



Data spaces can be used to integrate all types of materials information into digital networks - a valuable tool for production in the context of Industrie 4.0.

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The report is set up in a compact listing of various sections in alphabetical sequence. Every section contains one or more citations, each with the following set-up:

- (i) the respective **Topic**
- (ii) the publishing **Source** and bibliographical information
- (iii) the Abstract which supplies a short summary of the contents
- (iv) in case a contact address is available with the original information, it will be given under the **Contact**

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EDITORIAL

Dear Readers,

As the Science Counsellor at the Embassy of India, Berlin I had several opportunities to visit a number of S&T research labs, meet and discuss bilateral issues with many scientific organisations. All these meetings & discussions were opportunities to & connect contribute towards empowering understanding and scientific growth between the community of India and Germany.

As I have completed my present posting and go back to India, I wish that all of these initiatives fruit to become successful lona term programs in cutting edge areas of science and technology. At this juncture, I would like to thank all those who have teamed with me in realizing this objective in India and in Germany. Also hope that we all join scientific hands to cultivate temperament and innovation skills at a very young age in India which I understand will be the winner in the long run.

R. Madhan

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CONFERENCES

01.03.18 - 03.03.18

BIOTEC Forum "The Biophysics of the transcription, of chromatins and of the nuclear architecture" in Dresden

Organiser: Professor Dr. Adrian Francis Stewart, Technische Universität Dresden, Biotechnologisches Zentrum (Biotec), Tatzberg 47/49, 01307 Dresden, Tel.: (+49) 351/46340129

01.03.18 - 03.03.18

"6. Scientific Congress of German Society for Eating Disorders" in Munich **Organiser:** Professor Dr. Ulrich Voderholzer, Ludwig-Maximilians-Universität München (LMU), Klinik für Psvchiatrie und Psychotherapie (Campus Innenstadt), Nussbaumstraße 7, 80336 München. Tel.: (+49)89/440055511 Linkhttp://www.dgess-Externer kongress.de/

04.03.18 - 09.03.18

"6. International Geo-dangers Science symposium. 9. Dresden Symposium Danger recognition and -management" in Dresden

Organiser: Professor Dr. Johann-Wolfgang Bartha, Technische Universität Dresden,

Institut für Halbleiter- und Mikrosystemtechnik (IHM), Nöthnitzer Straße 64, 01187 Dresden, Tel.: (+49) 351/46335292, Externer Linkhttp://igrs.co/

05.03.18 - 07.03.18

"New Horizons in the seeing and hearing research" in Tübingen **Organiser:** Professor Dr. Eberhart Zrenner, Eberhard Karls Universität Tübingen, Forschungsinstitut für Augenheilkunde, Elfriede-Aulhorn-Straße 7, 72076 Tübingen, Tel.: (+49) 7071/29-84786

05.03.18 - 08.03.18

"Annual Meet of the German Society for Crystallography (DGK) 2018" in Essen

Organiser: Professor Dr. Matthias Epple, Universität Duisburg-Essen, Anorganische Chemie - AG Epple, Universitätsstraße 7, 45141 Essen, Tel.: (+49) 201/183-2413, Externer Linkhttp://www.dgk-conference.de/

06.03.18 - 09.03.18

"Wild Genomics Meet" in Bielefeld **Organiser**: Dr. Joseph Hoffman, Universität Bielefeld, Abteilung Tierökologie, Konsequenz 45, 33615 Bielefeld, Tel.: (+49) 521/106-2711,

www.thehoffmanlab.com

11.03.18 - 14.03.18

"Meeting of experimentally working psychologists" in Marburg **Organiser:** Professor Dr. Alexander Christian Schütz, Philipps-Universität Marburg, Arbeitsgruppe Allgemeine und Biologische Psychologie, Gutenbergstraße 18. 35037 Marburg, Tel.: (+49) 6421/2823683, Externer Linkhttp://www.teap.de

12.03.18 - 14.03.18

"GeMiC 2018 - German Microwave Conference 2018" in Freiburg in Breisgau

Organiser: Privatdozent Dr. Rüdiger Quay, Fraunhofer-Institut für Angewandte Festkörperphysik (IAF), Tullastraße 72, 79108 Freiburg, Tel.: (+49) 761/5159843

Externer Linkhttp://www.gemic2018.de

12.03.18 - 15.03.18

"Trends in Microscopy 2018: "Bridging the worlds" Annual Meet of German Bioimaging – Society for Microscopy and Image Analysis, in Düsseldorf

Organiser: Professor Dr. Elisa May, Universität Konstanz, Bioimaging Center, Universitätsstraße, 78464 Konstanz, Tel.: (+49) 7531/88-4054

14.03.18 - 16.03.18

"ITG Workshop on Smart Antennas" in Bochum

November 2018

Organiser: Professor Dr.-Ing. Aydin Sezgin, Ruhr-Universität Bochum, Lehrstuhl für Digitale Kommunikationssysteme, Universitätsstraße 150, 44801 Bochum, Tel.: (+49) 234/3229849, Externer Linkhttp://www.wsa2018.dks.ruhruni-bochum.de

15.03.18 - 17.03.18

"62. Scientific annual meet of the German Society for Clinical Neurophysiology and Functional Imaging (DGKN)," in Berlin

Organiser: Professor Dr. Agnes Flöel, Ernst-Moritz-Arndt-Universität Greifswald,

Klinik und Poliklinik für Neurologie, Ferdinand-Sauerbruch-Straße, 17489 Greifswald,

Tel.: (+49) 3834/86-6800, Externer Linkhttp://www.dgkn-kongress.de/

18.03.18 - 21.03.18

"Meeting of the European Environment and Mutagenity Research Society" in Potsdam

Organiser: Professor Dr. Tanja Schwerdtle, Universität Potsdam, Lehrstuhl für Lebensmittelchemie, Arthur-Scheunert-Allee 114-116, 14558 Nuthetal, Tel.: (+49) 33200/88-5580, Externer Linkhttp://www.eemgs2018.eu/

19.03.18 - 23.03.18

"89. Annual Meet of the Society for Applied mathematics and Mechanics (GAMM e.V.", in Munich **Organiser**: Professor Dr.-Ing. Gerhard Müller, Technische Universität München (TUM), Lehrstuhl für Baumechanik, Arcisstraße 21, 80333 München, Tel.: (+49) 89/289-28345, Externer Linkhttp://www.gamm2018.de

19.03.18 - 25.03.18

"Tectonics, Structural Geology and Crystallin Geology- TSK 2018" in Jena **Organiser**: Professor Dr. Kamil Marek Ustaszewski. Friedrich-Schiller-Universität lena, Lehrstuhl für Strukturgeologie, Burgweg 11, 07749 (+49)3641/948623 Jena, Tel.: Externer Linkhttp://www.tsk17.unijena.de

20.03.18 - 22.03.18

"15th Annual Joint GenoMEL/ BioGenoMEL/ MELGEN Scientific 2018" Meeting in Essen Dirk **Organiser:** Professor Dr. Schadendorf, Universität Duisburg-Essen.

Klinik für Dermatologie, Hufelandstraße 55, 45147 Essen, Tel.: (+49) 201/7234342

20.03.18 - 23.03.18

"34. European Workshop on Algorithmic Geometry" in Berlin Organiser: Professor Dr. Wolfgang Mulzer, Freie Universität Berlin, Institut für Informatik, Arnimallee 6, 14195 Berlin. Tel.: (+49)30/83875165 Externer Linkhttp://www.conference.imp.fuberlin.de/eurocg18/home

21.03.18 - 23.03.18

"11. Plenary der Research Data Alliance (RDA)" in Berlin

Organiser: Roland Bertelmann, Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum (GFZ), Bibliothek des Wissenschaftsparks Albert Einstein, Telegrafenberg, 14473 Potsdam, Tel.: 1650 (+49)331/288 Externer Linkhttp://www.rdalliance.org/plenaries/rda-eleventhplenary-meeting-berlin-germany

21.03.18 - 23.03.18

"German Congress for Psychosomatic Medicine and Psychotherapy 2018: Psychsomatics as Perspective" in Berlin

Organiser: Privatdozent Dr. Kim Hinkelmann, Charité -Universitätsmedizin Berlin, Medizinische Klinik mit Schwerpunkt Psychosomatik (CBF), Hindenburgdamm 30, 12203 Berlin, Externer Linkhttp://2018.deutscherpsychosomatik-kongress.de

