

# NEWS

from the **Science of Light**

Dear,

Here you can find news about research and people from our institute. Enjoy reading our March issue!

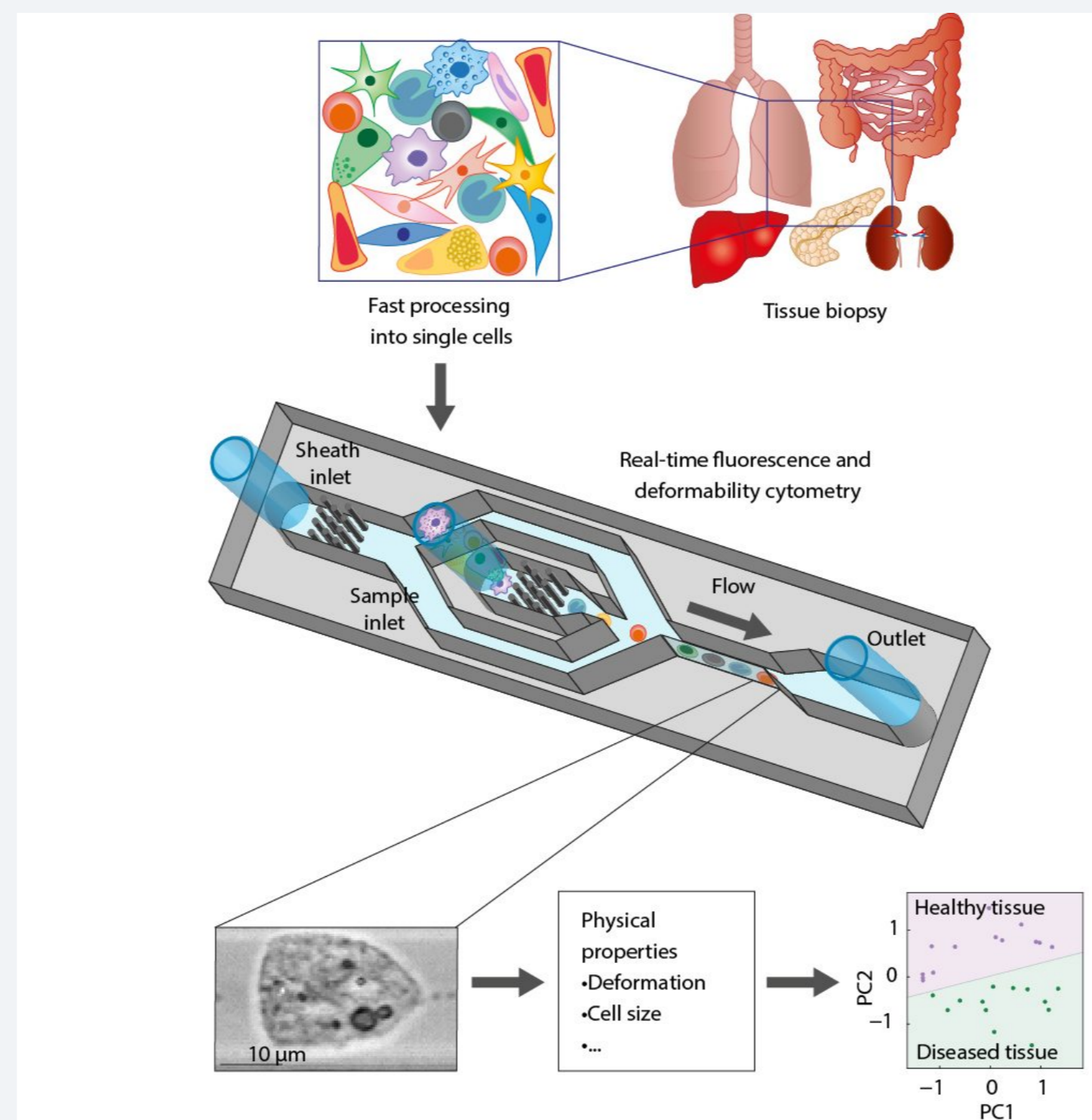
Yours sincerely,

Max Planck Institute for the Science of Light (MPL)

