angestrebt. Ziel ist es, aus simplen Beleuchtungsgeräten smarte Stationen zu machen, die mit Sensoren Informationen einholen und auch aussenden. „Wir wollen LED-Leuchten intelligenter machen, nur so kann Europa gegenüber China bestehen", sagt Wenzl. Gemeinsam mit der Leuchtenindustrie will man die Miniaturisierung vorantreiben und die Leuchtmittel mit Sensoren kombinieren. Licht soll auch Information in den Raum übertragen. Dazu entsteht ein spezielles Lichtlabor. „Wir wollen hochfunktionale Geräte entwickeln, wo alles zusammenkommt: eine hohe Lichtmenge, viele Sensoren, niedriger Energieverbrauch", so Institutsleiter Professor Paul Hartmann.

Mit im Boot ist die Beleuchtungsindustrie (Becom Electronics, Hella Fahrzeugteile, Lumitech, Melecs und Tridonic Jennersdorf), konkrete Projekte werden derzeit aufgestellt.

Forschungachse im Süden

Die ursprünglich rein steirische Forschungsgesellschaft Joanneum Research hat sich mittlerweile zur bedeutendsten außeruniversitären Forschungsschmiede in Südösterreich entwickelt. Es beteiligen sich Kärnten mit 15 Prozent und das Burgenland mit 5 Prozent.

Sieben Schwerpunkte werden von JR bearbeitet, darunter die Forschungseinheit Materials – Oberflächentechnologien und Photonik" mit dem Hauptstandort in Weiz. Fünf Forschungsgruppen arbeiten in dem Bereich, die jüngste ist „Smart Connected Light".

Forschung in Alpbach

Die JOANNEUM RESEARCH ist seit 20 Jahren Teil des Europäischen Forums Alpbach und stellte auch heuer neues Gedankengut in den Bereichen Gesundheit und Technologie im Rahmen des traditionellen Forums vor.

Die heimische Forschungsgesellschaft präsentierte neueste Technologien und Forschungsansätze nicht nur bei den Arbeitskreisen und am eigenen Präsentationsstand, der auch von Landesrätin Barbara Eibinger-Miedl besucht wurde (Foto unten Mitte), sondern auch in bewährter Weise in Kooperation mit der innoregio und dieses Jahr auch beim Tiroler Technologiebrunch.

„Unsere Forscherinnen und Forscher verfügen über exzellente Expertise in der akustischen Erkennung von Ereignissen."

„Ich freue mich, dass wir uns auch heuer wieder als Partnerin der innoregio in Alpbach präsentieren durften. Besonders, weil dadurch die in der Steiermark gut funktionierende und fruchtbare Zusammenarbeit zwischen Industrie, Wirtschaft, Politik und Forschung an zukunftsweisenden Entwicklungen und Projekten gezeigt werden kann. DIGITAL, das Institut für Informations- und Kommunikationstechnologien, stellte aus dem Forschungsbereich ‚Intelligente Akustische Lösungen' intelligente Mikrofon Arrays vor. Unsere Forscherinnen und Forscher verfügen über exzellente Expertise in der akustischen Erkennung von Ereignissen und haben intelligente Algorithmen entwickelt, um beispielsweise das Herannahen von unbemannten Flugobjekten anzeigen und lokalisieren zu können", so JR-Geschäftsführer Univ.-Prof. Wolfgang Pribyl.

RUND 80 INTERESSIERTE BEI DER PARTNER-SESSION VON HEALTH

„Disease Management Programme und Digitalisierung in der Medizin" lautete der Titel der heurigen spannenden Session von JOANNEUM RESEARCH HEALTH im Rahmen der Gesundheitsgespräche des Europäischen Forums Alpbach 2018. Disease Management Programme stellen Patientinnen und Patienten in den Mittelpunkt und sichern eine gute Versorgung. Gemeinsam mit der digitalen Prozess- und Entscheidungsunterstützung leisten sie einen Beitrag zur Resilienz der Gesundheitsversorgung. Über die Vorreiterrollen diskutierten im Congress Centrum Alpbach Helmut Hildebrandt (Keynote) von der OptiMedis AG, Clemens Martin Auer vom Bundesministerium für Gesundheit, Joachim Henkel von der AOK Hessen Health Insurance und Romana Ruda von der Wiener Gebietskrankenkasse. Roland Schaffler, Herausgeber der ÖKZ – Das Österreichische Gesundheitswesen moderierte die Veranstaltung.

„UNGLEICHHEIT UND RESILIENZ IN DER DIGITALEN ÖKONOMIE"

Im Rahmen der Technologiegespräche beim Europäischen Forum Alpbach richtete POLICIES, das Institut für Wirtschafts- und Innovationsforschung der JOANNEUM RESEARCH, einen Arbeitskreis mit dem Titel „Ungleichheit und Resilienz in der digitalen Ökonomie" aus. Diskutiert wurden gegenwärtige technologische Veränderungen (Digitalisierung, Industrie 4.0, Internet of Things), die vor dem Hintergrund von Ungleichheiten bei der Einkommensverteilung stattfinden.

Kontakt

Audit certificate

Report on the annual financial statements

Audit opinion

We have audited the annual financial statements of JOANNEUM RESEARCH Forschungsgesellschaft mbH Graz, which are comprised of the balance sheet as at 31 December 2018 showing equity of EUR 11,105,521.65, the income statement for the financial year ended 31 December 2018 and the Notes.

In our opinion the attached annual financial statements are in compliance with the statutory provisions and present a true and fair view of the financial position of the Company as at 31 December 2018 and of the Company‘s financial performance for the financial year ended 31 December 2018 in accordance with Austrian business law provisions.

Basis for the audit opinion

We have conducted our audit in accordance with the professional auditing principles applicable in Austria. Those principles require application of the International Standards on Auditing (ISA). Our responsibilities under those provisions and standards are described under the heading “Responsibilities of the auditor for the audit of the annual financial statements” of our audit certificate. We are independent of the Company in accordance with the Austrian business law and professional law provisions and we have fulfilled our other professional duties in compliance with those requirements. In our opinion the evidence obtained by us in the course of our procedures is sufficient and appropriate to serve as the basis for our audit opinion.

Responsibilities of the legal representatives and the audit committee for the annual financial statements

The legal representatives of the Company are responsible for preparation of annual financial statements and for ensuring that they present a true and fair view of the financial position and financial performance of the Company in accordance with Austrian business law provisions. In addition, the legal representatives are responsible for internal controls which they deem necessary in order to enable preparation of annual financial statements that are free from material misrepresentations, be they deliberate or inadvertent.

When preparing annual financial statements the legal representatives are responsible for assessing the Company‘s ability to continue its business as a going concern, for stating facts and circumstances relating to continuation as a going concern, if applicable, and for applying the going concern accounting principle, unless the legal representatives intend either to liquidate the Company or to discontinue its business activities, or have no realistic alternative.

The audit committee is responsible for supervising the Company‘s accounting process.

Responsibilities of the auditor for the audit of the annual financial statements

Our aims are to obtain sufficient certainty as to whether the annual financial statements as a whole are free from material misrepresentations, be they deliberate or inadvertent ones, and to issue an audit certificate that includes our audit opinion. Sufficient certainty means a high degree of certainty which, however, cannot guarantee that an audit conducted in accordance with the professional auditing principles applicable in Austria, which require application of ISA, will reveal a material misrepresentation, if any, in any case. Misrepresentation may result from fraudulent actions or mistakes and are considered to be material if one might reasonably expect that any or all of them influence the financial decisions made by users on the basis of these annual financial statements.

As part of an audit in accordance with the professional auditing principles applicable in Austria, which require application of ISA, we exercise dutiful discretion throughout the audit and maintain a critical attitude.

