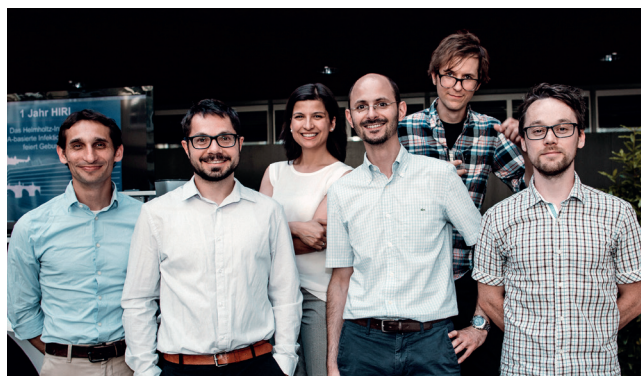


## ANNUAL REVIEW 2018

In June 2018, HIRI celebrated its first birthday. Thanks to the additions of Neva Caliskan, Chase Beisel, Lars Barquist, Alexander Westermann and the Helmholtz Young Investigator Redmond Smyth, the institute grew to seven working groups. To promote young scientists, the HIRI launched the new graduate program “RNA & Infection”. In addition, an excellent doctoral student at the HIRI was awarded a Dr Eckernkamp Fellowship. The new HIRI building on the campus of the Würzburg University Hospital also made progress: the architectural competition produced a great design whose implementation can soon begin.

### PERSONNEL

On January 1<sup>st</sup>, 2018, Prof Chase Beisel (North Carolina State University, USA) joined the HIRI with his research group “RNA Synthetic Biology”; Dr Neva Caliskan (Max Planck Institute for Biophysical Chemistry, Göttingen) started to establish her research group “Recoding Mechanisms in Infections”; and Dr Lars Barquist expanded HIRI with his research group “Integrative Informatics for Infection Biology”. On March 1<sup>st</sup>, the appointment of Dr Alexander Westermann and his research group “Host-Pathogen-Microbiota Interactions” followed. On May 1<sup>st</sup>, Dr Redmond Smyth (Université de Strasbourg, France) started as head of the Helmholtz Young Investigator Group “Genome Architecture and Evolution of RNA Viruses”. All new group leaders were appointed as professors (W1, or W2 in the case of Chase Beisel) at the Medical Faculty of the University of Würzburg before the end of the year. This means that HIRI has grown to a total of seven research groups in its first year of existence. In addition, the Würzburg virologist Prof Lars Dölken and the holder of the chair of microbiology at the JMU, Prof Thomas Rudel, have been affiliated with HIRI. By the end of the year, the number of employees had reached almost 50.



The squad of young group leaders at HIRI (from left to right): Chase Beisel, Alexander Westermann, Neva Caliskan, Emmanuel Saliba, Lars Barquist and Redmond Smyth.  
© HIRI / HZI

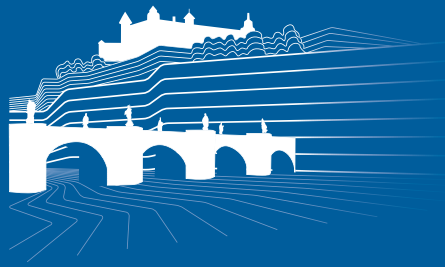
### NEW BUILDING

The designated building site for the new HIRI building was formalized in March. The architectural competition for the building was officially announced and a jury of experts, users, and stakeholders met in Braunschweig on October 10<sup>th</sup> to evaluate concepts and select a winner. At a press conference on 12 October, *doranth post architekten GmbH* (Munich) was announced as the winner of the architectural competition. Among the stakeholders present were representatives of the Bavarian State Ministry of Economic Affairs, Energy and Technology as well as representatives of the City of Würzburg, the JMU Würzburg, the Würzburg University Hospital, the jury, and the winners.