## Research

### Creating an artificial pathologist

A team from MPL and MPZPM around Despina Soteriou, Markéta Kubánková and director Jochen Guck has created a new, fast and precise method for clinicians to analyse cells in tissue samples from cancer patients without the need for a trained pathologist. They use artificial intelligence to evaluate the data their method produces. > **MORE**



## Events

### A presidential visitor at MPL

Patrick Cramer has been chosen as the new president of the Max Planck Society starting in June 2023. Before that time, he intends to visit every one of the 85 Max Planck Institutes. On March 13 at MPL, he was joined by the head of the Institute Department, Katja Ketterle and Institute Coordinator Barbara Müller. > **MORE**



### Successful retreat for MPL infrastructure

The MPL Infrastructure team has returned from a two-day retreat in Kloster Banz, full of motivation and new ideas. During their stay at the time-honored monastery, they participated in several workshops and team-building exercises to further develop their mutual understanding of each other's process tasks and procedures, and to explore new, interdisciplinary projects. Most importantly, the retreat strengthened the WE feeling within the infrastructure. > **MORE**



## Publications

### Impact of crowding on the diversity of expanding populations

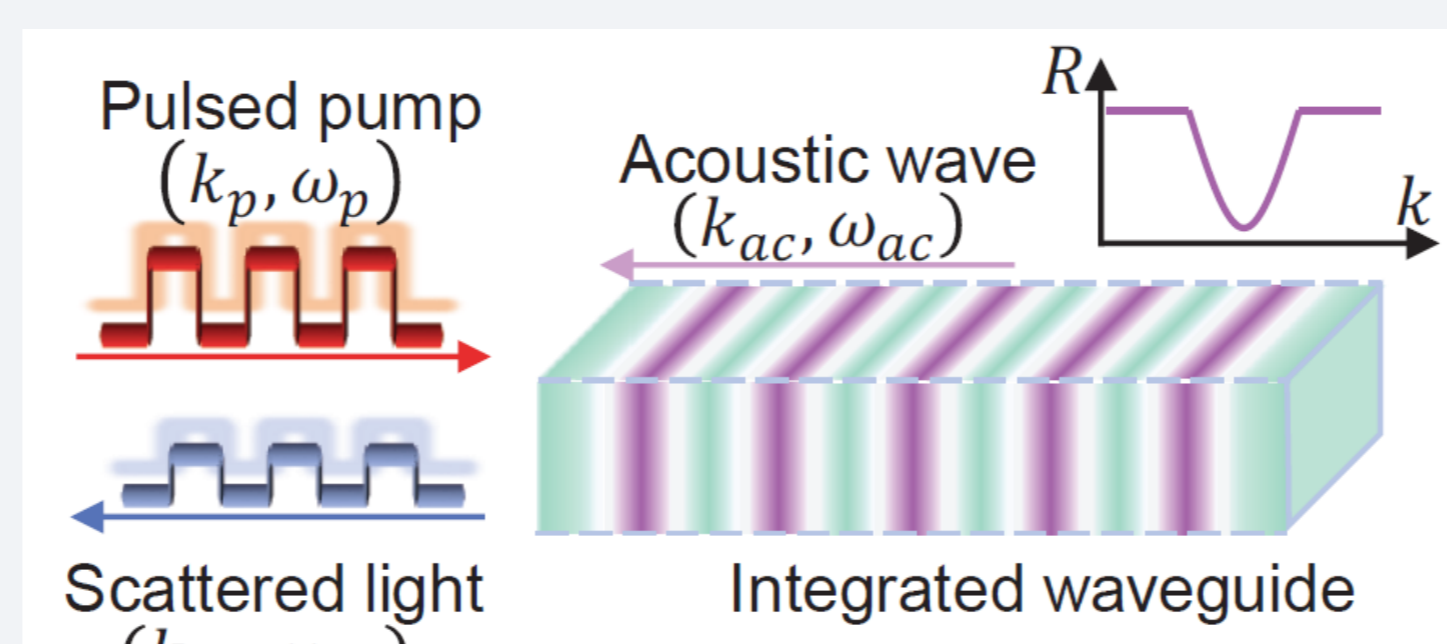
With microbial colonies on plates, a team from MPL around research group leader Jona Kayser show that the allele frequency spectrum is characterized by a power law for low frequencies. Using cell-based simulations and microfluidic experiments, they identify the origin of this distribution in the volume-exclusion interactions within the crowded cellular environment, enabling them to extend these findings to a broad range of dense populations. This study highlights the importance of cellular crowding for the emergence of rare genetic variants.