Audit certificate

In addition, the following applies:

- We identify and assess the risks of material misrepresentations, be they deliberate or inadvertent, in the financial statements, plan and carry out audit procedures in answer to those risks and obtain audit evidence that is sufficient and appropriate to serve as the basis for our audit opinion. The risk that material misrepresentations resulting from fraudulent actions will not be uncovered is higher than that resulting from mistakes because fraudulent actions may include fraudulent collusion, falsifications, deliberate incompleteness, misleading presentations or rendering internal controls inoperative.
- We become familiar with the internal control system that is relevant to the audit in order to plan audit procedures that are reasonable under the given circumstances, but not with the objective of providing an audit opinion on the effectiveness of the Company's internal control system.
- We give an opinion on the appropriateness of the accounting methods used and the plausibility of the amounts estimated by the legal representatives, including the related disclosures.
- We draw conclusions as to whether application of the going-concern principle by the legal representatives is appropriate and, on the basis of the audit evidence obtained, whether there is material uncertainty in connection with events or circumstances that may give rise to significant doubts about the Company's ability to continue its business as a going concern. If we arrive at the conclusion that there is material uncertainty, we are obliged to draw attention to the related disclosures in the annual financial statements in our audit certificate, or, if such disclosure is inappropriate, to modify our audit opinion. We draw our conclusions on the basis of the audit evidence obtained by the date our audit certificate is issued. However, future events or circumstances may lead to the Company's departure from continuation of its business as a going concern.
- We give an opinion on the overall presentation, structure and content of the annual financial statements, including disclosures, and on whether the annual financial statements present a true and fair view of the underlying transactions and events.

We communicate with the audit committee, inter alia about the planned scope and the planned timeline of the audit as well as about significant findings made during the audit, including any significant defects in the internal control system we might identify during our audit.

Report on the management report

The management report must be audited on the basis of Austrian business law provisions as to whether it is in line with the annual financial statements and whether it has been prepared in compliance with applicable legal requirements.

The legal representatives are responsible for preparing the management report in accordance with Austrian business law provisions.

We have conducted our audit in accordance with the professional auditing principles for audits of management reports.

Opinion

In our opinion the management report has been prepared in compliance with applicable legal requirements and is in line with the annual financial statements.

Statement

Based on the findings obtained in the course of the audit of the annual financial statements and on the understanding we gained of the Company and its environment no material faulty information was found in the management report.

Vienna, 6 March 2019

Crowe SOT Wirtschaftsprüfung GmbH

Crowe SOT Wirtschaftsprüfung GmbH

Dr. Anton Schmidl Mag. Andreas Maier

Balance sheet

Assets	31 Dec 2018 EUR	31 Dec 2017 EUR
A. Non-current assets		
I. Intangible assets		
1. 1. Rights and licences	380,519.00	345,303.00
II. Property, plant and equipment		
1. Land and buildings	9,434,735.66	9,558,082.66
2. Technical plant and machinery	4,581,596.00	4,344,864.00
3. Other plant, furniture and fixtures	619,451.00	625,117.00
4. Advances made and construction in progress	406,980.22	347,605.20
	15,042,762.88	14,875,668.86
III. Financial assets		
1. Shares in affiliates	150,000.00	150,000.00
2. Participating interests	340,638.25	260,638.25
3. Investment securities (book-entry securities)	1,411,750.00	1,406,750.00
	1,902,388.25	1,817,388.25
	17,325,670.13	17,038,360.11
B. Current assets		
I. Inventories		
1. Raw materials and supplies	3,478.89	3,894.90
2. Services not yet chargeable	8,202,716.39	9,357,580.24
3. Advances made	19,124.92	15,071.00
	8,225,320.20	9,376,546.14
II. Receivables and other assets		
1. Trade receivables	1,639,267.26	1,464,834.82
(thereof due within 1 year	*1,603,060.63*	*1,464,834.82)*
(thereof due after more than 1 year	*36,206.63*	*0.00)*
2. Receivables from affiliates	50,326.80	64,938.36
(thereof due within 1 year	*32,926.80)*	*30,138.36)*
(thereof due after more than 1 year	*17,400.00*	*34,800.00)*
3. Receivables from undertakings with which the company is linked by virtue of participating interests	175,697.93	179,414.63
(dthereof due within 1 year	*155,556.65*	*139,132.07)*
(thereof due after more than 1 year	*20,141.28*	*40,282.56)*
4. Receivables from subsidies and project grants	4,017,760.09	4,414,364.06
(thereof due within 1 year	*4,017,760.09*	*4,414,364.06)*
5. Other receivables and assets	15,442,863.63	11,975,729.60
(thereof due within 1 year	*15,442,863.63*	*11,975,729.60)*
	21,325,915.71	18,099,281.47
(thereof due within 1 year	*21,252,167.80*	*18,024,198.91)*
(thereof due within 1 year	*73,747.91*	*75,082.56)*
III. Securities and shares		
1. Other securities and shares	1,945,000.00	1,950,000.00
IV. Cash and balances at banks	5,748,368.99	7,514,629.81
	37,244,604.90	36,940,457.42
C. Prepayments and accrued income	1,006,500.39	466,445.70
D. Escrow funds	2,309,481.80	768,739.66
Total assets	**57,886,257.22**	**55,214,002.89**

Liabilities and shareholders' equity	31 Dec 2018 EUR	31 Dec 2017 EUR
A. Equity		
I. Share capital called in and paid up	3,600,000.00	3,420,000.00
II. Capital reserves		
1. Appropriated	4,924,099.68	3,504,800.34
2. Unappropriated	362,637.44	362,637.44
	5,286,737.12	3,867,437.78
III. Retained earnings		
1. Statutory reserves	159,571.25	159,571.25
2. Other reserves (free reserves)	793,250.31	750,910.22
	952,821.56	910,481.47
IV. Net profit for the year	1,265,962.97	769,022.22
(thereof profit carried forward	*769,022.22*	*508,771.61)*
	11,105,521.65	8,966,941.47
B. Investment grants	1,834,240.95	1,635,711.73
C. Provisions		
1. Provisions for severance pay	4,648,300.00	4,315,100.00
2. Provisions for pensions	5,212,450.00	4,692,330.00
3. Tax provisions	3,363,000.00	3,363,000.00
4. Other provisions	10,562,860.00	10,439,600.00
	23,786,610.00	22,810,030,00
D. Liabilities		
1. Bank borrowings	712,235.65	712,193.77
(thereof due within 1 year	*712,235.65*	*712,193.77)*
2. Advances received on orders	12,281,800.47	14,267,171.87
(thereof due within 1 year	*7,852,188.36*	*8,266,737.38)*
(thereof due after more than 1 year	*4,429,612.11*	*6,000,434.49)*
3. Trade payables	2,305,425.66	2,199,623.71
(thereof due within 1 year	*1,204,129.10*	*1,281,383.71)*
(thereof due after more than 1 year	*1,101,296.56*	*918,240.00)*
4. Payables to affiliates	586,055.77	574,943.99
(thereof due within 1 year	*76,002.83*	*20,160.00)*
(thereof due after more than 1 year	*510,052.94*	*554,783.99)*
5. Payables to undertakings with which the company is linked by virtue of participating interests	35,803.52	8,414.64
(thereof due within 1 year	*35,803.52*	*8,414.64)*
6. Other liabilities	2,650,466.02	2,960,036.61
(thereof due within 1 year	*1,262,989.02*	*1,572,559.61)*
(thereof due after more than 1 year	*1,387,477.00*	*1,387,477.00)*
(thereof for taxes	*248,596.75*	*527,894.75)*
(thereof for social security	*708,486.96*	*806,689.19)*
	18,571,787.09	20,722,384.59
(thereof due within 1 year	*11,143,348.48*	*11,861,449.11)*
(thereof due after more than 1 year	*7,428,438.61*	*8,860,935.48)*
E. Accruals and deferred income	278,615.73	310,195.44
F. Escrow liabilities	2,309,481.80	768,739.66
Total liabilities	**57,886,257.22**	**55,214,002.89**
Contingencies	414,243.17	326,252.96