21.03.18 - 23.03.18

"SIGOPT 2018 International Conference on Optimisation", in Kloster Irsee

Organiser: Professor Dr. Tobias Harks, Universität Augsburg, Institut für Mathematik, Universitätsstraße 14. 86159 Tel.: (+49)821/2234 Augsburg, Externer Linkhttp://www.math.uniaugsburg.de/tagungen/SIGOPT-2018/

22.03.18 - 24.03.18

"69. Mosbacher Colloquium of the Society for Biochemistry and Molecular Biology (GBM) Synthetic Biology . From Understanding to Application", in Mosbach/Baden

Organiser: Professor Dr. Wolfgang E. Trommer, Technische Universität Kaiserslautern, Fachrichtung Biochemie, Erwin-Schrödinger-Straße 52, 67663 Kaiserslautern, Tel.: (+49) 631/2052045, Externer Linkhttp://www.mosbacherkolloguium.org

22.03.18 - 25.03.18

"14. Psychoimmunology Experten-Meeting"

"Neuroinflammation and Psychiatry – From the basic research to Psychopathology", in Ulm-Reisensburg

Organiser: Professor Dr. Iohann Steiner, Otto-von-Guericke-Universität Magdeburg, Klinik für Psychiatrie und Psychotherapie, Leipziger Straße 44, 39120 Magdeburg, Tel.: (+49)391/6715019, Externer Linkhttp://www.psychoimmunologyexperts.de

25.03.18 - 28.03.18

"64. Biometric Colloquium of German Region of International Biometric Society (IBS-DR)", in Frankfurt Main am Professor Dr. **Organiser**: Eva Goethe-Universität Herrmann. Frankfurt am Main, Institut für Biostatistik und mathematische Modellierung, Theodor-Stern-Kai 7, 60596 Frankfurt, Tel.: (+49) 69/6301-87691 Externer Linkhttp://biometrischeskolloquium2018.de

25.03.18 - 29.03.18

"27. International Polar Meet", in Rostock

Organiser: Professor Dr. Ulf Karsten, Universität Rostock, Lehrstuhl Angewandte Ökologie und Phykologie, Albert-Einstein-Straße 3, 18059 Rostock, Tel.: (+49) 381/4986090

LASER TECHNOLOGY & APPLICATIONS

HZB BUILDS UNDULATOR FOR SESAME IN JORDAN

Helmholtz Centre Berlin (HZB) Press news, 29 November 2018

The Helmholtz-Zentrum Berlin is building an APPLE II undulator for the SESAME synchrotron light source in Jordan. The undulator will be used at Helmholtz SESAME beamline the (HESEB) that will be set up there by five Helmholtz Centres. The Helmholtz Association is investing 3.5 million euros in this project coordinated by DESY.

SESAME stands for "Synchrotron Light Experimental Science for and Applications in the Middle East" and provides brilliant X-rav liaht for The thirdresearch purposes. radiation generation synchrotron source became operational in 2017. Egypt, Iran, Israel, Jordan, Pakistan, the Palestinian Authority, Turkey, and Cyprus are cooperating on this unique project to provide scientists from the Middle East with access to one of the most versatile tools for research.

Contact: Helmholtz Centre Berlin, Helmholtz-Zentrum Berlin für Materialien und Energie

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Hahn-Meitner-Platz 1, 14109 Berlin, Tel: +49 30 8062 - 0

MATERIAL SCIENCES & COMPONENTS

CREATING DIGITAL TWINS OF MATERIALS

Fraunhofer Institute for Mechanical Materials Press news, 3 December 2018

Materials data space for additive manufacturing.

To ensure the digital networking of production systems and the optimization of material-specific requirements, we need to measure, analyze and replicate the changes in material properties in a process in which "digital twins" of materials are created. The materials data space developed by Fraunhofer researchers has laid the groundwork for this process.



Data spaces can be used to integrate all types of materials information into digital networks - a valuable tool for production in the context of Industrie 4.0.

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When a finished part rolls off the production line, this is one of the first questions always asked: "Does this component have the properties I want?" Often, even the tiniest of variations in the production environment are enough to alter a part's material properties - and throw its functionality into question. Manufacturers avoid this bv meticulously inspecting samples throughout the production process. Breaking down the samples into their composite parts and measuring them separately is an extremely timeconsuming process. "The outcome of the sample testing process branches out into an array of different subsets, each with their own specific measurement results," explains Dr. Christoph Schweizer, Head of the Assessment of Materials. Lifetime Concepts business unit at the Fraunhofer Institute for Mechanics of Materials IWM in Freiburg. "While experts may be able to keep an overview of the complex interrelationships in their heads, until now there has been no way to take the diversity of resulting data and portray it in a coherent digital format."

A digital twin for each material

Now, for the first time, researchers at the Fraunhofer IWM have developed a proof of concept demonstrating that it is possible to digitally represent many such material processing cycles with a

materials data space for test specimens produced using additive manufacturing. "The data space concept allows us to integrate any type of material information into a digital network - a really valuable tool, especially in the context of Industrie 4.0," says Schweizer. "We want to use the materials data space to automatically generate a digital twin of each material that will mirror the current state of the physical object under examination." The advantage of the materials data space is that it provides an overview of all relevant parameters at a glance, whereas formerly data on different material parameters was scattered among numerous data in different repositories many formats. But the real promise lies further ahead. "In the years to come, the materials data space has the potential to become the production command center. Whenever component quality isn't up to the expected standard, you can compare it with information on previous components stored in the materials data space to determine whether the present component can in fact be used or whether it must be rejected," says Schweizer. In the future, these automatically results could be integrated into industrial decisionmaking processes: whenever component quality dips below the required standard, production automatically comes to a halt.

Contact: Dr. Christoph Schweizer, Fraunhofer Institute for Mechanical Materials, Tel: +49 761 5142-382

MEDICAL SCIENCES & HEALTH

NAVIGATING OUR THOUGHTS: FUNDAMENTAL PRINCIPLES OF THINKING

MPI for Human Cognitive and Brain Sciences Press news, 8 November 2018

Researchers find evidence that our experiences and knowledge are organized in the brain in a spatial fashion.

It is one of the most fundamental questions in neuroscience: How do humans think? Until recently, we seemed far from a conclusive answer. However, scientists from the Max-Planck-Institute for Human Cognitive and Brain Sciences (MPI CBS) in Leipzig, Germany, have combined the available evidence, in collaboration with Nobel Prize laureate Edvard Moser from the Kavli Institute for Systems Neuroscience in Trondheim, Norway and Peter Gärdenfors from Lund University in Sweden, to paint a new, comprehensive picture in the current issue of the journal Science: Humans think using their brain's navigation system.



Spatial order: Our brain stores information in cognitive spaces - a kind of mental map in which we arrange complex reality in simplified terms.

© Ella Maru Studio & MPI for Human Cognitive and Brain Sciences/Doellerlab

When we navigate our environment, two important cell types are active in brain. Place cells our in the hippocampus and grid cells in the neighboring entorhinal cortex form a circuit that allows orientation and navigation. The team of scientists suggests that our inner navigation system does much more. They propose that this system is also key to 'thinking', explaining why our knowledge seems to be organized in a spatial fashion.

"We believe that the brain stores information about our surroundings in so-called cognitive spaces. This concerns not only geographical data, but also relationships between objects and experience," explains Christian Doeller, senior author of the paper and the new director at the MPI CBS.

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EARLY TREATMENT HAS NO SURVIVAL BENEFITS

Helmholtz Zentrum München - German Research Center for Environmental Health Press news, 29 November 2018

When is high blood pressure dangerous? Medical associations offer widely differing answers. In the USA, for example, patients are seen as hypertensive much sooner than in Germany. Α team of Helmholtz Zentrum München and the Technical University of Munich (TUM) has concluded in the 'European Heart Journal' that treating patients sooner does not reduce the risk of deadly heart disease. It could even negatively affect their mental health.

In 2017 the American College of Cardiology added a new category to its guidelines for high blood pressure: Stage 1 Hypertension. Under the new standards, doctors are advised to place patients in this category (130-139 mmHg / 80-89 mmHg) on treatment. For the European Society of Cardiology, that range is defined as "high normal" blood pressure, with no specific action recommended. "The idea behind the US guidelines is to lower blood pressure as early as possible and, by presenting patients with a diagnosis, to encourage them to adopt a healthier lifestyle," explains Prof. Karl-Heinz Ladwig. He is a group leader at the Institute Epidemiology of Helmholtz

Zentrum München and researcher at the Clinic for Psychosomatic Medicine and Psychotherapy at the TUM University Clinic rechts der Isar.

