

Study leads to new approach to trapping light in photonic kagome crystals

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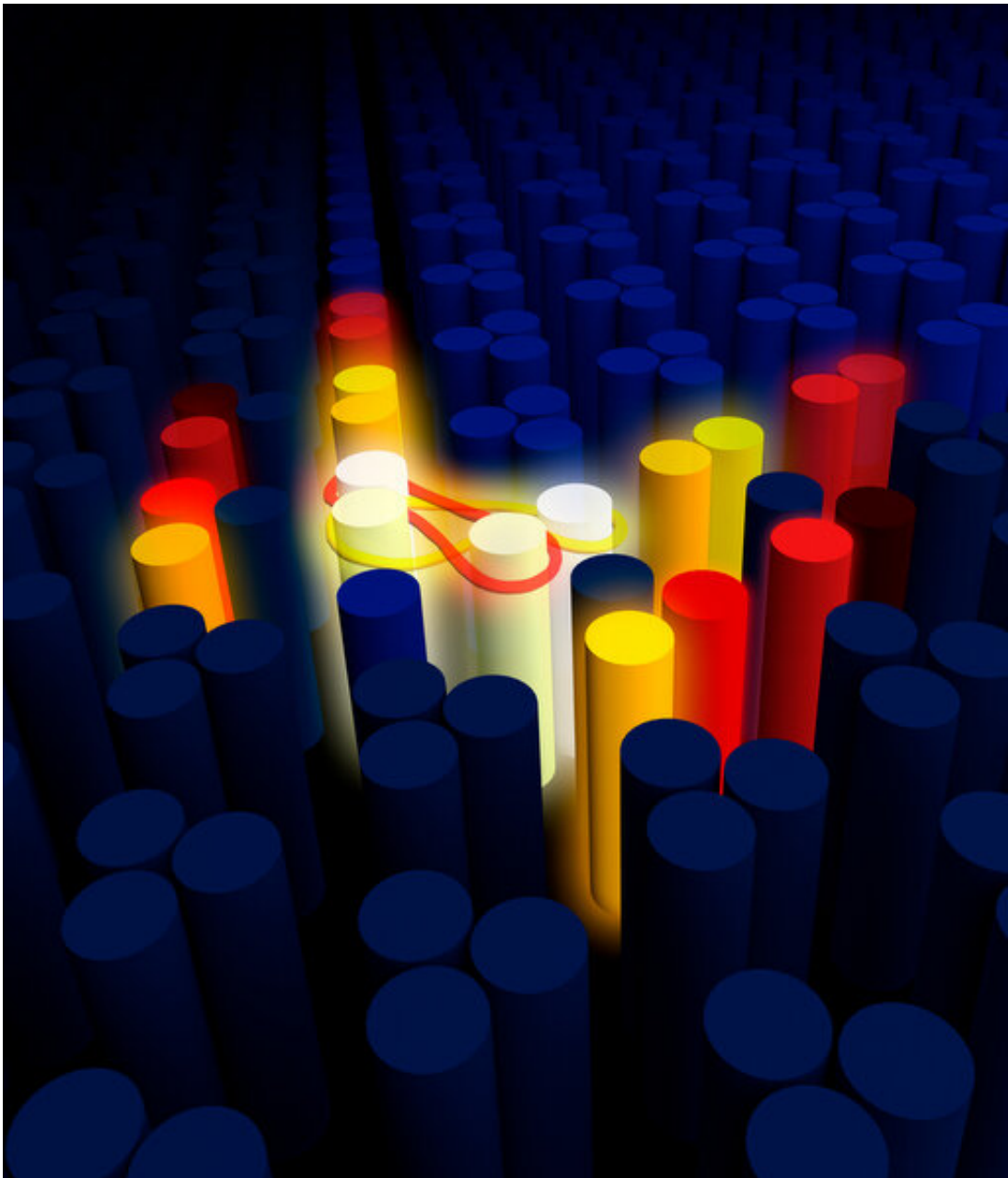


Illustration of light localized in space inside the topological crystal, entangled by interaction and topology (schematically shown by ribbons). Credit: ITMO University.

A new approach to trapping light in artificial photonic materials by a City College of New York-led team could lead to a tremendous boost in the transfer speed of data online.

Research into topological photonic metamaterials headed by City College physicist Alexander B. Khanikaev reveals that long-range interactions in the metamaterial changes the common behavior of [light](#) waves forcing them to localize in space. Further, the study shows that by controlling the degree of such interactions one can switch between trapped and extended (propagating) character of optical waves.

"The new approach to trap light allows the design of new types of optical resonators, which may have a significant impact on devices used on a daily basis, said Khanikaev. "These range from antennas in smartphones and Wi-Fi routers, to optical chips in optoelectronics used for transferring data over the Internet with unprecedented speeds."

Entitled "Higher-order topological states in photonic kagome crystals with [long-range interactions](#)," the research appears in the journal *Nature Photonics* published today.

It is a collaboration between CCNY, the Photonics Initiative at the Graduate Center, CUNY; and ITMO University in St. Petersburg, Russia. As the lead organization, CCNY initiated the research and designed the structures, which were then tested both at CCNY and at ITMO University.

Khanikaev's research partners included: Andrea Alù, Mengyao Li, Xiang Ni (CCNY/CUNY); Dmitry Zhirihin (CCNY/ ITMO); Maxim Gorlach, Alexey Slobozhanyuk (both ITMO), and Dmitry Filonov (Center for Photonics and 2-D Materials, Moscow Institute of Physics and Technology).

Research continues to extend the new approach to trap visible and infrared light. This would further expand the range of possible applications of the discovery.

More information: Mengyao Li et al. Higher-order topological states in photonic kagome crystals with long-range interactions, *Nature Photonics* (2019). DOI: [10.1038/s41566-019-0561-9](https://doi.org/10.1038/s41566-019-0561-9)

Provided by City College of New York

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