JOANNEUM RESEARCH

Income Statement

Income Statement	31 Dec 2018 EUR	31 Dec 2017 EUR
1. Revenue	17,831,514.19	14,674,334.87
2. Changes in the amount of services not yet chargeable	-1,154,863.85	611,337.67
3. Project-related other income	13,680,579.02	14,561,922.72
4. Shareholder contribution	9,351,189.91	8,833,813.74
5. Other own work capitalised	0.00	19,869.94
6. Other operating income		
a. Income from disposal of non-current assets except for financial assets	13,958.34	11,891.83
b. Income from reversal of provisions	436,270.72	381,225.88
c. Income from reversal of investment grants	280,839.31	254,006.80
d. Other	3,513,959.19	2,825,523.77
	4,245,027.56	3,472,648.28
7. Cost of materials and other services purchased		
a. Cost of materials	1,783,690.01	1,389,172.60
b. Costs of services purchased	1,706,647.87	1,843,689.69
	3,490,337.88	3,232,862.29
8. Cost of staff		
a. Salaries	21,883,285.08	20,864,596.59
b. Social benefits		
aa) Expenses for old-age provision	825,137.84	435,933.52
bb) Expenses for severance pay and contributions to Severance Pay and Pension Funds	700,803.97	846,621.93
cc) Expenses for statutory social security contributions and payroll-related taxes and compulsory contributions	6,058,654.34	5,869,932.55
dd) Other social benefits	149,376.73	146,028.56
	29,617,257.96	28,163,113.15
9. Amortisation of intangible non-current assets and depreciation of property, plant and equipment	2,703,616.54	2,561,838.95

Income Statement

Income Statement	31 Dec 2018 EUR	31 Dec 2017 EUR
10. Other operating expenses		
a. Taxes, other than taxes stated in line 19	7,841.36	7,868.43
b. Other	7,529,051.52	7,631,134.47
	7,536,892.88	7,639,002.90
11. Subtotal lines 1 to 10 (Operating result)	605,341.57	577,109.93
12. Income from other securities	26,750.00	28,371.35
13. Other interest and similar income	18,736.97	36,091.15
14. Expenses for financial assets and securities held as current assets		
a. Write-downs	*0.00*	*675.00*
b. Expenses for affiliates	*351,000.00*	*516,750.00*
c. Other	*28,611.63*	*51,614.70*
	379,611.63	569,039.70
15. Interest and similar expenses	50,946.82	59,744.49
16. Subtotal lines 12 to 15 (Financial result)	-385,071.48	-564,321.69
17. Profit or loss before tax (Subtotal lines 11 and 16)	220,270.09	12,788.24
18. Income taxes	1,750.00	1,750.00
19. Profit or loss for the year = profit or loss after tax	218,520.09	11,038.24
20. Reversal of capital reserves		
a. Appropriated	265,700.66	236,492.37
21. Reversal of retained earnings		
a. Other reserves (free reserves)	12,720.00	12,720.00
22. Profit carried forward from previous year	769,022.22	508,771.61
23. Net profit for the year	**1,265,962.97**	**769,022.22**

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, 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.

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

Property, plant & equipment	Useful life in years	Depreciation
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 %

The full annual depreciation is applied to additions in the first half of the financial year and half the yearly rate is applied to additions 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 or equal to EUR 400 per asset, are fully written off in the year of acquisition and presented as additions or 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 no write-downs of financial assets were 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 that are attributable according to the costs-by-cause principle, production costs also include pro rata capitalisable production overheads 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 the total net amount of 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 3.21% (previous year: 3.5%) as at 31 December 2018, a salary trend of 2.08% (previous year: 2%) 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 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 2.83% (previous year: 3.42%) with an average remaining term of eleven years.

Other provisions take into account all recognisable risks and liabilities the amount of which is not known and are recognised in the amount which, according to best estimate, is required to fulfil the obligation. No provisions other than those provided for by law are set up.

Liabilities

Liabilities are recognised at the settlement amount 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

ASSETS

Non-current Assets

As regards the development of the individual items of 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 17,325,670.13 (previous year: kEUR 17,038.4) in total. In the financial year 2018 capital expenditure amounted to a total of EUR 3,008,659.56 (previous year: kEUR 4,524.5) and amortisation and depreciation amounted to EUR 2,703,616.54 (previous year: kEUR 2,561.8). In the financial year 2018 disposals at historical cost amounted to EUR 1,001,819.17 (previous year: kEUR 3,991.0).

Intangible assets include software and data transmission rights of a carrying amount of EUR 380,519.00 (previous year: kEUR 345.3). Additions in the amount of EUR 313,343.48 (previous year: kEUR 317.4) are attributable to the acquisition of licences and various software.

As at the balance sheet date **property, plant and equipment** amounted to EUR 15,042,762.88 (previous year: kEUR 14,875.7). The land value was EUR 2,656,523.66 (previous year: kEUR 2,656.5). The building value of land with buildings and buildings on land owned by others of EUR 6,778,212.00 (previous year: kEUR 6,901.6) is made up of the net building value of EUR 2,737,521.00 (previous year: kEUR 2,826.8) and structural improvements worth EUR 1,884,723.00 (previous year: kEUR 1,977.2), i.e. EUR 4,622,244.00 (previous year: kEUR 4,804.0) are attributable to buildings on land owned by the Company and an amount of EUR 2,155,968.00 (previous year: kEUR 2,097.5) is attributable to capital expenditure on buildings owned by others. Additions in the total amount of EUR 2,610,316.08 (previous year: kEUR 2,794.8) 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 966,236.34 (previous year: kEUR 2,416.2) 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.

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.
As at the balance sheet date the carrying amount of **investment securities** was EUR 1,411,750.00 (previous year: kEUR 1,406.8).

Write-up or revaluation

In the reporting year no write-downs of financial assets were 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 3,478.89 (previous year: kEUR 3.9) is made up of consumables (mainly paper, inked ribbons, computer network cards, laser printer spare parts and small items of equipment).

The item **services not yet chargeable** of contract research includes work in progress and services not yet charged in the amount of EUR 8,202,716.39 (previous year: kEUR 9,357.6), under which administrative overheads of EUR 1,596,833.07 (previous year: kEUR 1,957.6) were capitalised for contracts the execution of which lasts more than twelve months. The Company's project structure requires capitalisation of administrative overheads in order to present a true and fair as well as continuous view of the Company.

Advances made on inventories amounted to EUR 19,124.92 (previous year: kEUR 15.1).

Notes

Itemised allowances in the amount of EUR 636,475.18 previous year: kEUR 59.9) were made for expected losses of **trade receivables** and deducted from the assets.

The item **receivables from affiliates** concerns trade receivables.

Receivables from subsidies and project grants concern grant approvals from various funding agencies. Due to the fact that processing, including receipt of payments, takes more than three months, a discount in the amount of EUR 16,400.00 (previous year: kEUR 26.5) was made. The calculatory interest rate was 0.88% (previous year: 1.33%).