Motivation factor questionable

from Using data approximately 12,000 patients, Ladwig and his team assessed the situation in Germany. "We studied the 10-year risk of mortality from cardio-vascular disease (CVD) among people in the various hypertension categories in the context of the other risk factors affecting them," says Servan Atasoy, the first author of the study, who is working as an epidemiologist at Helmholtz Zentrum München and Ludwig-Maximilians-Universität München.

In the newly created category Stage 1 Hypertension, the CVD mortality risk was not significantly higher than among patients with normal blood pressure. "The motivation effect is questionable, too," says Karl-Heinz Ladwig. Patients in the high-risk category Stage 2 Hypertension, where medication is recommended under both the US and the European guidelines, have a much greater risk of dying of heart disease, he explains. "At the same time, risk factors such as smoking and a lack of exercise are far more frequent in that group. That shows that many people do not change their lifestyles despite the diagnosis."

Dangerous depression

Although the incidence of depression is generally lower among people with dangerously high blood pressure than in the general population, depression was significantly more common in one subset of that group: those taking medication to treat their serious hypertension. Here, depressive moods were reported by around half of all patients, as opposed to just one-third of those not receiving treatment. "We believe that this should be seen as a labeling effect," says Ladwig. "When people are officially labeled as 'sick', that has an impact on their mental health." A previous study by Ladwig and his team showed that, in terms of mortality risk from cardio-vascular disease, depression is comparable to high cholesterol levels or obesity.

New guidelines mean more sick people

"The American College of Cardiology itself has calculated that the proportion of adults diagnosed with high blood pressure will increase from 32 to 46 percent," says Karl-Heinz Ladwig. "That means 14 percent more who have to deal with the additional mental stress although their risk of developing a potentially deadlv cardio-vascular condition is not significantly higher, and despite no real expectation of extra motivation through the diagnosis." For those reasons, Ladwig believes that it would be a serious

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mistake to adopt the US guidelines in Europe.

Scientific Contact: Prof. Dr. Karl-Heinz Ladwig, Helmholtz Zentrum München - German Research Center for Environmental Health, Institute of Epidemiology, Ingolstädter Landstr. 1, 85764 Neuherberg, Tel. +49 89 3187 3623

MULTI-RESISTANT BACTERIA WITH CAMOUFLAGE STRATEGY

Max-Planck-Society Press news, 3 December 2018

A previously unknown protein makes *Staphylococcus aureus* pathogens invisible to the immune system.

A new approach has been uncovered for treating infections caused by particularly dangerous bacte-ria. Researchers at the University of Tübingen and the German Center for Infection Research (DZIF) have teamed up with scientists from the Max Planck Institute for Colloids and Interfaces and have achieved a breakthrough in determining how Staphylococcus aureus evades detection by the immune system. According to them, a previously unknown protein helps the pathogen, which can cause life-threatening infections in hospitals, to avoid detection, as if hidden by a magic cloak. The researchers have now identified the structure and function of this protein, thereby creating a basis for allowing the immune system to recognise this pathogen.

Infections caused by bacteria such as Staphylococcus aureus cause many deaths worldwide. Staphylococcus aureus strains resistant to the antibiotic methicillin (MRSA for short) are particularly feared in hospitals. According to a study published at the beginning of November, there were around 670,000 diseases caused by multi-resistant pathogens in the EU alone in 2015 and 33,000 patients died.

Contact: Prof. Dr. Andreas Peschel, Interfakultäres Institut für Mikrobiologie und Infektionsmedizin, Tel: +49 7071 29-78855

ACTIVE SUBSTANCES FOR CANCER MEDICATION

Max-Planck-Society Press news, 3 December 2018

First molecule by the Lead Discovery Center is tested in clinical trials.

When the Max Planck Society established the Lead Discovery Center (LDC) for the development of new medicinal compounds in 2008, only a few people believed it would be successful. Ten years later, researchers at the LDC are now working on around 20 projects involving searches for new substances that can be used for medicinal purposes. One of the compounds developed at the LDC is already being tested in clinical studies on humans, while another is soon to reach this phase. Along with academic

organizations and public entities such as the Max Planck Society the Helmholtz Association and the state of North Rhine-Westphalia, a number of pharmaceutical and biotech companies such as Bayer, Boehringer Ingelheim, Gruenenthal and Merck are also involved with the of development medicinal compounds at the LDC in the capacity of licensees or cooperative partners.

The search for new cancer drugs accounts for the majority - currently around 40 percent - of the research projects at the LDC. One substance that has already overcome several obstacles on the way to becoming a drug is atuveciclib. This substance was discovered and developed by scientists at the LDC. Atuveciclib inhibits the activity of an enzyme known as CDK9, which regulates the formation of so-called messenger RNA and consequently the synthesis of proteins. CDK9 is overactive in some cells. This can cause them to become cancerous.

"The pharmaceutical industry did not pursue the blockage of CDK enzymes for a long time because there was supposedly too little chance of success. With the development of atuveciclib, we have shown that this principle can by all means be used in drugs provided the CDK9 inhibitor is specific enough," explains Bert Klebel, co-director of LDC with Peter Nussbaumer. The development of this substance was supported by the Max Planck Foundation. The LDC has issued a license for atuveciclib to Bayer, which is currently testing it in a clinical phase 1b study.

Contact: Dr. Michael Hamacher Press and Public Relations, Max Planck Society, Tel+49 231 9742-7012

NATURAL SCIENCES

THE LIGHT SWITCH WHICH ACTIVATES ENZYMES

Kiel University Press news, 29 November 2018

Research team under Kiel leadership controls the function of iron enzymes with light for the first time.

Whether animals, plants, fungi, bacteria or people: enzymes containing iron are at work in almost all living organisms. In the human liver, such an enzyme acts like a kind of biological waste incinerator: it oxidises harmful substances, medication or the body's own materials, to excrete them via the kidneys. In order to fulfil their vital task, the iron atom inside the enzyme constantly switches back and forth between a magnetic and non-magnetic state. An international research team led by Professor Rainer Herges from the Institute of Organic Chemistry at Kiel University (CAU) has now

succeeded in designing for the first time an artificially-produced iron molecule, whose magnetic spin state can be switched on and off via UV light. Spin is an intrinsic form of angular momentum - one of the primary characteristics of elementary particles - and a way to change the functions of molecules in a controlled manner. Such switches could also be used for numerous other applications, such as regulating further enzymatic reactions, chemical catalyses or for converting methane. The research team's findings have published been recently in the renowned journal Nature Communications.

"Enzymes, such as the ferrous cytochrome P450 in our livers, operate as independent molecular machines," explained Rainer Herges, Professor of Organic Chemistry and spokesperson for the Kiel Collaborative Research Centre 677 "Function by Switching". "Their biological functions are based on which switching processes, we explore and want to control as far as possible." In collaboration with scientists from the Ruhr Universität Bochum (RUB), the Max Planck Institute for Chemical Energy (MPI CEC) Conversion and the National Institute for Interdisciplinary Science and Technology (NIIST) in India, they have now taken a further November 2018

step towards achieving this: modelled on the cytochrome P450, they designed a ferrous molecule they can switch back and forth between different magnetic states using light in order to change their characteristics.

Contact: Prof. Dr. Rainer Herges,Institute of Organic Chemistry, Kiel University, Tel.: +49 (0)431 880 2440, www.uni-kiel.de/fakultas/mathnat/chemie/organische/

FRAUNHOFER LIGHTHOUSE PROJECT "COGNITIVE AGRICULTURE"

Fraunhofer Institute Press news, 14 *November* 2018

Balancingproductivityandsustainability of agricultural processes.

Finding the right balance between sustainability and productivity is one of the goals of the United Nations' Agenda 2030 for worldwide "Food Security and Sustainable Agriculture". This is in line with the new lighthouse project "Cognitive Agriculture" of the Fraunhofer-Gesellschaft, which aims at achieving a more efficient and at the same time more sustainable agriculture based the on comprehensive of digital use technologies. In this lighthouse project, eight Fraunhofer Institutes under the leadership of the Fraunho-fer Institute for Experimental Software Engineering IESE in Kaiserslautern are jointly working on solutions for producing agricultural products in an environmentally friendly, resourcesaving, and at the same time highly

efficient manner. On 14 November 2018, the project was launched officially at the Fraunhofer-Forum in Berlin in the presence of representatives from research, industry, government, and the press.

