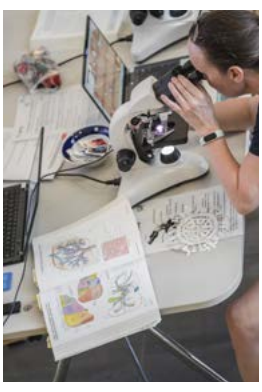
Open Day at HITS: Climate, Molecules and Galaxies

On 11 July, HITS welcomed the public back for its Open Day. Despite the summer heat, more than 400 visitors came to explore the institute, meet its researchers and experience science through a wide range of interactive hands-on activities.

Visitors could craft virus snowflakes, test their card-sorting skills, build dams or even find their own celebrity twin, all while discovering different areas of HITS research in a fun and engaging way.

A series of talks at Studio Villa Bosch offered insights into current scientific topics and invited the audience to think along and join the discussion. Leif Seute explored how AI supports protein design, HITS group leader Vincent Heuveline demonstrated how humans and machines can create music together, and Vagrant Gautam examined the ethical questions surrounding ChatGPT and other large language models.



Guided tours of the institute's garden were another popular attraction. Younger visitors enjoyed face painting and free science experiment books, provided by Explore Science and the Klaus Tschira Foundation. As in previous years, the Open Day brought researchers and the public together, giving visitors of all ages the chance to experience science up close. The next HITS Open Day is planned for 2028.

HITS Symposium – The Future of Sustainable Computing

30 November – 1 December 2026
Studio Villa Bosch, Schloss-Wolfsbrunnenweg 35, Heidelberg
https://thefutureofsuscomp2026.h-its.org/

HITS

Anna Su from Yale University Joins HITS as a Visiting Scientist

Since April 2026, **Anna Su** has been a visiting scientist in the Machine Learning and Artificial Intelligence (MLI) group at the HITS, where she is supervised by **Jan Stühmer**. She is also a PhD candidate in Computational Biology and Bioinformatics at Yale University, where she is co-supervised by Professors Mark Gerstein and Jeffrey Brock.

Anna's research brings together machine learning, topology, differential geometry, and biophysics to develop computational methods for studying the structure and function of proteins. By combining computational geometry and knot theory with deep learning, she aims to create innovative approaches for functional protein design.

At HITS, her research complements the institute's strengths in artificial intelligence and mathematical modeling. "Collaborating closely with the MLI group, I'm investigating how modern geometric and topological methods can enhance machine learning models for molecular structures," she says. Her visit fosters scientific exchange between HITS and Yale University, creating new opportunities for collaboration at the interface of AI, mathematics, and structural biology.

Her passion for interdisciplinary research began during a summer research experience in high school, when she discovered that programming could bridge the worlds of molecular biology and mathematics. Fascinated by the connection between DNA and mathematics, she pursued research that brings together knot theory, geometry, and computational biology to tackle fundamental questions in the life sciences.

Anna's research stay is funded by the Baden-Württemberg-Stipendium until the end of the year. She adds: "During my time at HITS, I want to contribute to the institute's international research environment while helping strengthen interdisciplinary collaborations across mathematics, AI, and the life sciences."

New employees and visiting scientists

Master Student:	Raheela Sahar (SET)
Research associates:	Aliaksandra Shutsko (SDBV), Mariia Babaeva (SDBV)
Postdoc:	Vinicius Cabral (MCM)
Visiting scientists:	Ke-Jung Chen (PSO, AvH Fellowship, Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan) Po-Sheng Ou (PSO, DAAD Fellowship, Institute of Astronomy and Astrophysics, Academia Sinica, Taiwan), Kazuya Iwata (PSO, JSPS Fellowship, Kyoto University, Japan), Tan Liu (PSO, CAS/DAAD Scholarship), Felix Rauprich (AIN), Simone Ponzetto (NLP, Mannheim University), Balint Soproni (DMQ, Heidelberg University)
IT Services:	Clemens Hemsing (System Administrator)

HITS groups (09/2026): *Astroinformatics (AIN), Computational Molecular Evolution (CME), Computational Statistics (CST), Data Mining and Uncertainty Quantification (DMQ), Machine Learning and Artificial Intelligence (MLI), Molecular and Cellular Modeling (MCM), Natural Language Processing (NLP), Physics of Stellar Objects (PSO), Scientific Databases and Visualization (SDBV), Stellar Evolution Theory (SET), Theory and Observations of Stars (TOS)*

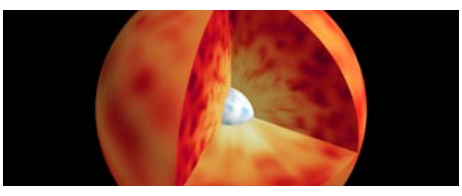
HITSters

Stellar Quakes: What Waves and Flickers Reveal

Red giants may look like calm, glowing spheres, but beneath the surface, they are in constant motion. Tiny fluctuations in their brightness reveal the oscillations rippling through the star, offering an indirect glimpse into its interior. Using asteroseismology, researchers can study these signals in much the same way that the sound of a bell can reveal something about its structure. Particularly important for analyzing these signals are so-called mixed modes. These oscillations connect waves in the star's outer layers with those occurring deep within its core. This allows them to carry information outward from regions that are impossible to observe directly. This is where the research of **Jonas Müller**, a PhD student in the Theory and Observations of Stars (TOS) group at HITS, comes in.