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

Statement of Investments as at 31 December 2018	Interest		Equity EUR	Net profit or loss in EUR	Balance sheet date
	EUR	%			
ACIB GmbH	16,000.00	8.00%	3,939,305.80	328,950.77	31.12.2017
ALP.Lab GmbH	5,600.00	16.00%	-59,410.78	-94,410.78	31.12.2017
BIOENERGY 2020+ GmbH	20,000.00	10.00%	799,105.54	563,751.61	31.03.2018
CBmed GmbH	25,000.00	12.50%	932,916.93	732,916.93	31.12.2017
decide Clinical Software GmbH	42,500.00	10.00%	297,149.91	-127,850.09	31.12.2017
EPIG GmbH	8,750.00	25.00%	51,382.87	16,382.87	31.12.2017
FH JOANNEUM Gesellschaft mbH	10,828.25	14.90%	4,000,000.00	0.00	30.06.2017
Geo5 GmbH	8,000.00	10.00%	31,420.66	-48,579.34	31.12.2017
Holz.Bau Forschungs GmbH	3,500.00	8.68%	222,530.57	182,210.57	31.12.2017
Human.technology Styria GmbH	2,450.00	7.00%	218,241.90	17,578.07	31.12.2017
Know-Center GmbH Research Center for Data-Driven Business & Big Data Analytics	14,540.00	10.00%	1,640,114.21	0.00	31.12.2017
Kompetenzzentrum – Das virtuelle Fahrzeug, Forschungsgesellschaft mbH	10,640.00	10.00%	5,014,381.09	1,265,443.42	31.12.2017
Materials Center Leoben Forschung GmbH	51,100.00	17.50%	5,756,883.01	539,729.63	31.12.2017
Polymer Competence Center Leoben GmbH	34,000.00	17.00%	4,432,130.75	496,372.50	31.12.2017
Rebeat Innovation GmbH	80,000.00	2.00%	-120,727.50	-125,727.50	31.12.2017
Research Center Pharmaceutical Engineering GmbH	15,000.00	15.00%	4,817,625.12	717,625.12	30.06.2018

Other receivables and assets mainly include entitlements to insurance benefits vis-à-vis the insurance fund due to premiums paid, claims vis-à-vis the Tax Office Graz-Stadt, 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 Graz-Stadt, and claims vis-à-vis the Tax Office Graz-Stadt from research allowances in the amount of EUR 8,471,761.11 (previous year: kEUR 4,986.8).

Securities held as current assets

Securities held as current assets in the amount of EUR 1,945,000.00 (previous year: kEUR 1,950.0) concern bank bonds with a term until the end of September 2020.

Cash and balances at banks

This item in the amount of EUR 5,748,368.99 (previous year: kEUR 7,514.6) is made up of cash in the amount of EUR 7,620.93 (previous year: kEUR 7.9) and a bank balance of EUR 5,740,748.06 (previous year: kEUR 7,506.8).

Receivables and other assets	Receivables as at 31 Dec 2018 (31 Dec 2017) EUR	thereof due after more than 1 year EUR	thereof evidenced by bills of exchange EUR	Capitalised accruals Section 225(3) UGB EUR	General allowance EUR
Trade receivables	1,639,267.26 (1,464,834.82)	36,206.63 (0.00)	0.00 (0.00)	0.00 (0.00)	35,000.00 (33,200.00)
Receivables from affiliates	50,326.80 (64,938.36)	17,400.00 (34,800.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Receivables from undertakings with which the undertaking is linked by virtue of participating interests or book-entry securities	175,697.93 (179,414.63)	20,141.28 (40,282.56)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Receivables from the proprietors	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)
Receivables from subsidies and project grants	4,017,760.09 (4,414,364.06)	0.00 (0.00)	0.00 (0.00)	4,017,760.09 (4,414,364.06)	0.00 (0.00)
Receivable from the liability commitment of the state of Styria	5,600,000.00 (5,600,000.00)	0.00 (0.00)	0.00 (0.00)	5,600,000.00 (5,600,000.00)	0.00 (0.00)
Other receivables and assets	9,842,863.63 (6,375,729.60)	0.00 (0.00)	0.00 (0.00)	9,784,526.62 (6,296,702.96)	0.00 (0.00)
Total	**21,325,915.71 (18,099,281.47)**	**73,747.91 (75,082.56)**	**0.00 (0.00)**	**19,402,286.71 (16,311,067.02)**	**35,000.00 (33,200.00)**

Prepayments and accured income

Prepayments and accrued income in the amount of EUR 1,006,500.39 (previous year: kEUR 466.4) include payments made in the financial year 2018 which have to be charged to the following year as expenses and mainly concern prepayments of maintenance expenses, various subscriptions and membership fees, insurance premiums, travel expenses and congress fees. In addition, this item includes a prepayment of rent in the amount of EUR 660,000.00 (previous year: EUR 0.00) as well as additional expenses of EUR 117,172.94 (previous year: kEUR 175.8) resulting from the change in the calculation of both the provision for severance pay and the pension provision.

Escrow Funds

Escrow funds include balances at banks for projects with Österreichische Forschungsförderungsgesellschaft mbH (Austrian Research Promotion Agency) and/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 liabilities).

Liabilities and Shareholders‘ Equity

Equity

Following the increase by EUR 180,000.00 the Company‘s share capital now amounts to EUR 3,600,000.00 (previous year: kEUR 3,420.0), of which 80.75% (previous year: 85%) or EUR 2,907,000.00 (previous year: kEUR 2,907.0) are held by the state of Styria and 14.25% (previous year: 15%) or EUR 513,000.00 (previous year: kEUR 513.0) by Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. and 5% (previous year: 0%) or EUR 180.000.00 (previous year: EUR 0.00) are held by Landesholding Burgenland GmbH.

Taking into account the profit for the year of EUR 496,940.75 (previous year: EUR 260,250.61 and the profit carryforward in the amount of EUR 769,022.22 (previous year: EUR 508,771.61) the resulting **net profit for the year** is EUR 1,265,962.97 (previous year: EUR 769,022.22).

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 have agreed that the appropriated capital reserve will 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 2018 EUR	Additions EUR	Consumption according to depreciation EUR	Reversal EUR	Reclassification or corrections EUR	As at 31 Dec 2018 EUR
Property, plant and equipment						
1. Buildings, including buildings on land owned by others	1,388,917.00	-10,290.66	-158,704.31	0.00	0.00	1,219,922.03
2. Machinery, scientific equipment and electronic data processing systems	54,614.81	489,659.19	-79,246.00	0.00	0.00	465,028.00
3. Other plant, furniture and fixtures	192,179.92	0.00	-42,889.00	0.00	0.00	149,290.92
Financial assets						
1. Financial assets	0.00	0.00	0.00	0.00	0.00	0.00
Total	**1,635,711.73**	**479,368.53**	**-280,839.31**	**0.00**	**0.00**	**1,834,240.95**

Provisions

An amount of EUR 25,897.76 (previous year: kEUR 42.3) of the provisions **for severance pay** was used. In order to meet the cover requirement of EUR 4,648,300.00 (previous year: kEUR 4,315.1), an amount of EUR 365,228.00 (previous year: kEUR 365.0) was allocated to the provision.

An amount of EUR 256,551.12 (previous year: kEUR 251.9) of the **provisions for pensions** (of former managing directors) was used for pension payments. In order to meet the actuarial cover requirement of EUR 5,212,450.00 (previous year: kEUR 4,692.3), an amount of EUR 776,671.12 (previous year: kEUR 387.8) 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 3,363,000.00 (previous year: kEUR 3,363.0).

Other provisions include as main items the provision for unconsumed leave in the amount of EUR 2,296,800.00 (previous year: kEUR 2,133.3), provisions for potential claims for refund of various funding parties in the amount of EUR 704,400.00 (previous year: kEUR 728.3), the provision for working time credits in the amount of EUR 855,600.00 (previous year: kEUR 824.8) and the provision for anticipated losses or costs of work in progress in the amount of EUR 826,600.00 (previous year: kEUR 955.2).

This item also includes the **provision for the tax audit** by the Tax Office Graz-Stadt in the amount of EUR 4,847,700.00 (previous year: kEUR 4,847.7).

Liabilities

The item **bank borrowings** in the amount of EUR 712,235.65 (previous year: kEUR 712.2) mainly includes an export fund credit line of EUR 712,193.77.