Industrialization has had a major impact on agricultural technology in recent decades, not only increasing productivity, but also causing negative effects: soil compaction, intensive fertilization, excessive use herbicides. of pesticides. and fungicides, or various types of genetically manipulated seedlings lead to permanent damage to the biosphere. Organic agriculture has evolved as an alternative; however, it deliberately accepts productivity losses. In the Fraunhofer lighthouse project "Cognitive Agriculture", we will study what а networked ecosystem for agricultural processes must look like that can help to optimize both the economic and the ecological aspects in equal measure.

"Agricultural technology is not only a branch of industry that is essential for our society - it is also a progressive, highly innovative industry. The use of state-of-the-art information technologies has great potential to make agricultural processes even more efficient in the future", explains the President of the Fraunhofer-Gesellschaft, Prof. Reimund Neugebauer. "In our new

lighthouse project, eight Fraunhofer Institutes have joined forces to use innovative automation concepts and novel sensory technology to build a data-based ecosystem that shall become a milestone in digitalized agriculture. In this way, digital technologies, new research approaches, and the problem-solving competence of Fraunhofer can become the enablers of highly efficient and at the same time sustainable agriculture of the future."

Contact: Claudia Reis, Pressereferentin, Fraunhofer-Platz 1, 67663 Kaiserslautern, Tel +49 631 6800-2296

OCEAN TECHNOLOGY & MARINE SCIENCES

AN ENTIRE YEAR TRAPPED IN ARCTIC ICE

Alfred Wegener Institute Helmholtz Center for Polar and Ocean Research Press news, 27 June 2018

The international MOSAiC expedition with the German research icebreaker Polarstern will launch in autumn 2019.

It could be the largest-scale Arctic research expedition of all time: in September 2019 the German research icebreaker Polarstern will depart from Tromsø, Norway and, once it has reached its destination, will spend the next year drifting through the Arctic Ocean, trapped in the ice. A total of 600 people from 17 countries, who will

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be supplied by other icebreakers and aircraft. will participate in the expedition - and several times that number of researchers will subsequently use the data gathered to take climate and ecosystem research to the next level. The mission will be spearheaded by the Alfred Wegener Institute, Helmholtz Centre for Polar and Marine Research (AWI).

Contact: Dr. Folke Mehrtens, Alfred Wegener Institute, Helmholtz-Zentrum für Polar- und Meeresforschung, Am Handelshafen 12, 27570 Bremerhaven,Tel+49 (0)471 4831-0, www.awi.de

CHASINGCORAL:ADOCUMENTARY FILM SHOWSTHEBEAUTYANDPLIGHTOFTROPICAL CORAL REEFS

Leibniz Centre for Tropical Marine Research (ZMT) Press news, 30 November 2018

For the International Year of the Reef 2018, the Leibniz Centre for Tropical Marine Research (ZMT), in cooperation with the Bremen municipal cinema City 46, presents the documentary "Chasing Coral" by the U.S. director Jeff Orlowski.

The multiple award-winning film accompanies a team of marine researchers, filmmakers and coral lovers in their attempt to document the climate-induced change in tropical coral reefs. The devastating coral bleaching is recorded with time-lapse cameras. The team fights against technical malfunctions and forces of nature.

The result is a dramatic, moving and visually stunning documentary that unsparingly shows how human action is destroying the reefs. The images show the unique beauty of the reefs as well as the catastrophic dying under the sea surface.

In cooperation with the municipal cinema City 46, the Leibniz Centre for Tropical Marine Research (ZMT) is showing the German version of the film on Saturday, 8 December at 7 p.m. at City 46, Birkenstraße 1, Bremen. The reef experts Dr Sonia Bejarano and Dr .Achim Meyer of the ZMT will give an introduction to the film and the problems of the destruction of tropical coral reefs and will be available for questions and discussion after the screening. Admission is free.

Filming "Chasing Coral" in 30 countries took more than three years and more than 500 hours using underwater cameras. It seeks to be a wake-up call and an impetus for anyone to guestion our actions in order to slow down climate change. The film, which was released in 2017, has already received numerous awards. For example, it was honoured with the Audience Award at the Sundance Film Festival and is nominated for the Emmy Award. Director Jeff Orlowski and his team also produced predecessor the film

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"Chasing Ice," a documentary on the melting of the polar ice caps.

The reason for the film screening is the International Year of the Reef 2018. Initiated by the International Coral Reef Initiative (ICRI), which today comprises more than 60 member states, the Year of the Reef seeks to inspire people around the world about the importance of this valuable ecosystem and to draw attention to the urgency of comprehensive reef protection.

The value of coral reefs is not only aesthetic. Although they cover only 0.1% of the ocean surface, they are home to 30% of the marine fish species and are the nursery of many marine creatures. Through tourism and fishing, coral reefs contribute to the livelihood of about one billion people, are suppliers of medicinal substances and are an important factor in coastal protection.

Contact: Leibniz Centre for Tropical Marine Research (ZMT), https://www.chasingcoral.com/

CLIMATE REFUGEE COD

Alfred Wegener Institute Press news, 28 November 2018

High Probability for loss of breeding grounds if temperature increases by more than 1.5 degrees.

The latest research conducted by AWI experts that the chances of survival for the offspring of important fish species will dramatically worsen, if the 1.5 ° C target of the Paris Climate Agreement is not achieved. Under conditions of further warming and acidification of the ocean, Atlantic cod and its arctic relative polar cod would be forced to look for new habitats in the far north. Their populations could dwindle. If so, this could be disastrous, as the polar cod is the most important food source for Arctic seals and seabirds. In addition, fishers could lose the world's most productive area for catching Atlantic cod, located to the north of Norway. However, the results of the study in the magazine science advances also show that a stringent climate policy could prevent the worst consequences for animals and humans.

There are some types of fish that prefer extremely cool water - and can only spawn in cold water. The Atlantic cod, a well-known and favourite food fish, is one of them. Even better adapted to the cold is the polar cod, which overwinters in the Arctic in large swarms below the sea ice. The polar cod spawns at water temperatures between 0 and 1.5 degrees Celsius, because the fertilised eggs / the embryos can best develop at this temperature. In contrast, the Atlantic cod spawns at 3 to 7 degrees, which, from a human standpoint, is still extremely cold. The AWI researchers Flemming Dahlke and Dr Daniela Storch are convinced that this dependency on cold water could prove

fateful for both species; as a result of change, especially climate the waters of the North Atlantic and Arctic will warm considerably unless human beings find а way to massively reduce emissions of the greenhouse gas carbon dioxide. In addition, there is the problem of acidification: the more carbon dioxide finds its way into the atmosphere, the carbon more dioxide dissolves in the ocean. Carbon dioxide bonds with water to form carbonic acid, which acidifies the ocean as it decays. "That means Atlantic cod and polar cod will be doubly stressed in the future: their habitat will simultaneously grow warmer and more acidic," explains marine ecologist Flemming Dahlke.

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WHICH TYPES OF JELLYFISH ARE THERE IN THE ARCTIC OCEAN TODAY - AND WHICH WILL STILL BE THERE TOMORROW ?

AWI Press news, 21. November 2018

AWI biologist Charlotte Havermans and the new Helmholtz Young Investigator Group for Arctic Jellyfish will soon explore uncharted territory In 2019, Charlotte Havermans will form a new four- to five-member research group, which will use cutting-edge technologies to create a jellyfish inventory for the Arctic Ocean. The group will receive financial support from the Helmholtz Association and the Alfred Wegener Institute.

No matter whether it's the Baltic, North Sea, Atlantic or Pacific: these days you can see jellyfish virtually every time you take a stroll along the beach. Over the past few decades, the number of these eye-catching cnidarians has grown so rapidly that, in some regions, the fish population has suffered - and in some cases, the gelatinous raiders are even claimed to be dominant. Yet so little is known about the lifecycle, distribution and diversity of jellyfish (cnidarians) and similar marine like comb jellies organisms and tunicates. For example, we know virtually nothing about which species of these (in some cases only very distantly related) phyla there are in the Arctic Ocean, how frequently they can be found there, or what their roles are in the polar food web.

"We know so little because you can't simply catch jellyfish in a net. Their soft, fragile bodies are often destroyed when hauled out of the water, or are too quickly digested in the stomachs of predators, which means that new, complex methods are called for, in order to confirm their existence and understand their role in the ecosystem," explains Dr Charlotte Havermans. biologist at the а University of Bremen and the AlfredWegener Institute, Helmholtz

Centre for Polar and Marine Research (AWI).

researcher detailed The young precisely which methods will be required in the course of her proposal for а new Young Investigators Group, which was approved. With the financial backing of the Helmholtz Association and the AWI, next year Charlotte Havermans will create a four- to five-member research group, which will use the latest technologies to create a jellyfish inventory for the Arctic Ocean. "In the course of several ship-based expeditions, we'll deploy a range of camera systems in the water column and beneath the sea investigate ice. the stomach various contents of marine organisms, search for the genetic fingerprints of jellyfish and co. in the water, and analyse sonar data, which will hopefully give us new insights into the occurrence and distribution of cnidarians and comb jellies," Havermans adds.

