PRESS RELEASE

MAX PLANCK INSTITUTE
FOR THE SCIENCE OF LIGHT

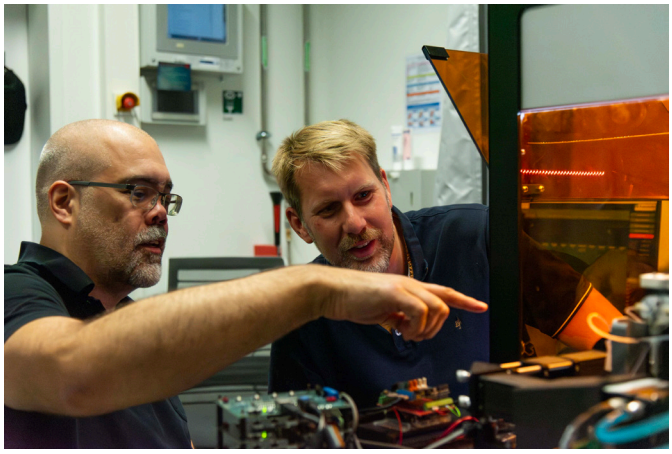
AutoRAPID project enters the home stretch: Successful trial installation in Erlangen

ERLANGEN, 18 OCTOBER 2023

The fully automated measurement of the biophysical properties of hundreds of cell samples in just a few days is the goal of the cooperative project "AutoRAPID," involving scientists from the Max Planck Institute for the Science of Light (MPL) in Erlangen and the Fraunhofer Institute for Production Technology and Automation IPA in Mannheim. For the first time, the biophysicists and automation engineers have assembled their individual components in a setup in Erlangen.

Researchers* from the Department of Biological Optomechanics at the MPL, led by Prof. Jochen Guck, have developed a biophysical measurement method which enables them to perform individual mechanical characterization of a large number of cells at a measurement speed of 100 to 1000 cells per second. For example, they can show that the biomechanical properties of pathologically altered cells differ significantly from those of healthy cells. Rapid physical phenotyping in deformational flow, or RAPID for short, is not only the name of the project but also its aim: it involves the maximum acceleration of the measurement speed.

The aim of the AutoRAPID project is to apply the microfluidic measurement method to a fully automated, validated analysis system. Cells flow through a system of channels just a few tens of microns wide to test their deformability. The researchers' long-term goal is to measure the effects of variable parameters, such as drugs, on the physical properties of cells and make this knowledge available for use in therapeutic approaches. The integrated setup has now been assembled for the first time in Erlangen and the interplay between the effects of process automation, from sampling to optical analysis methods, tested.



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Prof. Jochen Guck (l.) and Dr. Jens Langjürgen (r.) inspect the setup of the AutoRAPID project.

Prototype for the automation of biophysical cell measurements fully functional

The individual components of the AutoRAPID project were successfully assembled into a system by the two research groups and subjected to a functional test in a joint trial run. The biophysical measurement expertise is provided by the research team of Prof. Jochen Guck, director of the MPL. In the final setup, the specially developed fluidic microchip is combined with optical measurement methods. Using a sophisticated flow system, the scientists are able to analyze the physical properties of the cells and focus on them in various measurements.

The Fraunhofer IPA scientists, led by Dr Jens Langejürgen, head of the Clinical Health Technologies department and site manager in Mannheim, are contributing their expertise in pro-

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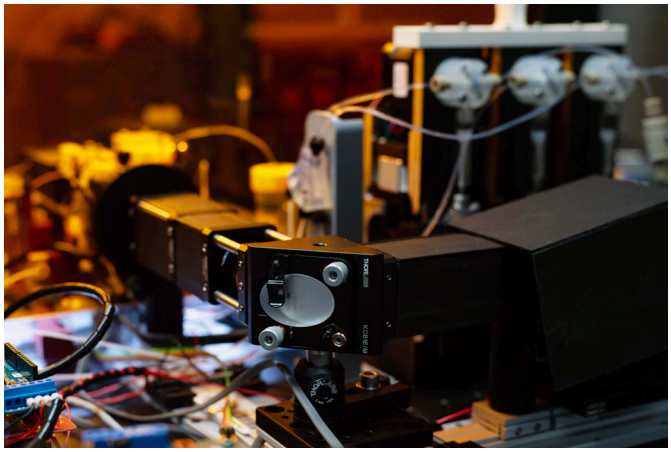

The AutoRAPID projects combines the biophysical measurement expertise from MPL with the IPA scientists tecnical know-how in process automation.

cess automation.While the conventional manual measurement of a sample requires a time-consuming preparation lasting up to 30 minutes per sample, the new automated AutoRAPID process can analyze up to 96 samples per day. From sample collection and microchip loading by a pipetting robot to control of the three-pump system and the sample analysis itself, all steps of the process can be programmed fully automatically. Another advantage is the newly developed integrated cleaning process of AutoRAPID: the previous disposable chip is replaced by a permanently installed reusable measuring module.

The four-year AutoRAPID project is now in its third (research) year and entering the decisive final project phase. By the end of 2024, the scientists hope to demonstrate a validated measuring device that can automatically perform thousands of measurements. Jochen Guck is confident: "It's great to see a long-planned goal finally becoming tangible. Soon we will be able to perform series of measurements that were unthinkable just a short time ago." The next step is to test the automatic analysis procedure in practice and put it through its paces in daily use.
Jens Langejürgen is pleased: "Thanks to the excellent cooperation in this project, we were able to quickly assemble a sufficiently automated measurement setup for the extensive practical test phase in Erlangen. At the same time, we have an identical copy of the system in Mannheim, which enables us to carry out further optimisation steps in parallel. In the joint interdisciplinary project team, we benefit from the very different experiences and approaches."

MAX-PLANCK-INSTITUT
FÜR DIE PHYSIK DES LICHTS

Research at the Max Planck Institute for the Science of Light (MPL) covers a wide range of topics, including nonlinear optics, quantum optics, nanophotonics, photonic crystal fibres, optomechanics, quantum technologies, biophysics, and – in collaboration with the Max-Planck-Zentrum für Physik und Medizin – links between physics and medicine. MPL was founded in 2009 and is one of the over 80 institutes that make up the Max Planck Society, whose mission is to conduct basic research in the service of the general public in the natural sciences, life sciences, social sciences and the humanities.

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Fraunhofer
IPA

Fraunhofer IPA – one of the Fraunhofer-Gesellschaft's largest institutes – was founded in 1959 and employs nearly 1200 workers. The focus of our research and development work is on organizational and technological issues related to the manufacturing industry. We develop, test and implement methods, components and devices right up to entire machines and production lines. Fraunhofer IPA's 19 specialist departments cover the entire field of manufacturing engineering. They are coordinated by six business units and work on an interdisciplinary basis with industrial enterprises from the following sectors: automotive, machinery & equipment, electronics & microsystems, energy, medical engineering & biotechnology, and the process industry.

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