Advances received on orders that may be deducted from inventories in the financial year amounted to a net amount of EUR 12,281,800.47 (previous year: kEUR 14,267.2). This item also includes advances of EUR 5,165,148.81 (previous year: kEUR 5,976.1) made by funding parties.

As at the balance sheet date **trade payables** were EUR 2,305,425.66 (previous year: kEUR 2,199.6), 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) with a remaining term of more than five years. In addition, this item mainly includes clearing funds with the Health Insurance Fund of the State of Styria *[Steiermärkische Gebietskrankenkasse]* and other necessary deferrals.

Other financial obligations

Based on the business plan of JR-AquaConSol GmbH and the resolution of the supervisory board of JOANNEUM RESEARCH Forschungsgesellschaft mbH of 6 June 2016 the financial obligations for the financial year 2018 were EUR 351,000.00 (previous year: kEUR 516.8). In addition, JR-AquaConSol GmbH has been granted a declining shareholder contribution in a maximum amount of EUR 1,660,000.00 until 31 December 2020.

Obligations arising from use of property, plant and equipment not presented in the balance sheet: (see table below).

Accruals and Deferred Income

Accruals and deferred income in the amount of EUR 278,615.73 (previous year: kEUR 310.2) mainly concern royalties.

Escrow Liabilities

Escrow liabilities result from projects with Österreichische Forschungsförderungsgesellschaft mbH (Austrian Research Promotion Agency) and/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).

	for the next financial year	for financial years 2019 to 2023
Room rents	907,358.00	4,491,277.00
(previous year)	*943,564.00*	*4,717,820.00*
Equipment rents	56,568.00	282,840.00
(previous year)	*55,512.00*	*277,560.00*
Lease payments	107,491.00	122,962.00
(previous year)	*198,674,00*	*326,384.00*
Total	**1,071,417.00**	**4,897,079.00**
(previous year)	**(1,197,750.00)**	**(5,321,764.00)**

Notes to the Income Statement

The **revenues** generated in the financial year 2018 are classified according to areas of activity and divided into domestic and international revenues:

Domestic revenues	Financial year 2018 EUR	Financial year 2017 EUR
Research	6,824,978.85	6,121,613.68
Royalties	1,862,408.37	743,057.24
Congress fees	7,777.02	17,142.63
Other	1,222,234.77	687,107.44
Total domestic revenues	**9,917,399.01**	**7,568,920.99**
International revenues		
Research	7,877,638.84	7,029,879.88
Royalties	34,655.11	73,444.00
Congress fees	1,321.23	0.00
Other	500.00	2,090.00
Total international revenues	**7,914,115.18**	**7,105,413.88**
Total revenues	**17,831,514.19**	**14,674,334.87**

The expenses of EUR 700,803.97 (previous year: kEUR 846.6) stated in item 8.(b) include contributions to Severance Pay and Pensions Funds in the amount of EUR 219,756.77 (previous year: kEUR 205.2) and expenses for severance payments in the amount of EUR 481,047.20 (previous year: kEUR 641.5) and severance compensation in the amount of EUR 0.00 (previous year: kEUR 51.6).

Other Disclosures

Shares in affiliates and participating interests

As at the balance sheet date 31 December 2018 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 2017 showed equity of EUR 499,672.84 (previous year: EUR 225,944.48) including a profit for the year of EUR 273,728.36 (previous year: EUR 75,944.48).

In addition, the Company held another participating interest of 25% of the shares or EUR 8,750.00 in EPIG GmbH as at the balance sheet date 31 December.

The annual financial statements for the year ended 31 December 2017 showed equity of EUR 51,382.87 (previous year: EUR 51,382.87) including a profit for the year of EUR 16,382.87 (previous year: EUR 16,382.87).

All other participating interests were below 20%.

Staff

As at the balance sheet date the Company had 451 (previous year: 437) employees; taking part-time employees into account on a pro rata basis, the number of staff was 378.9 (previous year: 374.6). Taking part-time employees into account on a pro rata basis the average number of employees was 376.3 (previous year: 371.1).

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 241(4) UGB was made.

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 the members of the scientific advisory board and of the supervisory board amounted to EUR 101,921.82 (previous year: kEUR 97.0) in total.

Results after the balance sheet date

After the closing of accounts for the financial year 2018 no other significant events have occurred which would have affected the financial position or financial performance in the financial year 2018.

Executive Bodies

Officers of the Company in the financial year 2018:

Scientific Advisory Board

Prof. Dr Dr Gerald **SCHÖPFER**
Chairman

Prof. Dr Gerhard **FRIEDRICH**
Deputy Chairman

Dr Gernot **HANREICH**
(from 29 November 2018)
Deputy Chairman

Prof. Dr Hansjörg **ALBRECHER**

Prof Dr. Horst **BISCHOF**

Dr Michaela **FRITZ**

Prof. Dr Günter **GETZINGER**

Prof. Dr Gottfried **HABER**
(from 20 June 2018)

Prof. Dr Dr Manfred **HUSTY**

Prof. Dr Joachim **KRENN**

Dr Mario **MÜLLER**

Michael **PATAK**

Reinhard **PETSCHACHER**

Herbert **RITTER, MBA**

Prof. Dr Karin **SCHAUPP**

Dr Stefan **TASCH**

Supervisory Board

Dr Martin **WIEDENBAUER**
Chairman

Prof. Fritz **SPERL**, MAS MBA
Deputy Chairman

Dr Erlfried **TAURER**
Deputy Chairman

Prof. Dr Werner **HAUSER**

Prof. Dr Thomas **KRAUTZER**

Christoph **LUDWIG**

Ingolf **SCHÄDLER**

Dr Birgit **STRIMITZER-RIEDLER**

Ursula **STROHMAYER**

Members of the works council delegated to the supervisory board

Ferdinand GOLJA, chairman of the works council

Clemens HABSBURG-LOTHRINGEN, MAS

Helen HASENAUER, MSc

Gertrude MATZER, BA MSc

Gerhard PROBST

Management

Prof. Dr Wolfgang **PRIBYL**, MBA

Notes

Contingencies

Pursuant to Section 199 UGB an advance payment guarantee vis-à-vis EPCOS OHG, A TDK Group Company (EUR 5,225.00), a payment guarantee vis-à-vis ACAM Systemautomation GmbH (EUR 39,000.00) and 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), Lakeside Science & Technology Park GmbH (EUR 36,746.67) and SFL technologies Science Tower GmbH (EUR 36,000.00) as well as retention guarantees vis-à-vis Autobahnen- und Schnellstraßen-Finanzierungs Aktiengesellschaft (EUR 122,512.04) and voestalpine Wire Rod Austria GmbH (EUR 25,850.00) are presented below the balance sheet.

Pursuant to Section 199 UGB guarantees for rent security deposits concerning Zentrum für Wissens- und Technologietransfer in der Medizin GmbH (EUR 110,890.00), W.E.I.Z. Immobilien GmbH (EUR 38,019.46), Lakeside Science & Technology Park GmbH (EUR 36,746.67) and SFL technologies Science Tower GmbH (EUR 36,000.00) as well as retention guarantees vis-à-vis Autobahnen- und Schnellstraßen-Finanzierungs Aktiengesellschaft (EUR 104,596.83) were presented below the balance sheet for the previous year.

Other information

Based on the objectives stipulated in Article 1(3) of the Articles of Association the Company pursues the 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 for the year that may be generated will be distributed.

According to a decision dated 16 January 1995, reference no. 29/31-10/94, of the finance authority for the state of Styria 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 the audit of the annual financial statements amounted to EUR 11,750.00 (previous year: EUR 11,500.00). No other certification services, tax advisory services or other services of the statutory auditor were incurred in the reporting year or in the previous year.