Drawing on these and many other types of data, the new group leader hopes to subsequently determine how many different species of gelatinous organisms there are in the Arctic Ocean, where they hail from, what they feed on, and whether or not they are dependent on sea ice at a certain point in their lifecycle. Further research questions include

whether or not the total number of jellyfish is actually on the rise; whether the territories of individual species will shift as a result of climate change; whether they are prey for Arctic fish species and/or migrating species from the North Atlantic, or conversely are species' these fish decimating offspring; and whether Arctic jellyfish species are capable of adapting to climate change. "When I began gathering all these questions for the proposal, I got so excited about the topic that I couldn't imagine working on anything else," enthuses the researcher, who grew up in Belgium.



Ctenophore in the Arctic Ocean Photo: Carmen David

For Havermans, the promise of support from the Helmholtz Association was like a dream come true. As she recalls, "I read the email over and over again, just to be 100% sure I wasn't dreaming. The Helmholtz Association and the AWI have given me the opportunity to continue working in Bremerhaven for the years to come, and to exclusively focus on this exciting topic. I can't wait to get started!".

Contact: Dr. Charlotte Havermanns, Alfred Wegener Institute, Helmholtz Center for Polar and Ocean Research,

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PRODUCTION TECHNOLOGY

CHEMICALS FROM RENEWABLE RAW MATERIALS

Fraunhofer Research news, 2 November 2018

Producing everyday products with fungi.

Most detergents, cosmetics, and clothes, to name just a few products, are manufactured using petroleum, making such everyday items anything but eco-friendly. It is now possible to produce the bio-based and CO2-neutral basic chemicals for such articles with the help of fungi. Fraunhofer research teams are developing fermentation techniques and manufacturing processes to produce them on an industrial scale.



Laboratory-scale bioreactor for optimizing fermentation conditions.

© Fraunhofer IGB

If you find a layer of blue-green mold covering your bread, fruit or something else from your pantry, you'll quite rightly end up throwing it out with the garbage – fungi are after all harmful to your health.



Fermentation cascade of bioreactors with volumes of 10 liters to 10 m3 at the Fraunhofer Center for Chemical-Biotechnological Processes in Leuna, Germany.

© Fraunhofer CBP

Researchers at the Fraunhofer Institute for Interfacial Engineering and IGB in Biotechnology Stuttgart, however, are particularly keen on molds, and in particular the genus Aspergillus. They're also enthusiastic about yeast and smut fungi. Why? "Fungi have long been indispensable for antibiotic production or in the food industry. The fungi we employ help us to synthesize a variety of chemicals in a CO₂-neutral way. They're the basis for detergents, emulsifiers, cosmetics and pharmaceuticals, pesticides, and plastics," says Prof. Steffen Rupp, deputy director of Fraunhofer IGB and head of the Department of Molecular Biotechnology.

In contrast to petroleum, extracting

chemicals from renewable raw materials doesn't release CO2 into the atmosphere. And using fungi as production organisms has another major advantage: The loog of potential production organisms is almost inexhaustible, as is the range of renewable raw materials they can convert. As the fungi employ a host of different metabolic pathways, they produce an astonishing variety of products, which can be used in a wide range of applications.

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RELIABLY SIMULATING POLYURETHANE FOAMS

Fraunhofer Research news, 2 November 2018

Plastic processing: Car seats, mattresses and insulation materials are often made of polyurethane foams. The foaming process of the liquid polymer emulsions is complex. Fraunhofer researchers are now able to simulate the foaming behavior and reliably characterize the material. This also works with composite materials in which the plastic foams are combined with textile structures.

Polyurethane foams – PU foams for short – play a big role in our everyday lives, even if we are generally not aware of them. We sit and lie on them every day: car seats and mattresses, for example, are made of soft PU foams. Hard PU foams, on the other hand, are used among other things for insulation materials in buildings. Predicting the properties of foams and characterizing them is very complex – experimental analyses often lead to false parameters.

Better planning of new product lines of particular interest are the following questions: How does the initial liquid transform into foam? And what are the characteristics of the foam created? Researchers at the Fraunhofer Institute for Industrial Mathematics ITWM in Kaiserslautern are now able to reliably answer these questions and provide manufacturers of PU foam products with a good characterization of the polymers used, making it much easier for them to plan new product lines. This is best explained using an example, such as a car seat. In this case, some areas are meant to be others softer. harder and Manufacturers achieve this by injecting foams with different characteristics against each other. They use liquid polymer blends as their starting materials, which are injected into a suitable mold: a rapid but complicated chemical process begins. Within a few seconds, the two liquid emulsions transform into a complex polymer foam. But how exactly do the two different substances foam? Do they have the required properties, and do they spread as intended into their proper zones? "Instead of starting with chemistry and experimentally determining all parameters such as reaction rates and viscosity in many independent experiments, we do two or three simple experiments – such as foaming in beakers," explains Dr. Konrad Steiner, head of department at Fraunhofer ITWM. "We simulate these experiments one to one on the computer.



© Fraunhofer ITWM

Manufacturers have previously had to laboriously test whether the foam composite had the required properties - a process that could last weeks or even months. By contrast, the simulation comes up with a reliable result within a day or two. researchers The have already validated and tested the results on components and established that they match up very well with reality.

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SPACE SCIENCE

IN THE WHIRLPOOL AROUND A GIGANTIC BLACK HOLE

Max-Planck-Society Press news, 3 December 2018

Astronomers peer closely into heart of the quasar 3C 273.

Detailed observations of the quasar 3C 273 with the GRAVITY instrument reveal the structure of rapidly moving gas around the central super-massive black hole, the first time that the socalled "broad line region" could be resolved. The international team of astronomers was thus able to measure the mass of the black hole with unprecedented precision. This confirms measurement the fundamental assumptions of the most commonly used method to measure the mass of central black holes in distant quasars. Studying these black holes and determining their masses is essential ingredient to an understanding galaxy evolution in general.

More than 50 years ago, the astronomer Maarten Schmidt identified the first "quasi-stellar object" or 3C quasar, named 273. as an extremely bright but distant object. The energy emitted by such a quasar is much greater than in a normal galaxy such as our Milky Way and cannot be produced by regular fusion processes

in stars. Instead, astronomers assume that gravitational energy is converted into heat as material is being swallowed by an extremely massive black hole.

An international team of astronomers has used the GRAVITY now instrument to look deep into the heart of the guasar and was able to actually observe the structure of rapidly moving gas around the central black hole. So far, such observations had not been possible due to the small angular size of this inner region, which is about the size of our Solar system but at a distance of some 2.5 billion lightyears. The GRAVITY instrument combines all four ESO VLT telescopes in a technique called interferometry, which allows a huge gain in angular resolution, equivalent to a telescope with 130 metres in diameter. Thus the astronomers can reveal structures at the level of 10 microarcseconds, which corresponds to about 0.1 lightyears at the distance of the guasar (or an object the size of a 1-Euro-coin on the Moon).

"GRAVITY allowed us to resolve the so-called 'broad line region' for the first time ever, and to observe the motion of gas clouds around the central black hole", explains Eckhard Sturm, lead author from the Max Planck Institute for Extraterrestrial Physics (MPE). "Our observations reveal that the gas clouds do whirl around the central black hole."

Contact: Prof. Reinhard Genzel, Max Planck Institute for Extraterrestrial Physics, Garching, Tel+49 89 30000-3280

TWENTY YEARS OF THE ISS- THE MOST UNLIKELY MACHINE HUMANITY HAS EVER BUILT

DLR Press news, 20 November 2018



Copyright:DLR

Twenty years ago today, on 20 November 1998, a Russian Proton rocket took off from the Baikonur Cosmodrome and carried the first component of the International Space Station, the Zarya module (Zarya is Russian for sunrise), into Earth orbit. Sixteen days later, on 6 December 1998, the crew of the space shuttle Endeavour joined the Russian Zarya module together with the US Unity connecting node. This dockina manoeuvre represented much more than just an impressive technical achievement. It was a visible event marking the start of the biggest collaborative project ever to take place among people in space. Lasting cooperation international between Russia, the US, Europe, Canada and Japan was thus achieved for the first time in space. Through the European Space Agency (ESA), Germany is involved in around 37 per cent of operations and roughly 45 per cent of the scientific activities on the ISS, making it the station's foremost European partner. The German Center Aerospace (Deutsches Zentrum für Luft- und Raumfahrt: DLR) Space Administration in Bonn coordinates and manages these contributions to the ESA. As a centre of research, DLR has also been and still is involved in numerous experiments on board the Space Station.

