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Physicist Raphael Wittkowski awarded the €1.1 million Alfried Krupp Prize 2026 in the prize's 40th anniversary year

The 38-year-old scientist conducts research in the field of active soft matter at RWTH Aachen University and at the DWI - Leibniz Institute for Interactive Materials

Essen, 16 July 2026 – Physicist Prof. Dr. Raphael Wittkowski has been awarded the 2026 Alfried Krupp Prize. The 38-year-old has been Professor of the Theory of Active Soft Matter at the Faculty of Mathematics and Natural Sciences of RWTH Aachen University since 2025. The Alfried Krupp Prize, which this year celebrates its 40th anniversary, is one of Germany's most distinguished academic awards. The prize is endowed with €1.1 million and includes an allowance of €150,000 to cover the indirect (overhead) costs of the university. The awardee will enjoy the greatest possible flexibility in the allocation of funds for their research at the university over the next five years. The Alfried Krupp von Bohnen und Halbach Foundation selection committee received a large number of nominations for outstanding candidates from throughout Germany.

"In this anniversary year the 2026 Alfried Krupp Prize honours Professor Raphael Wittkowski and his ambitious work in the nascent field of active soft matter. Raphael Wittkowski has discovered fundamental effects in active soft matter, has developed significant models and has advanced methods of statistical physics," stated Professor Ursula Gather, Chairwoman of the Board of Trustees of the Krupp Foundation. "Thanks to his research, utopian concepts which until now were more to be found in the vicinity of science fiction have found their way into the scientific realm, with the aim of establishing new and innovative applications in medicine and technology. The Krupp Foundation is highly pleased to support Raphael Wittkowski in the continuation of his work on the development of autonomous sound-propelled microsystems and programmable materials, and its transfer from theory to practical application."

Prof. Dr. Raphael Wittkowski conducts research in the field of active soft matter – a new field at the interface between physics, chemistry, engi-

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neering, biology and medicine. At the core of his work are, in particular, microsystems with their own propulsion mechanism that are controlled using ultrasound, the objective being to identify new opportunities for applications in medicine and technology.

Active soft matter consists of a liquid or soft material with embedded active particles equipped with a propulsion mechanism. These particles extract energy from their surroundings and convert it into directional motion or forces, thus enabling novel effects. What makes active soft matter special is that, compared to conventional materials, it can manifest extraordinary properties. Raphael Wittkowski's research has helped to transform concepts into genuine scientific issues that were long considered unimaginable – such as remote-controlled micro-submarines for targeted drug release or programmable materials that autonomously adapt to their environment.

Potential applications of acoustically propelled microsystems

The systems Professor Wittkowski researches – in particular sound-propelled microparticles, micromachines and microrobots – are relevant to visionary applications in medicine and technology. Acoustically propelled microsystems have key benefits: ultrasound propagates through tissue and other materials, the propulsion mechanism works in liquids and biological tissue and the activity can be modulated remotely by variation of the ultrasound intensity. A representative example of Professor Wittkowski's research is the 2025 Nature publication "Ultrasound-driven programmable artificial muscles." In this, together with colleagues, he developed artificial muscles that are supplied with energy by ultrasound and can be precisely controlled. In the future these systems could be used as sensitive soft grippers, as programmably deformable cardiac patches for assisting myocardial contraction or for the targeted delivery of drugs.

Professor Wittkowski's group has also developed AcoDyn, the most powerful simulation software until now for sound-propelled microsystems, and has used it to perform the world's most complex simulations of such systems. This enabled him to predict important properties of these systems, thus filling a gap in research. He has also developed a method for

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guiding a large number of acoustically propelled microparticles towards a specified target. With such advances, Professor Wittkowski laid a foundation for future medical applications of acoustically propelled microparticles, for example for transporting drugs to a specific target within the body with the aim of avoiding the disadvantages of systemic drug distribution. When active particles are used in patients in the future, this will make it possible to minimise undesirable side effects such as damage to healthy tissue or avoid unnecessarily high drug doses. One example is conventional chemotherapy, the side effects of which are primarily caused by the systemic distribution of the drugs in the body, which also harms healthy tissue.

Prof. Dr. Raphael Wittkowski

Prof. Dr. Raphael Wittkowski (38) was appointed to a professorship at the Faculty of Mathematics and Natural Sciences of RWTH Aachen University in 2025, where he holds the Chair of Theory of Active Soft Matter. He is also a member of the Scientific Board of the DWI - Leibniz Institute for Interactive Materials.

Raphael Wittkowski studied physics and mathematics at the Heinrich Heine University in Düsseldorf, Germany. He earned his doctorate in physics at this university for a thesis on the Brownian dynamics of active and passive anisotropic colloidal particles – the motion of particles over time in a liquid or gas caused by thermal fluctuations and (in the case of active particles) self-propulsion. He completed his undergraduate, graduate and doctoral studies in less than half the standard time. He spent two years as a postdoctoral research fellow at the University of Edinburgh, UK, with Prof. Dr. Michael Cates, a highly renowned physicist and currently the successor to Isaac Newton and Stephen Hawking at the University of Cambridge, UK.

Raphael Wittkowski's contributions to the theory of active soft matter and specifically to sound-propelled microparticles have received widespread international acclaim and have also established him as a leading scientist in this field. His work has already received numerous awards and grants, including the EIC Pathfinder Grant from the European Innovation

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Council, the Heisenberg Grant from the German Research Foundation (DFG), the Emmy Noether Grant and the "Emerging Leader" award from the editorial board of the "Journal of Physics: Condensed Matter". Raphael Wittkowski substantiates his research with a prolific output of almost 100 publications including leading journals such as Nature and Physical Review Letters. His publications have been cited 6,000 times. As well as research and publishing, he is also involved in teaching and the promotion of young researchers. He offers courses and supervises Bachelor's-, Master's and doctoral theses, and involves students and staff in active research at an early stage.

Alfried Krupp Prize

The Alfried Krupp Prize has been awarded annually since 1986 to young university lecturers who hold their first professorship in the fields of natural sciences and engineering (including medicine) at a German university. It has been awarded to 45 researchers to date. The €1.1 million award gives the recipients freedom in research and teaching: they can flexibly and independently create an optimal working environment for themselves and advance their research over a period of five years. From 2025 onwards, the prize money also includes €150,000 to meet the indirect (overhead) costs of the prize-winner's university.

Alfried Krupp von Bohlen und Halbach Foundation

The non-profit Alfried Krupp von Bohlen und Halbach Foundation has been promoting people and projects in art and culture, education, science, health and sport since 1968, to date committing around €700 million for this purpose. As the largest shareholder of today's thyssenkrupp AG, the Foundation uses the income it receives exclusively for charitable purposes. With its work, it sets accents in the development of science and higher education and also aims to create equal opportunities and improve the education of young generations.

For further information see: www.krupp-stiftung.de/wissenschaft/

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