Graz, 6 March 2019

Prof. Dr Wolfgang Pribyl, MBA
The Management

Development of non-current assets	Cost of acquisition					Accumulated amortisation and depreciation					Carrying amounts	
	1 Jan 2018	Additions	Disposals	Reclassifi-cation	31 Dec 2018	1 Jan 2018	Additions	Write-ups	Disposals	31 Dec 2018	31 Dec 2017	31 Dec 2018
I) Intangible assets												
Software, data transmission rights and other rights	2,405,441.94	313,343.48	35,582.83	0.00	2,683,202.59	2,060,138.94	278,127.48	0.00	35,582.83	2,302,683.59	345,303.00	380,519.00
Total intangible assets	2,405,441.94	313,343.48	35,582.83	0.00	2,683,202.59	2,060,138.94	278,127.48	0.00	35,582.83	2,302,683.59	345,303.00	380,519.00
II) Property, plant and equipment												
1) Land, rights equivalent to land and buildings, including buildings on land owned by others												
a) Land value	2,656,523.66	0.00	0.00	0.00	2,656,523.66	0.00	0.00	0.00	0.00	0.00	2,656,523.66	2,656,523.66
b) Building value	15,142,645.32	283,118.67	60,416.11	168,367.19	15,533,715.07	8,241,086.32	570,304.86	0.00	55,888.11	8,755,503.07	6,901,559.00	6,778,212.00
Subtotal land and buildings	17,799,168.98	283,118.67	60,416.11	168,367.19	18,190,238.73	8,241,086.32	570,304.86	0.00	55,888.11	8,755,503.07	9,558,082.66	9,434,735.66
2) Machinery, scientific equipment and EDP systems	25,642,389.37	1,681,103.75	747,138.94	124,510.67	26,700,864.85	21,297,525.37	1,556,600.42	0.00	734,856.94	22,119,268.85	4,344,864.00	4,581,596.00
3) Other plant, furniture and fixtures	3,180,087.37	234,944.42	99,784.93	0.00	3,315,246.86	2,554,970.37	239,687.42	0.00	98,861.93	2,695,795.86	625,117.00	619,451.00
4) Advances made and construction in progress	352,455.20	361,654.88	0.00	-292,877.86	421,232.22	0.00	0.00	0.00	0.00	0.00	352,455.20	421,232.22
Offsetting of input tax on advances for non-current assets	-4,850.00	-9,402.00	0.00	0.00	-14,252.00	0.00	0.00	0.00	0.00	0.00	-4,850.00	-14,252.00
Subtotal advances made and construction in progress	347,605.20	352,252.88	0.00	-292,877.86	406,980.22	0.00	0.00	0.00	0.00	0.00	347,605.20	406,980.22
5) Low-cost assets	0.00	58,896.36	58,896.36	0.00	0.00	0.00	58,896.36	0.00	58,896.36	0.00	0.00	0.00
Total property, plant and equipment	46,969,250.92	2,610,316.08	966,236.34	0.00	48,613,330.66	32,093,582.06	2,425,489.06	0.00	948,503.34	33,570,567.78	14,875,668.86	15,042,762.88
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	0.00	150,000.00	150,000.00
2) Participating interests	260,638.25	80,000.00	0.00	0.00	340,638.25	0.00	0.00	0.00	0.00	0.00	260,638.25	340,638.25
3) Investment securities (book-entry securities)	1,406,750.00	5,000.00	0.00	0.00	1,411,750.00	0.00	0.00	0.00	0.00	0.00	1,406,750.00	1,411,750.00
Total financial assets	1,817,388.25	85,000.00	0.00	0.00	1,902,388.25	0.00	0.00	0.00	0.00	0.00	1,817,388.25	1,902,388.25
Total non-current assets	**51,192,081.11**	**3,008,659.56**	**1,001,819.17**	**0.00**	**53,198,921.50**	**34,153,721.00**	**2,703,616.54**	**0.00**	**984,086.17**	**35,873,251.37**	**17,038,360.11**	**17,325,670.13**

Management Report

The Management Report covers the reporting period of the financial year 2018 from 1 January 2018 to 31 December 2018 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 2018 JOANNEUM RESEARCH was organised in seven research units, which represent the main areas of activities.

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

I.2 Investment report

As at 31 December 2018 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.

JR-AquaConSol GmbH	100.0 %

I.2.2 Corporate investments

ALP.Lab GmbH	16.0 %
decide Clinical Software GmbH	10.0 %
EPIG GmbH	25.0 %
FH JOANNEUM Gesellschaft mbH	14.9 %
Geo5 GmbH	10.0 %
Holz.Bau Forschungs GmbH	8.7 %
Human.technology Styria GmbH	7.0 %
Rebeat Innovation GmbH	2.0 %

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

As at 31 December 2018 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 Transport, Innovation and Technology (BMVIT) and the Federal Ministry for Digital and Economic Affairs (BMDW):

ACIB GmbH	8.0 %
BIOENERGY 2020+ GmbH	10.0 %
CBmed GmbH	12.5 %
Kompetenzzentrum – Das virtuelle Fahrzeug, Forschungsgesellschaft mbH	10.0 %
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 %

The main objective of those investments is to support the central business tasks and objectives as well as to enhance the competitiveness of JOANNEUM RESEARCH. Another important aspect besides the activities for the COMET competence centre programme is the exploitation of technologies and products developed by JOANNEUM RESEARCH.

I.3 Branches

The Company has no branches.

I.4 Course of business

As at 31 December 2018 the orders on hand amounted to approximately EUR 53.9 million. The work on hand amounted to approximately EUR 25.0 million, the value of offers submitted was approximately EUR 55.6 million. The profit for the financial year 2018 amounted to kEUR 496.9 (previous year: profit for the year of approximately kEUR 260.3). Accordingly, the self-financing ratio (operating result / total expenses) was calculated at 80% (previous year: 80%).

In the area of contract research the operating result for the financial year 2018 was approximately EUR 16.7 million (previous year: approximately EUR 15.4 million). In funded research the Company generated an operating result of approximately EUR 14.0 million (previous year: approximately EUR 14.8 million).

At an international level JOANNEUM RESEARCH solicited contract research projects and funded research projects worth approximately EUR 12.0 million in the aggregate in the reporting year (previous year: approximately EUR 10.7 million). An amount of EUR 4.3 million thereof (previous year: approximately EUR 3.6 million) is attributable to projects with the European Union and approximately EUR 7.9 million (previous year: approximately EUR 7.1 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 5.4 million in the financial year 2018. Under the Horizon 2020 programme projects with a funding volume of approximately EUR 1.9 million were awarded to the Company and in connection with ESA projects an order volume of approximately EUR 0.8 million was solicited.

In the financial year 2018 revenues of approximately EUR 5.8 million (previous year: approximately EUR 7.0 million) were achieved through national cooperative research projects related to Österreichische Forschungsförderungsgesellschaft mbH (Austrian Research Promotion Agency) (FFG).

Under a 2015-2018 funding agreement with the Federal Ministry for Transport, Innovation and Technology (BMVIT) funds in the amount of EUR 9.4 million were granted. In the reporting period JOANNEUM RESEARCH achieved revenues totalling approximately EUR 1.9 million from BMVIT.

In the financial year 2018 the attributable business share amounted to EUR 13.4 million.

I.4.1 Financial position

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

As at the balance sheet date 31 December 2018 JOANNEUM RESEARCH had a balance sheet total of approximately EUR 57.9 million (previous year: approximately EUR 55.2 million). This is comprised of non-current assets in the amount of approximately EUR 17.3 million and current assets (inclusive of prepayments and accrued income and escrow funds) of approximately EUR 40.6 million.