The launch of the Proton rocket carrying the Zarya module is already considered as a historic endeavour, marking not only the transportation of the first ISS component into Earth's orbit, but also the beginning of the most intense flight phase in the history of space travel. Ever the Space since. Station has garnered plenty of acclaim, and the ISS is often referred to as our outpost in space. It is testament to the overcoming of the Cold War and to the peaceful cooperation in space for the benefit of all. "It is also an ideal test environment for new technologies and scientific disciplines, not to mention a unique laboratory for experiments that cannot be conducted at any scientific facility on Earth," says Volker Schmid, Head of the ISS Expert Group at DLR.

Many other modules and structural components were added in the years leading up to 2012. The components, which were transported on Russian carrier rockets or the US Space Shuttle, were added to the ISS in 32 stages of expansion to make it into an extensive research station. It took 42 flights for the modules and large components to be carried into orbit. While the first building block of the ISS, the 12.6metre-long Zarya module, weighed some 20 tonnes, in its current form the ISS has a total mass of around 420 tonnes. Today, the space station consists of six research laboratories, two living units, an observation dome (the Cupola), several storage spaces, connecting nodes, docking facilities and robotic arms. Its residents live and work in a space of around 1000 cubic metres - about as much room as on a Boeing 747.

Astronauts have been present on the space station since November 2000. Soon after, in February 2001, the US Destiny module docked onto the Space Station as its first research unit. This allowed scientific activities to be carried out at an altitude of 400 kilometres, in permanent microgravity conditions.

DLR has been 'present' on board the ISS from the very beginning. In fact, it was a German-Russian experiment

investigating cold plasmas that marked the beginning of scientific research on the space station, back in February 2001. The plasma crystal experiments are among the most successful research projects to have taken place on the ISS. Over 70 scientific publications have documented the new knowledge gained from the experiments carried out over the last 15 years. Such work has led to fundamental insights relating to solid-state and fluid physics in particular, while also facilitating applications for space physics, plasma physics, plasma technology and fusion research.

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MetOp-C WEATHER SATELLITE SUCCESSFULLY LAUNCHED

DLR Press news, 7 November 2018

Weather forecasting will become more precise.

The European weather satellite 'MetOp-C' was launched on 7 November 2018 at 01:47 CET aboard a Soyuz rocket.

The satellite's seven main instruments will be used for weather observation and monitoring climate change.

On 7 November 2018 at 01:47 CET, the European weather satellite

MetOp-C was launched on board a Soyuz rocket from the European spaceport in French Guiana. MetOp-C will join two structurally identical satellites, MetOp-A and MetOp-B, which were launched in October 2006 and September 2012, respectively..



The successor system MetOp-SG is expected to replace MetOp from 2023.

Focus: Space, Copyright: DLR

They are all operated by EUMETSAT, the European Organisation for the Exploitation of Meteorological Satellites. Through the DLR Space Administration, Germany has contributed to approximately 21 percent of the satellite's development.

The seven main instruments on board the two 'older' satellites have already significantly improved the quality of weather forecasting. Their tasks also include monitoring climate change, for example the hole in the ozone layer. The use of MetOp data helped to make forecasting models 27 percent more accurate in 2017, and the quality of multi-day weather forecasts has seen considerable improvements as a result. MetOp-C will make weather forecasting even more accurate.

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"We are responsible for the technical supervision of the MetOp programme, for which the German Federal Ministry of Transport and Digital Infrastructure has provided us with sufficient funding," explains Thomas Ruwwe, MetOp Programme at the DLR Manager Space Administration in Bonn. The payload modules and the ASCAT instrument also come from Germany. They were Airbus constructed at in Friedrichshafen. The Advanced Scatterometer (ASCAT) radar instrument observes the water reflections o f the seas. "These wave images allow us to draw conclusions about wind speed and direction," **DLR Programme Manager Thomas** Ruwwe continues. "They represent important input variables for weather forecasting, while also having applications in maritime route planning.

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OPENING OF THE DLR INSTITUTE FOR THE PROTECTION OF MARITIME INFRASTRUCTURES

DLR Press news, 29 October 2018

Protecting ports and offshore wind farms from accidents and attacks.

One-of-a-kind research facility in Europe.

On 29 October 2018, the Institute for the Protection of Maritime Infrastructures of the German Aerospace Center was opened in Bremerhaven. Operating against the backdrop of the Energy Transition, digitalisation, innovative mobility and global connectivity, the new institute will focus on the task of protecting vital infrastructures such as ports and offshore wind farms against accidents and terrorist or other attacks. It is the first of its kind in Europe.

Peter Altmaier. German Federal Minister for Economic Affairs and Energy, emphasised the importance of the Institute: "Maritime infrastructures are vital to Germany as a business location. Ninety percent of imports and exports are transported by sea. Power supply from offshore wind farms is also increasing. For these reasons, protecting maritime infrastructures is as important for the economy as it is for the general public. The new DLR institute will focus all of its efforts and expertise on addressing this task."

The new Institute will concentrate its scientific and technical developments on increasing the resilience of maritime infrastructures – that is, on their ability to withstand disruption without failing. All of the development work is aimed at identifying – and defending against – threats to the infrastructure. In doing so, the Institute will expand DLR's

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current competencies in technology development and maritime security.

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A COLD SUPER-EARTH IN OUR NEIGHBOURHOOD

Max Planck Gesellschaft Press news, 14 November 2018

Barnard's star, the closest single star, hosts an exoplanet.

An international group of astronomers. involving the Max Planck Institute for Astronomy (MPIA) in Heidelberg, has succeeded in detecting a planet around Barnard's star, which is only six lightyears away. The planet has just over three times the mass of Earth and is slightly colder than Saturn. The discovery was made by measuring the periodic change in the radial velocity of the parent star. The spectrograph CARMENES, developed to a large part by the MPIA, played an important role in this discovery.

Barnard's star (GJ 699) is the single star closest to Earth, located at a distance of about 6 lightyears. When viewed from Earth, it moves faster than any other star in the sky. For a long time, the search for planets orbiting Barnard's star has been unsuccessful. But now astronomers have extracted a signal from 771 individual measurements they have collected over the recent 20 years, which points to a planet that at a distance of 0.4 astronomical units (1 au = 150 million km, mean distance between Sun and Earth) travels around its host star once within 233 days. The planet has been named Barnard's star b.

"For the analysis we used observations different from seven instruments. spanning 20 years, making this one of largest and most extensive the datasets ever used for precise radial velocity studies," explains Ignasi Ribas of the Institut de Ciènces de l'Espai (ICE, CSIC), Spain, and first author of the underlying research published in Nature.

Contact: Max Planck Gesellschaft, Max-Planck-Gesellschaft zur Förderung der Wissenschaften e.V. Hofgartenstraße 8, D-80539 München, Telefon: +49 (89) 2108-0, https://www.mpg.de

UN GERMANY HIGH LEVEL FORUM "THE WAY FORWARD AFTER UNISPACE+50 AND ON SPACE 2030 IN BONN"

DLR Press News, 16 November 2018

The United Nations High Level Forum 'The Way Forward after UNISPACE+50 and on Space2030' was held in Bonn from 13 to 16 November 2018. Over 300 participants from some 60 countries gathered in the federal city to discuss how aerospace applications solving contribute to can global challenges in future. The event was organised by the United Nations Office for Outer Space Affairs (UNOOSA), the German Federal Ministry for Economic Affairs and Energy (BMWi), the European Space Agency (ESA) and the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt; DLR).

"Aerospace activities require strong collaboration between governments, international space agencies, organisations and private stakeholders," emphasised Thomas Jarzombek (Member of Parliament), Federal Government Coordinator of German Aerospace Policy, in his opening address. "Only if we work together will it be possible to unleash the full potential of space sciences and technology, in order to achieve our global development goals and ensure the sustainable use of space."