Schreck CF, Fusco D, Kanita Y, Martis S, Kayser J, Duvernoy MC, Hallatschek O. Impact of crowding on the diversity of expanding populations. Proc Natl Acad Sci U S A. 2023 Mar 14;120(11):e2208361120.

### Dynamic Brillouin cooling for continuous optomechanical systems

Birgit Stiller and Changlong Zhu demonstrate that optomechanical ground state cooling in a continuous optomechanical system is possible by using backward Brillouin scattering while mechanical dissipation exceeds optical dissipation which is the common case in optical waveguides. The cooling is achieved in an anti-Stokes backward Brillouin process by modulating the intensity of the optomechanical coupling via a pulsed pump to suppress heating processes in the strong coupling regime. With such dynamic modulation, a cooling factor with several orders of magnitude can be realized, which breaks the steady-state cooling limit. This modulation scheme can also be applied to Brillouin cooling generated by forward intermodal Brillouin scattering.

Changlong Zhu and Birgit Stiller, Dynamic Brillouin cooling for continuous optomechanical systems. Mater Quantum Technol. 3 (2023) 015003



### Photon pairs bi-directionally emitted from a resonant metasurface

A team around Maria Chekhova generate photon pairs via spontaneous parametric down conversion from a metasurface supporting a quasi-bound state in the continuum (BIC) leading to remarkable emission directivities. The pair generation rate is enhanced 67 times compared to the case of an unpatterned film of the same thickness and material. They expect this work to be a starting point for the efficient demultiplexing of photons in nanoscale quantum optics.

Changlin Son, Vitaliy Sultanov, Tomás Santiago-Cruz, Aravind P. Ananthur, Haizhong Zhang, Ramon Paniagua-Dominguez, Leonid Krivitsky, Arseniy I. Kuznetsov and Maria V. Chekhova, Photon pairs bi-directionally emitted from a resonant metasurface. Nanoscale. 2023,15, 2567-2572.

### On-chip quantum interference between the origins of a multi-photon state

In 2019, a new multi-photon interference effect has been predicted using a bridge between graph theory and quantum optics, a core research technology used by the team of Mario Krenn. Now, this phenomenon has been experimentally demonstrated for the very first time in a collaboration with researchers at the USTC in Hefei, China. The authors, including Mario Krenn, demonstrate for the first time quantum interference between the origins of a multi-photon state.

Lan-Tian Feng, Ming Zhang, Di Liu, Yu-Jie Cheng, Guo-Ping Guo, Dao-Xin Dai, Guang-Cai Guo, Mario Krenn, and Xi-Feng Ren, "On-chip quantum interference between the origins of a multi-photon state," Optica 10, 105-109 (2023)

## People

### Karim Almahayni invited to Lindau Nobel Laureate Meeting

Karim Almahayni has been chosen as one of 635 young scientists to attend the prestigious Lindau Nobel Laureate Meeting. The MPL researcher from the group of Leonhard Müchli will have the chance to meet around 40 Nobel Laureates from the field of Physiology/Medicine. > **MORE**



## Jobs

**3 PhD Student Positions** in the Biological Optomechanics Division of Prof. Jochen Guck: They investigate the physical – mechanical and optical – properties of living cells and tissues using novel photonics and biophysical tools and test their biological importance. Are you interested in applying your knowledge to explore the boundary between physics and biology/medicine? > **MORE**

**Postdoctoral Position** in Molecular Quantum Optics: Would you like to work in a highly motivated research team that aims to understand and control the interaction of quantum emitters, in particular organic molecules, with their nanoscopic environment and with each other? > **MORE**

**Postdoctoral position** for developing a novel source of squeezed light for quantum imaging: Do you have a strong grasp of experimental optics as well as quantum and nonlinear optics? Are you interested in a project that will build sources of pulsed squeezed light for future use in a quantum-enhanced Raman microscope? > **MORE**

## Looking for a Master's degree or Ph.D. at the forefront of optics?

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