As at 31 December 2018 shareholders' equity including investment grants amounted to EUR 12.9 million (thereof investment grants of approximately EUR 1.8 million) or 22% of the balance sheet total compared to approximately EUR 10.6 million or 19% of the previous year's balance sheet total. Borrowings (inclusive of accruals and deferred income and escrow liabilities) increased by approximately EUR 0.3 million to approximately EUR 44.9 million (previous year: EUR 44.6 million) and amounted to 78% (previous year: 81%) of the balance sheet total.

In the financial year 2018 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 3.4 million. Working capital (current assets minus short-term borrowings) was approximately EUR 12.9 million (previous year: approximately EUR 8.4 million).

No derivative financial instruments were used in the past financial year 2018. 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 2018 the operating result including own work capitalised and other operating income net of shareholder contribution and research tax premium amounted to approximately EUR 31.1 million (previous year: approximately EUR 33.3 million).

Domestic revenues account for 64% and international revenues account for 36% of the operating result. The share of the operating result attributable to Styria of 13% did not change compared to the previous year.

The amount of services not yet chargeable decreased by approximately EUR 1.2 million compared to the previous year and amounted to approximately EUR 8.2 million as at 31 December 2018.

The expenses in the amount of approximately EUR 43.3 million (previous year: approximately EUR 41.6 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 29.6 million (previous year: approximately EUR 28.2 million), cost of materials and other services purchased of approximately EUR 3.5 million (previous year: approximately EUR 3.2 million), amortisation and depreciation of approximately EUR 2.7 million (previous year: approximately EUR 2.6 million) and other operating expenses of approximately EUR 7.5 million (previous year: approximately EUR 7.6 million).

As at the balance sheet date the self-financing ratio was 80% (previous year: 80%). 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 and the Grant Agreement with the Federal Ministry for Transport, Innovation and Technology (BMVIT) constitute material parts of corporate financing and secure accomplishment of the Company's mission.

The Company closed the financial year 2018 with a profit before taxes (formerly profit or loss on ordinary activities) of EUR 220,270.09. Taking into account income taxes of EUR 1,750.00, reversal of reserves in the amount of EUR 278,420.66 and the profit of EUR 769,022.22 carried forward from the previous year, the net profit for the year is EUR 1,265,962.97.

After the accounts for the financial year 2018 were closed no other significant events occurred which would have affected the financial position or financial performance in the financial year 2018.

I.4.3 Capital expenditure report

In the financial year 2018 approximately EUR 2.9 million (previous year: approximately EUR 3.1 million) were spent on 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 451 employees (175 women and 276 men), +3.20% (+6.71% women and +1.10% men) compared to the previous year. This corresponds to 378.9 full-time equivalents as at 31 December 2018, i.e. an increase by 1.16% compared to the previous year.

With 86 new employees (46 women and 40 men) and 72 employees who left the Company (35 women and 37 men) in the reporting period the fluctuation regarding active employees was approximately 15.96% (20.00% women and 13.41% men). This figure has decreased compared to the previous year (19.45%).

The average age of the Company‘s employees is 41.2 years and has therefore changed only slightly compared to the previous year (41.1 years).

As at 31 December 2018 the share of graduates from universities and universities of applied sciences was 70.73% (32.59% women); the share of grammar school graduates was 17.96%.

As at the balance sheet date 9 apprentices, 5 female and 4 male, were undergoing training at JOANNEUM RESEARCH.

In the reporting period a total of 20 interns (8 women, 12 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, 26 students (5 female and 21 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)

At year-end 2018 performance of the global economies was characterised by a marked cooling down of the previous boom that had prevailed in all major economic zones. According to recent forecasts economic growth will gradually slow down in the next few quarters, followed by a stagnation of the economy.

The most important factors triggering such slowdown include the arduous Brexit negotiations between the EU and the UK, the unstable economic and political situation in Italy as well as the ongoing trade disputes between the USA and China. As additional factors unexpected production losses of the German automotive industry due to delays in the reconfiguration of exhaust gas measuring equipment should be mentioned.

In the USA the prolonged economic upswing has already reached its zenith. Fostered by large capital expenditure, an expansive monetary policy and strong private consumption the US economy grew by 2.9% in 2018 (WIFO Monthly Report 1/2019). A slight difference in the returns on short-term and those on long-term bonds indicates, however, an economic downswing in the next one to three years.

In the EURO zone GDP growth amounted to only 2.0% in 2018 due to the slackening economy, in particular in the three largest countries Germany, France and Italy. The relevant trend indicators also point towards an end of the economic boom, even if, for the time being, a solid economic growth can still be expected in 2019.

Also nationally a weakening of economic activity, which is currently at a high level, has to be noticed. For 2018 the calculation models show real GDP growth of up to 2.7% and from a present-day perspective a further reduction to 2.0% in 2019 and 1.8% in 2020 is to be expected for the years to come. Nonetheless, business enterprises in Austria are still optimistic about the current and future economic situation. Significant factors influencing future GDP development are the anticipated passing of the peak

in the industrial sector and the ensuing reduction in capital expenditure, which is already taking place.

The overall estimate of gross domestic expenditure on research and development (R&D) in Austria shows a research share of 3.19% for 2018 (Statistics Austria Press Release 11.763-074/18). In the previous year the research share was 3.16%. According to the present calculation status a total of EUR 12.34 billion was spent on R&D in the past year. The business sector accounts for EUR 6.11 billion thereof, the Federal Government's share was EUR 3.56 billion and EUR 0.53 billion are attributable to the states and EUR 0.19 billion to the municipalities, chambers and social security institutions. R&D expenditure of foreign businesses in Austria is expected to be approximately EUR 1.95 billion.

Shareholder contribution from the state of Styria

The Government of the State of Styria provided JOANNEUM RESEARCH with a shareholder contribution of EUR 7,750,000.00 for 2018 as a contribution to recurring expenses.

Shareholder contribution from Kärntner Betriebsansiedlungs- und Beteiligungsgesellschaft m.b.H. (BABEG)

The shareholder contribution agreement between BABEG and JOANNEUM RESEARCH will be in force until 2020. BABEG granted JOANNEUM RESEARCH a shareholder contribution of EUR 1,424,000.00 for 2018.

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 the state of Burgenland agreed to grant JOANNEUM RESEARCH a shareholder contribution of EUR 464,500.00 for the term of the investment.

Due to the fact that the investment took place in the second half of the year a total shareholder contribution of EUR 232,250.00 was paid in the financial year 2018.

Grant Agreement Federal Ministry for Transport, Innovation and Technology (BMVIT)

Under the current Grant Agreement 2015-2018 the Federal Ministry for Transport, Innovation and Technology (BMVIT) provides funding in a total amount of EUR 9.40 million for near-basic research projects.

Preparations to draft the contract for the Grant Agreement 2019-2021 are closely coordinated with BMVIT. Funding of eight near-basic research projects worth EUR 7.755 million in the aggregate is planned.

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 Transport, Innovation and Technology (BMVIT) are significant financing tools of JOANNEUM RESEARCH.

Risks and prospective development

As a research company JOANNEUM RESEARCH faces changing national and international framework conditions of research funding. The competition for available grants is becoming increasingly tough.

Starting new research topics requires adequate resources taking into account the development risk inherent in research.

The Company's financial performance is expected to be stable in the financial year 2019.

IT security at JOANNEUM RESEARCH

Since the previous year the damage suffered by Austrian business entities due to attacks on IT and communications systems has decreased slightly. In 2018 a study on this subject showed that 61% of the 269 surveyed entities had been victims of cyber attacks. In 2017 almost three fourths of the entities had been affected, which means a slight decrease (comparison of the KPMG study "Cyber security in Austria" for 2018 and 2017). In half of the cases the attacks caused interruptions of business processes and sometimes serious consequences. The estimated number of undetected cases is much higher, as almost half of the attacks are not being reported.