Representatives from government, administration, industry and civil attended society the high-level gathering to discuss the resolutions of the UNISPACE+50 Conference, which took place in Vienna in June 2018. The event focused on how space applications can contribute to achieving the UN sustainability targets enshrined in the Space2030 Agenda, as well as on the issue of space law, which mainly addressed the preservation of existina agreements. The more than 70 talks and presentations addressed issues such as exploration, the prevention and monitoring of space debris and environmental monitoring from space.

"Designing the Space2030 Agenda is extremely important to achieve the best possible and most effective use of space technologies and applications in the interest of sustainable development," said Pascale Ehrenfreund. DLR Chair of the Executive Board. "Science, technology and innovation are key components of the Agenda and it is important to link them more closely with development cooperation and the private sector and thus better integrate space activities into national development plans."

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UBC PRESIDENT SANTA ONO VISITS THE DLR CENTER FOR LIGHTWEIGHT-PRODUCTION-TECHNOLOGY IN AUGSBURG

DLR Press news, 31 October 2018

Lightweight construction and the factory of the future: DLR@UBC cooperation agreement signed in Augsburg.

Research cooperation agreed between DLR and the University of British Columbia, Vancouver (UBC).

The DLR@UBC cooperation will focus on new technologies for lightweight construction in the aviation sector,

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ground-based transport and the factory of the future

Focus: aviation, digitalisation, industry 4.0

Representatives from the German Aerospace Center (Deutsches Zentrum für Luft- und Raumfahrt: DLR) and the University of British Columbia, Vancouver (UBC) came together in Augsburg to sign a cooperation agreement for the DLR@UBC research initiative. This German-Canadian collaboration will focus on new technologies for construction lightweight in the aviation sector and ground-based transportation, as well as on the digitalised, highly automated factory of the future. The high-level delegation from Vancouver with UBC President Santa Ono, as well as Sabine Doering-Manteuffel, President of the University of Augsburg, were welcomed at the DLR Center for Lightweight-Production-Technology (ZLP) in Augsburg for the signing ceremony.

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FOUR NEW SOURCES OF GRAVITATIONAL WAVES

Max Planck Institute for Gravitational Physics Press news, 4 December, 2018

LIGO and Virgo Observatories also present their first catalogue.

Scientists have carried out a closer analysis of previously recorded data from the LIGO and Virgo gravitational wave detectors, tracking down four new signals. They all originate from the collison of pairs of black holes. Once again, the researchers at the Max Planck Institute for Gravitational Physics in Potsdam and Hanover have made decisive contributions in key areas to the observations and their interpretation.



Space is moving: This numerical-relativistic simulation reflects the first observed fusion of two black holes measured by the Advanced LIGO detectors on September 14, 2015.

© S. Ossokine, A. Buonanno (Max Planck Institut for Gravitational Physics, Simulating eXtreme Spacetimes Projekt, W. Benger (Airborne Hydro Mapping GmbH)

During the first observing run O1, from September 12, 2015 to January 19, 2016, gravitational waves from three BBH mergers were detected. The second observing run, which lasted from November 30, 2016, to August 25, 2017, yielded a binary neutron star

merger and seven additional binary black hole mergers, including the four new gravitational wave events being

reported now. The new events are known as GW170729, GW170809, GW170818 and GW170823 based on the dates on which they were detected. With the detection of four additional BBH mergers the scientists learn more about the population of these binary systems in the universe and about the event rate for these types of coalescences.

The observed BBHs span a wide range of component masses, from 7.6 to 50.6 solar masses. The new event GW170729 is the most massive and distant gravitationalwave source ever observed. In this coalescence, which happened roughly 5 billion years ago, an equivalent energy of almost five solar masses was converted into gravitational radiation.

(GW151226 two BBHs In and GW170729) it is very likely that at least one of the merging black holes is spinning. One of the new events, GW170818, detected by the LIGO and Virgo observatories, was very precisely pinpointed in the sky. It is the best localized BBH to date: its position has been identified with a precision of 39 square degrees (195 times the apparent size of the full moon) in the northern celestial hemisphere.

The scientific papers describing these new findings present a catalog of all the gravitational wave detections and candidate events of the two observing runs as well as describing the characteristics of the merging black hole population. Most notably, the scientists find that almost all black holes formed from stars are lighter than 45 times the mass of the Sun.



Panopticon of gravity traps: This illustration shows the masses of black holes, which were detected by gravitational waves (blue) and by observations in the electromagnetic spectrum (purple). In the lower part, the neutron stars can be seen which were also registered in 'light' (yellow). The two neutron stars that merged in the event GW170817, which were detected by gravitational waves, are depicted in orange. The numbers on the left indicate solar masses. © LIGO-Virgo / Frank Elavsky / Northwestern

"State-of-the-art waveform models, advanced data processing and better calibration of the instruments, have allowed us to infer astrophysical parameters of previously announced events more accurately", says Alessandra Buonanno, director of the "Astrophysical and Cosmological

Relativity" division at AEI-Potsdam, and College Park professor at University of Maryland. "I look forward to the next observing run in Spring 2019, where we expect to detect more than one

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black-hole merger every 15 days of data search!"

"I am happy that many of the detector advanced technologies developed at our GEO600 detector have helped to make the O2 run so sensitive and that in O3 another technology pioneered at GEO600, squeezed light, will be employed in LIGO and Virgo", says Karsten Danzmann, director of the "Laser Interferometry and Gravitational Wave Astronomy" division at AEI-Hannover.

The eleven confidently detected gravitational waves were discovered using three independent analyses: two different so-called "matchedfilter" analyses using relativistic models of gravitational waves from compact binary coalescences and one unmodeled search for shortduration bursts. In addition to these detections, the scientists presented a set of 14 marginal candidate events identified by the two matched-filter analyses.

The third observing run (O3) of Advanced LIGO and Virgo is planned to start in early 2019. With further sensitivity upgrades to both LIGO and Virgo as well as the prospects of the Japanese gravitational-wave detector KAGRA joining the network possibly towards the end of O3, many tens of binary observations are anticipated in the coming years. In O3, observational alerts triggered by gravitational-wave observations will be distributed publicly, allowing all astronomers – amateurs and professionals alike – to conduct followup observations.

Contact: Max Planck Institute for Gravitational Physics, more information at Virgo website: www.virgo-gw.eu.

FAIR CORNER

CONTRACT SIGNED

FAIR news, 8 September 2018

Collector Ring: Contract with Budker Institute has been signed.

During the visit of a delegation of representatives from the Budker Institute for Nuclear Physics (BINP) to the FAIR and GSI campus, the contract for the remaining part of the CR was signed together with the management of FAIR and GSI.

The course for development and construction of the Collector Ring (CR), an important part of the future FAIR accelerator center, has been completely set. During the visit of a delegation of representatives of the Budker Institute for Nuclear Physics (BINP) to the FAIR and GSI campus, the contract for the remaining part of the CR was signed together with the management of FAIR and GSI. Prior to this, two contracts concerning the responsibility for the CR project realization and the dipole magnets construction for the CR had already been concluded.

The CR is designed for fast precooling of hot secondary ions comina from the antiproton separator and the Superconducting Fragment Separator (Super-FRS). The fast cooling will be done by means of the RF debuncher and stochastic which coolina systems, are developed by GSI. The CR is going to be used for mass measurements of short-lived secondary rare isotope beams from the Super-FRS in a special CR optical mode as well.

A large part of the CR is being developed under the direction of the Budker Institute as a Russian in-kind contribution to FAIR. The Budker Institute also bears the main responsibility for the Collector Ring. The signed contracts provides that BINP manufactures dipole. quadrupole and sextupole magnets, a vacuum system, power supplies for all magnets, beam diagnostic components and injection/extraction The most challenging system. components are 26 dipole magnets weighing almost 60 tons each. The BINP is responsible for assembly and commissioning of all CR components at FAIR site.

With the contract now signed, all decisive prerequisites for the technological demanding Collector Ring are in place.

Contact: FAIR Facility for Antiproton and Ion Research in Europe GmbH, Planckstr. 1, 64291 Darmstadt

PRECISE MEASUREMENTS OF SIX CHROMIUM ISOPTOPES

FAIR news, 21 August 2018

ISOLTRAP delivers information about shell closure and shape of the exotic nuclides.

An international research team has for the first time at ISOLDE, the Isotope Separator On Line Device at CERN, succeeded in creating six chromium isotopes and measuring their masses up to 300 times more precisely than ever before using the ISOLTRAP ion trap. The ISOLTRAP experiment was largely constructed by scientists from GSI and has been constantly supported by significant contributions from GSI since that time. The new measurement results have enabled scientist to make the first-ever statements concerning trends of the shape and binding energies of these and neighboring isotopes.