From Theory to Observation

In a paper published in Astronomy & Astrophysics in March 2026, first author Jonas Müller, together with group leader **Saskia Hekker** and his colleagues, developed a new theoretical model describing how certain oscillations in stars are damped. Until now, it has been difficult to connect



the strength of these observed oscillations with damping – the process by which oscillations lose energy – inside the star. The new model establishes that link.

The results reveal something surprising: the characteristic signal of a particular oscillation, known as a mixed mode, can disappear without requiring extremely strong damping. Even moderate damping can weaken the oscillations so much that, from the outside, it appears as though there were virtually infinite damping inside the star. The study therefore offers a possible explanation for why some red giants show unusually weak – or apparently missing – dipole modes, specific patterns of stellar oscillation.

The Next Step

In a follow-up paper, published in June 2026, the research group went a step further. They examined not only how damping affects the oscillations, but also how reliably these changes can be inferred from observations. "We identified a systematic bias in the observational data, suggesting that the dipole-mode visibilities previously reported for late red giants may have been overestimated by as much as 20 percent," says Müller.

The researchers also took a closer look at magnetic damping. They accounted for the possibility that when an oscillation encounters a strong magnetic field in the stellar core, it does not necessarily lose all of its energy. Some of that energy could last. This process, known as partial dissipation, may explain why the signal of mixed modes remains visible in some stars but disappears in others.

When the Abstract Becomes Fascinating

Müller and Hekker's research sits at a unique intersection: it begins with mathematically abstract descriptions of waves and damping and ends with something astronomers can actually measure in the light of a star. "That abstractness is precisely what makes it so fascinating. Behind the equations are real processes taking place inside stars that we can never observe directly. A faint flicker in the light of a red giant can thus give us an indirect glimpse into its core," Müller adds.

Publication:
Müller, J.; Hekker, S.
Oscillations of red giant stars with magnetic damping in the core. II. Mixed mode visibilities on the red-giant branch.
Astronomy & Astrophysics manuscript no. aa59383-26 (June 2026)
https://doi.org/10.48550/arXiv.2606.12034

Research

Beyond the limits – Fabian Grünewald, HITS Independent Postdoc

In October 2023, Fabian Grünewald joined HITS as an Independent Postdoc, working closely with the Molecular Biomechanics (MBM) and Machine Learning and Artificial Intelligence (MLI) groups. Nearly three years later, in July 2026, he successfully completed the HITS Independent Postdoc Program. Before leaving HITS, he sat down for an interview to reflect on his time at the institute, share advice for future Independent Postdocs, and talk about his next adventure — including the metaphor he finds in van Gogh's The Starry Night.

Why did you decide to join HITS as an Independent Postdoc?
The opportunity to conduct my own research independently while working at an institute specializing in interdisciplinary theoretical sciences and method development led me to accept the Independent Postdoc position at HITS.

You started the Martini User Meeting during your time at HITS. What was the idea behind it?
The term "Martini" refers to a molecular simulation method developed by an international initiative that I am part of. As developers, we noticed that Southwest Germany has one of the strongest user communities, with more than 14 research groups using the method. The idea behind the User Meeting is simple: to bring together as many local groups as possible to discuss advances in the method, as well as the challenges they face. Keeping the meeting local lowers the barrier to participation for many early-career researchers, giving them the opportunity to present their work, ask questions, and receive feedback from groups beyond their own.

What advice would you give to future Independent Postdocs at HITS?
At least once, take a walk up the hill beyond HITS and into the tranquil woods. Just don't forget your hiking boots – the terrain can be rough.

If you could describe your time at HITS with one image, what would it be? And why?
Vincent van Gogh's The Starry Night comes to mind: a researcher observing nature, with the dark sky unfolding before them. Patterns and motifs emerge – almost within reach, yet still elusive, abstract, and difficult to understand. It's a fitting metaphor for the endeavor of natural science in general, and for the journey of a young scientist in particular.

What will you do after your time at HITS?
I have recently started a group leader position at the Frankfurt Institute for Advanced Studies (FIAS), where I head the Virtual-Integrative Platforms for Synthetic Biology (VIPSynBio) group. Our mission is to bring a central paradigm of synthetic biology into the virtual realm: understanding biological systems by reconstructing their functions from minimal, well-defined components. To achieve this, we develop virtual platforms that integrate high-throughput molecular simulations with AI-driven exploration techniques to reproduce and study biological function in silico.

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