There is great interest in the model of the new HIRI building.  
Image: Hilde Merkert, © HIRI / HZI

Following the press conference, the submissions were exhibited publicly for two weeks in the foyer of building D15 on the Medical Campus in Würzburg. In addition to cooperation partners, friends, and sponsors of HIRI, architecture students from the Würzburg Schweinfurt University of Applied Sciences were invited to the exhibition.



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### SEMINARS

With the “RNA Seminar”, HIRI initiated its own lecture series together with the Institute for Molecular Infection Biology (IMIB), the Biocenter, and the Institute for Virology and Immunobiology of the University of Würzburg. The focus of the RNA Seminar is on science and technology centered on RNA, and thus covers a broad spectrum of topics. Top international scientists have come to Würzburg as speakers for the RNA Seminar to present their work and thus enter into dialogue with colleagues and students. The seminars on Tuesday evening are very well attended and rounded off by a subsequent reception. The official kick off of the RNA Seminar was held by Henrik Oerum, Founder and CSO of CiVi Biopharma and General Manager of the Roche Innovation Center Copenhagen with his presentation “RNA therapeutics - the long road to success”. Other invited speakers included Gilad Bachrach (The Hebrew University of Jerusalem), Susan Carpenter (University of California, Santa Cruz), Blake Wiedenheft (Montana State University), Birgitta Henriques Normark (Karolinska Institutet), Lingling Chen (Shanghai Institute of Biochemistry and Cell Biology), John D. MacMicking (Yale), and Fabian Theis (Helmholtz Zentrum München).

### PROMOTION AND YOUNG SCIENTISTS

In collaboration with the Graduate School for Infection Research at the HZI (GS-FIRE) and the Graduate School of Life Sciences (GSLs) at JMU, HIRI has developed the new graduate program “RNA & Infection”. Integral parts of the program are initial laboratory rotations, structured supervision, and multi-year funding.

The three six-week laboratory assignments offer PhD students the opportunity to get an overview of the research at HIRI at the beginning of their doctorate. They can then make an informed decision on which topic they wish to work on for their PhD. In the first call for applications in autumn, about 160 candidates applied for a spot in the new program. From all applications, two excellent candidates were selected in a multi-stage selection process and will begin their doctoral studies in spring 2019. For excellent doctoral candidates, the Dr Eckernkamp Fellowship of the Vogel Foundation was established in summer. The first fellowship recipient is Falk Ponath, who is researching *Fusobacterium nucleatum*, a bacterium associated with colon cancer.

As of this year, HIRI is also involved in teaching at the JMU via elective courses. The three-day intensive course “RNA Biology” started in September. In the future, this course will alternate with the “Infection Biology” course planned for May 2019. Both courses are mandatory for all PhD students and postdocs at HIRI and are intended to provide young scientists with a solid foundation in the fields of RNA and infection biology.

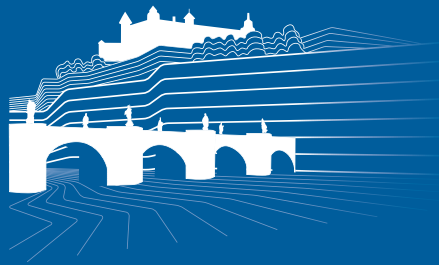
### INFRASTRUCTURE



Dr Eckernkamp Fellow Falk Ponath at work under oxygen-deficient conditions. Image: Mario Schmitt, © HIRI / HZI

With the LabCytte Echo, HIRI has acquired a state-of-the-art liquid handling robot. Utilizing high-frequency sound, the robot makes it possible to accurately transfer mere nanolitres into microtitre plates - a quantum leap.

In addition, from June we were able to obtain a second anaerobic workstation. This was urgently needed for work on bacteria that can only survive under low oxygen conditions. Examples include *Fusobacterium nucleatum* and *Bacteroides* bacteria, which are very common in the human intestine.



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### RESEARCH FUNDING

In its first calendar year, HIRI has already acquired third-party funding of around 180,000 euros. These were mainly provided by the Helmholtz Association, the DFG, DARPA, and Agilent.