The masses of the exotic chromium nuclides were measured more accurately than ever before by the experimenters at CERN in the Penning trap mass spectrometer ISOLTRAP. The binding energies can be derived from the results. When the physicists plot

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the binding energies of the six isotopes they can draw a trend line through the points and from this line they can see whether a shell closure occurs in this region or the nuclear shape suddenly changes between one isotope and the next. The measurement uncertainties were previously too large to enable reliable statements.

ISOLTRAP is a Penning trap mass spectrometer combined with a multireflection time-of-fliaht (MR-ToF) This mass separator. structure enables the masses of especially rare isotopes to be measured directly. The combination of two Penning traps enables precise and clean unaffected measurements bv contaminants. The most exact mass measurements of exotic, short-lived nuclei can thus be carried out using penning trap spectrometers.

ISOLTRAP is a forerunner of the Penning trap precision experiment for exotic ions. Technology, software, and hardware that has been and is being developed for ISOLTRAP is in use at SHIPTRAP, HITRAP, and is also for use at the FAIR planned collaboration MATS experiment within the NUSTAR collaboration. At FAIR, the particle accelerator facility that is under construction at GSI, similar experiments with even more exotic nuclei are planned.

The ISOLTRAP experiment, initiated by the former head of Atomic Physics at GSI, Prof. Kluge, is the result of a collaboration over many years.



The cave of ISOLTRAP at CERN



The Penning trap mass spectrometer ISOLTRAP.

Photo: Frank Wienholtz

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MISCELLANEOUS

INDO-GERMAN SYMPOSIUM

An Indo-German Symposium 2018 was organised by the Association of Indian Students in Aachen (AISA e.V.) at Aachen on 14th November. The top three posters of the symposium are as follows:

RNNTHAA

Developing E-mobility charging infrastructure in India with aid of "Second-life" batteries

4

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Introduction

- · Being a developing country, the Indian E-Mobility market has major challenges in manufacturing (mainly cost), grid capabilities and Charging infrastructure.
- · This research work address challenges in developing a stable charging infrastructure with an innovative solution, which would be economical as well as sustainable for the Indian E-mobility situation.

Problem Statement

- Current Indian vehicle population \rightarrow 240 million (rapidly growing).
- · India's Ambitious Initiative National Electric Mobility Plan aims to achieve 100% market penetration by 2030.
- Use case by end of 2030: 1) LB (modest 33% penetration) and 2) UB (ambitious 100% penetration), \rightarrow total energy requirement between 37 and 97 TWh (still achievable [1])



*considering AC charging speeds

Proposed idea



- Conventionally \rightarrow new batteries used for mobility operations until capacity fades down to $80\% \rightarrow$ discarded and recycled.
- Proposed idea \rightarrow after capacity fade select some discarded batteries through a process \rightarrow use them as buffers in charging infrastructure (or stations) \rightarrow after significant health reduction (~20%), recycle the batteries

Discussion

Challenges with 2nd life batteries

- Aged batteries are not as good as new, but still usable for low power $\widehat{\mathbb{Q}}_{\,^4}$ demanding operations ïZ.
- With capacity fade, their internal resistance increases during operation, i.e. higher losses under higher loads.

Technological benefits

- Multiple 2nd life packs could be lumped together for higher power.
- Faster and better EV charging efficiency as it is DC to DC, \rightarrow no inverter conversion while charging.
- Distributed energy storage grid improves stability, by providing peak shaving



SOC%

Internal resistance increases with age

Economical benefits

- Conventionally \rightarrow OEMs pay for recycling the batteries thus increasing overall cost of commodity for end user.
- Proposed approach \rightarrow OEMs paid back some amount for selling 2nd life battery packs. (reduced prices, as low as 87 €/kWh for whole pack including case and electronics [2]), which is win-win

Implementation approach

- and check quality during procurement.
- 1) Heterogenous approach→ OEM packs directly used with custom built BMS on top. 2) Homogenous approach → OEM electronics discarded and similar batteries stacked together with self built BMS



5

3

1

2

Conclusion

- Improved charging infrastructure could be a booster in India's EV acceptance similar to what was observed in China in 2016 (acceptance tripled).
- 2nd life battery operations reduces its overall cost, as well as offer grid stability and better charging speeds (approximately 20 50kW).
- Indian vehicle population would easily cross 250 million by 2030, thus offering huge amounts of discarded batteries available for second life applications. Thus this solution is inherently sustainable, as it sets a circular economy and better path between battery dissertation and recycling



Further Information

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- for both sides.
 - · Black box to select batteries
 - Further two possible cases: and case.

Prediction of Equilibrium Constants from Reactive Molecular Dynamics Simulations

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Introduction

Chemical Processes:

Complex networks of elementary reactions with hundreds of species and thousands of reactions

Experimental or quantum mechanical examination of all involved reactions is too time and cost expensive

Fast Alternative:

Atomistic simulations, based on empirical, reactive force fields

THEORY

Qualitative Insight

into the chemistry of processes → Elementary reactions

Quantitative Evaluation

via reaction rate constants and equilibrium constants

Aim of This Work:

Evaluation of the accuracy of reactive molecular dynamics simulations for determination of equilibrium constants



Macroscopic Concentration Balance: $\frac{\mathbf{d}[D]_{\text{prod}}}{\mathbf{d}_{i}} = \sum_{i} k_{i}(T)[A_{i}] + \sum_{i} k_{j}(T)[B_{j}][C_{j}]$ → Rate Constants:

$\frac{\int_{t_0}^{t} r_j \mathrm{d}t'}{\int_{t} [B_j][C_j] \mathrm{d}t'}, \quad k_i(T) = \frac{1}{\int_{t_0}^{t}}$ $k_j(T) =$ $K_{\rm eq}(T) = \frac{k_{\rm vor}(T)}{k_{\rm vor}(T)}$ → Equilibrium:

ALGORITHM



METHODS

LAMMPS/ReaxFF Simulations: 100 Trajectories for each species (CH₄, CH,OH, CH,OCH, CH,OCHO)

 $T = 2500 \text{ K}, c = \sim 1 \text{ mol/l}, \text{ fuel in}$ stoichiometric oxygen atmosphere

Quantum Mechanics: Electronic energy and Hessian matrix from CBS-QB3 level of theory (Gaussian09 d01), Rigid Rotor-Harmonic Oscillator Model for thermochemistrv

Literatur: GRI-Mech 3.0 → 54 reactions



COMPARISON TO LITERATURE



- · Literature values are from experiments and predictions
- QM and Force Field (ReaxFF) results deviate similarly when compared to literature
- · For outliers, QM and ReaxFF are often not correct

In 60-70% of the reactions, atomic hydrogen is involved

CONCLUSION

- · Parallel examination of several hundred reactions is possible
- · Classic anharmonic effects are automatically included in MD simulations
- . The accuracy strongly depends on the number of observed events \rightarrow many simulations for good statistics
- · Comparison to QM and literature: Obtaining equilibrium constants from MD has huge potential



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Augmenting Information Modelling using the CityGML Standard for an Energy Transition in Developing Nations

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CityGML: Open XML-based modelling standard

- · Defines the geometrical, topological, semantical and appearance properties of topographic city objects
- 13 thematic extension modules: Appearance, Bridge, Building, CityFurniture, CityObjectGroup, Generics, LandUse, Relief, Transportation, Tunnel, Vegetation, WaterBody, and TexturedSurface
- Based on ISO 191xx family, the Open Geospatial Consortium, the W3C Consortium, the Web 3D Consortium, and OASIS standards
- Available external re-definable dictionaries, code lists, provides the allowed values for enumerative attributes such as Making location count.

Supported by :



building class, function and usage for energy performance simulations

Fig.1: Example of a building modelled in 4 different level of details. (Source: [1])

Energy Application Domain Extension (ADE)



Urban Scale Visualization and Analysis

Fig. 3: Top: Visualization of an urban area with 1202 buildings modelled with CityGML Standard, Bottom: Visualization of an urban area with 1202 buildings according to measured height with FZK Viewer, Institute for Automation and Applied Computer Science (IAI) / Karlsruhe Institute of Technology (KIT)



Proposition for information modelling using CityGML standard

- To reach a common modular definition of the basic entities, attributes, and relations of 3D city models with respect to a cost-effective sustainable maintenance, the reusability of the same data in different application domains is increased
- Definition of the dynamic properties of the city objects such as heating and cooling demands along with the energy systems installed using the ADEs
- Substantiate the prognosis of energy conservation by providing structured and robust data to urban planners and energy specialists

References

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