In terms of the human factor credulity on the part

of the victims, lack of awareness of the need for security measures and the increasing prominence of digital equipment in everyday life constitute the attack vectors. Technical threats are manifold and change constantly. A vast number of recording devices (e.g. cameras, microphones) record most different situations in a way that can hardly be monitored. GPS-spoofing kits, by means of which valid but fake geolocation data can be generated and sent, are publicly available and offered at low prices. Thus, GPS-controlled devices can be deceived by feigning a location, which poses an enormous risk to the future area of highly-automated driving.

In May 2018 both the General Data Protection Regulation of the European Union (GDPR) and the Austrian Data Protection Amendment Act [Datenschutz-Anpassungsgesetz] 2018 entered into force. At the same time the transposition period for the "EU Network and Information Security (NIS) Directive" ended. All of such legislation requires additional documentation and security measures and provides for massively increased fines of up to EUR 20 million. For standardisation of data protection JOANNEUM RESEARCH adopted a process description and procedural instructions according to ISO 9001.

Even in the past JOANNEUM RESEARCH continuously improved security measures in the area of IT and has established more controls in the quality management system. In implementation of the new legislation measures will be taken throughout the Company to enhance security, which will also mean capital expenditure.

All staff members signed the revised data protection agreement and completed one or more courses on data protection. Courses are being offered regularly and creating awareness of threats from the internet (e.g. ransomware) is being continued. The systems used, both in the area of IT and for physical access controls, are continuously being improved and adapted to the state of the art.

III. Report on research and development

III.1 Research units

MATERIALS – Institute for Surface Technologies and Photonics

Activities planned for financial year 2019:

In the course of the strategic development 2017-2021 MATERIALS redesigned its organisational structure. In the financial year 2019 the focus areas will in particular be the setup and expansion of the Smart Connected Lighting research group at the new location in Burgenland and the merger of the two locations Leoben and Niklasdorf to further increase the development potential in the area of 3D printing of metals. Another research focus will be on developing a simulation platform for roll-to-roll processes and establishing corrosion-chemical testing of metallic and ceramic coatings for porous SLM metals.

HEALTH – Institute for Biomedicine and Health Sciences

Activities planned for financial year 2019:

HEALTH is optimally embedded in a national and international scientific and business network. Therefore, HEALTH operates in accordance with international quality and GxP standards of the pharmaceutical and medical technology industry and is certified accordingly (EN ISO 13485, Good Laboratory Practice). In order to further increase the quality standard and concurrently upgrade the research portfolio, it is planned to complete the setup of clinical data management and clinical statistics for approval studies by the end of 2019. Cooperation with COREMED is essential for developing new topics in the research field of regenerative medicine.

DIGITAL – Institute for Information and Communication Technologies

Activities planned for financial year 2019:

The DIGITAL institute will continue the process of topical (re-)orientation also in the financial year 2019. In particular, the activities in the field of highly-automated driving will be expanded in close connection to the current Styrian initiatives in the area of mobility. Furthermore, the new FORTE defence research programme offers enhanced cooperation opportunities in the area of security research. In addition, the available competences in the field of deep computing for image processing and data analytics will be strengthened. For AKUT™ the service area will be supplemented by a service team of its own.

POLICIES – Institute for Economic and Innovation Research

Activities planned for financial year 2019:

In 2019 POLICIES will continue its fundamental mission of providing advice on and support in strategic and operational decisions to customers from politics and business. For this purpose further activities will be initiated and carried out, in particular under projects of EU Framework Programmes and ongoing work on the mission-oriented policy in the European Union and in Austria. The focus will continue to be on new analytical methods based on big data. Apart from the ongoing in-depth dealing with big data analytics in the production area also new areas of application in socio-scientific and economic analyses will be developed.

Management Report

ROBOTICS – Institute for Robotics and Mechatronics

Activities planned for financial year 2019:

By completing the new-build institute in the financial year 2019 ROBOTICS will create the basis for a significant enhancement of both the research infrastructure and the research portfolio. In 2019 ROBOTICS will focus on "robot safety", "sensitive & mobile manipulation - collaboration, sensor technology & interaction" as well as on "artificial intelligence in robotics and automation". An additional topic is credible robotics, by which the institute has also established itself at an international level. Another objective is the establishment and accreditation of a measurement laboratory for robot safety that is certified according to ISO 17025 (ROBOTICS Evaluation Lab).

LIFE – Centre for Climate, Energy and Society

Activities planned for financial year 2019:

Since it was founded in January 2018 LIFE has addressed central issues concerning climate change, national and regional climate policy and the related necessary decarbonisation, and research into climate risks. It is intended to further expand the Urban Living Lab competence group in the financial year 2019 at Klagenfurt. In addition, the focus of research work is on multi-agent modelling of mobility, which is above all necessary to illustrate future developments in the area of automated and shared mobility. The scientific profile of the Centre will continue to be strongly characterised by the current LIFE Doctoral Programme.

COREMED – Cooperative Centre for Regenerative Medicine

Activities planned for financial year 2019:

COREMED, which will be set up in the next few financial years in close coordination and cooperation with the Medical University of Graz and HEALTH, gives new impulses in medical research at the styrian location. The research topics addressed at the new Centre are of high social relevance and hold large development potential in the medium and long term. COREMED works on restoring dysfunctional cells, tissues or organs. In financial 2019 further steps will be taken to build and expand research activities in the area of regenerative medicine with a focus on wound healing.

Graz, 6 March 2019

Prof. Dr Wolfgang Pribyl, MBA
The Management

JOANNEUM RESEARCH Forschungsgesellschaft mbH

Executive Board, Corporate Staff and Departments

prm alg 18204-2

as of: December 2018

Research Units

MATERIALS
Institute for Surface Technologies and Photonics

- Hybrid Electronics and Patterning
- Light and Optical Technologies
- Laser and Plasma Processing
- Sensors and Functional Printing
- Smart Connected Lighting

HEALTH
Institute for Biomedicine and Health Sciences

- Biomedical Tissue Monitoring
- Bioanalytics and Metabolomics
- Health Sciences
- Competence Group Clinical Decision Support
- Competence Group Medical Sensors

DIGITAL
Institute for Information and Communication Technologies

- Remote Sensing and Geoinformation
- Machine Vision Applications
- Space and Communication Technology
- Connected Computing
- Intelligent Acoustic Solutions
- Competence Group Cyber Security and Defence

POLICIES
Institute for Economic and Innovation Research

- Technology, Innovation and Policy Consulting
- Data Analytics and Statistical Modelling
- Regional Economics and Structural Policy

ROBOTICS
Institute for Robotics and Mechatronics

- Cognitive Robotics
- Mechatronic Systems
- Robotic Systems

LIFE
Centre for Climate, Energy and Society

- Weather and Climate Risk Management
- Future Energy Systems and Lifestyle
- International Climate Policy and Economics
- Competence Group Urban Living Lab
- Competence Group Innovative Mobility Modelling

COREMED
Cooperative Centre for Regenerative Medicine

Equity Holdings

Affiliated Company

- JR-AquaConSol GmbH

Shareholdings

- ALP.Lab GmbH
- decide Clinical Software GmbH
- EPIG GmbH
- FH JOANNEUM Gesellschaft mbH
- Geo5 GmbH
- Holz.Bau Forschungs GmbH
- Human.technology Styria GmbH
- Rebeat Innovation GmbH

Shareholdings COMET-Centres

- ACIB GmbH
- BIOENERGY 2020+ GmbH
- CBmed GmbH
- Know-Center GmbH Research Center for Data-Driven Business & Big Data Analytics
- Kompetenzzentrum – Das virtuelle Fahrzeug, Forschungsgesellschaft mbH
- Materials Center Leoben Forschung GmbH
- Polymer Competence Center Leoben GmbH
- Research Center Pharmaceutical Engineering GmbH

JOANNEUM RESEARCH Forschungsgesellschaft mbH

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

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