Mathias Munschauer successfully applied for a Helmholtz Young Investigators Group and began planning his move from the Broad Institute in the USA to Würzburg. Thus, HIRI was successful in the highly competitive Helmholtz Young Investigator Program for two consecutive years.

Jörg Vogel and Emmanuel Saliba participated in the application for the EU-FET flagship project “LifeTime” of the Helmholtz Association with the Institute Curie. LifeTime aims to map and analyze tissue on the single-cell level in order to reliably predict the onset and development of a disease. Following the success of the preproposal, the initiative will receive one million euros for one year starting in 2019. It will then be decided in Brussels whether and which of the six initially funded research initiatives the EU will continue to support on a large scale, meaning up to a billion euros.



Dr Mathias Munschauer to become head of a new Helmholtz Young Investigator Group at the HIRI. Image: Mario Schmitt, ©HIRI / HZI

### AWARDS AND POSITIONS



HIRI junior professor Neva Caliskan.  
Image: Mario Schmitt, ©HIRI / HZI

Chase Beisel was appointed as member of the Scientific Advisory Board of Benson Hill Inc. (USA). The biotech start-up, based in Raleigh, North Carolina (USA), develops biotechnological approaches to increase crop yields.

Neva Caliskan received a “Young Leader in Science Training Program Award” of the Schering Foundation. The associated program provides effective management skills and tools for leaders in science.

### CONFERENCES

Starting in December, the RNA Society sponsored the HIRI RNA Seminar as part of its “RNA Salon” program. In addition to monetary funding, this adds HIRI to a growing international network of renowned RNA research institutes.

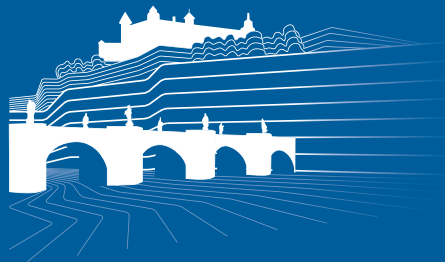
Throughout the year, HIRI group leaders were present at 32 scientific events worldwide, 23 times as invited speakers.



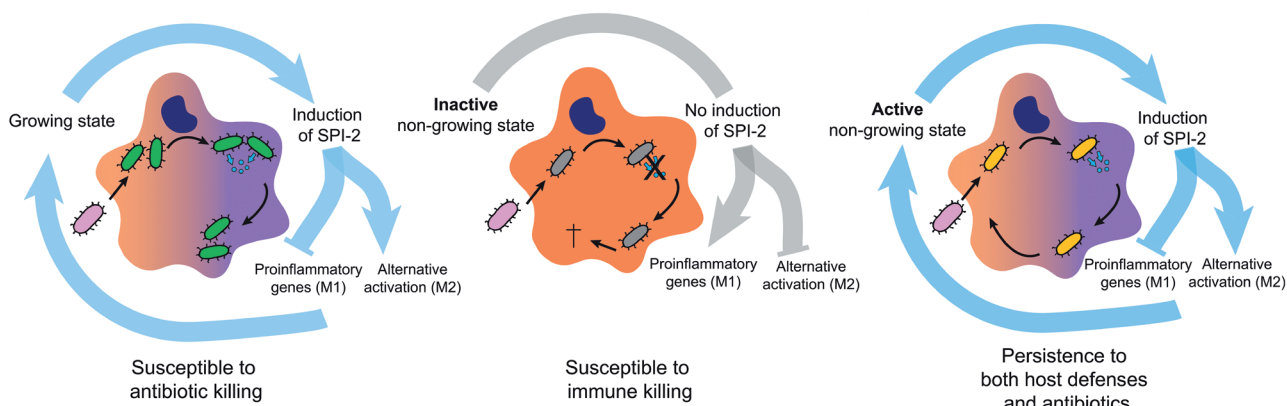
### PUBLICATIONS

In 2018, HIRI scientists published 37 papers; a full 18 of them appeared in high-profile international journals. These included a research article in *Nature*, in which the heterogeneity in the antigen variation of trypanosomes was characterized with high resolution using state-of-the-art single-cell RNA sequencing approaches (co-authors: E. Saliba, J. Vogel). In a joint research article in *Science*, HIRI co-authors Saliba, Vogel and Westermann, together with the research group of Sophie Helaine of the Imperial College London, described how *Salmonella* persister stages can infiltrate the immune system despite antibiotic treatment (see image on next page).





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From Stapels *et al.*, Science; 362: 1156-1160 (2018). Reprinted with permission from AAAS.

The Seed Grant projects, launched in 2017 to promote the swift publication of joint research results from HIRI, HZI, JMU, and the University Hospital of Würzburg, have already produced nine publications by the end of the one-year project period, and 12 further manuscripts are in preparation. Emmanuel Saliba published the results of his successful collaboration with Jochen Hühn (HZI) within the framework of a HIRI Seed Grant, which provides new insights into the immune system of newborns, in *Nature Communications*.

Three papers were published in the renowned journal *Molecular Cell*. The first project was also the result of a Seed Grant, this time between HIRI group leader Chase Beisel and Cynthia Sharma from JMU, who together described a new RNA-dependent CRISPR system in the pathogen *Campylobacter jejuni*. HIRI scientists Jörg Vogel and Lars Barquist identified target structures of the RNA-binding protein ProQ in *Salmonella* and *E. coli* and reported on a new mechanism of post-transcriptional regulation in enterobacteria. In the third publication, Chase Beisel showed how cell-free transcription-translation systems can be used to effectively characterize CRISPR technologies.

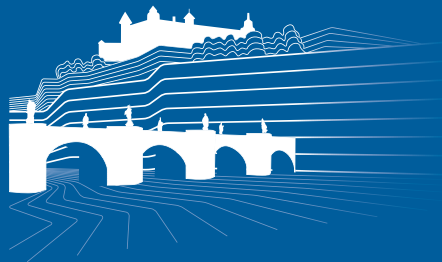
### OUTREACH & EVENTS

HIRI has established social media presences on Twitter and LinkedIn, and has been building its community of followers. We are always keen to explain RNA and infection research to the general public. In this context, our booth at the Campus Festival of the JMU made a great contribution. Through games and small experiments, science became tangible for interested citizens.

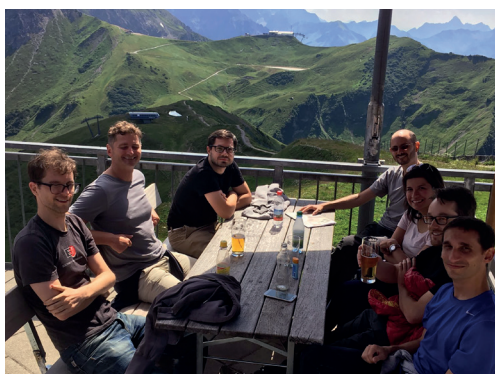
To strengthen the team spirit, we organized the first institute outing, which took us to the Würzburg Hubland. During a guided tour, we learned about the eventful history of this district and current urban redevelopment. Afterwards we rounded off the day with pizza and conversation.



Nina Panitz & HIRI colleagues at the JMU Campus festival. © HIRI / HZI



## ANNUAL REVIEW 2018



The HIRI group leaders taking a short break during the first retreat.  
© Nina Panitz

During our first retreat in the Allgäu Alps, the group leaders put their heads together professionally and personally for three days. To relax, the HIRI team enjoyed hiking in front of the breathtaking natural backdrop.

On June 4<sup>th</sup>, a beautiful summer day, we celebrated our 1<sup>st</sup> birthday. We looked back on an eventful first year and introduced ourselves. We officially launched the Dr Eckernkamp Fellowship and awarded the first HIRI trophy for “Fostering the HIRI Spirit” to Nina Panitz. Among the guests at the birthday party were Dirk Heinz, Scientific Director of the HZI, Alfred Forchel, President of the JMU, and Matthias Frosch, Dean of the Medical Faculty of the JMU.



A lot has happened in 2018 and we enjoyed our first successes – to be continued in 2019!