

# Emergent Research:

The PIMS Postdoctoral Fellow Seminar

Oct 27, 2021 | 9:30am Pacific

## Quantum Operations

## as Resources

### ABSTRACT:

Protocols and devices that exploit quantum mechanical effects can outperform their classical counterparts in certain tasks ranging from communication and computation to sensing. Intuitively speaking, the reason for this is that different physical laws allow for different technological applications. Therefore, the question where quantum mechanics differs from classical physics is not only of foundational or philosophical interest but might have technological implications too. To address it in a systematic manner, so-called quantum resource theories were developed. These are mathematical frameworks that emerge from (physically motivated) restrictions that are put on top of the laws of quantum mechanics and single out specific aspects of quantum theory as resources. A widely studied example would be the restriction to local operations and classical communication, which leads to the resource theory of entanglement. It is then investigated how these restrictions influence our abilities to do certain tasks (e.g., communicate securely), how these restrictions can be overcome, and how the resulting resources can be quantified. Historically, resource theories were mainly focused on the resources present in quantum states. After an introduction to the general topic, I will speak about my recent research on how these concepts can be extended to quantum operations and why this is of interest.

### For more information and registration:

<https://www.pims.math.ca/seminars/PIMSPDF>



### Thomas Theurer

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### SPEAKER BIO:

Thomas Theurer studied Physics with focus on quantum information at Ulm University in Germany, followed by a PhD in 2021 with Prof. Martin B. Plenio. His main research interest is the characterization of non-classicality using the mathematical framework of quantum resource theories, with a focus on resource theories of operations and their application to technologically relevant problems. Traditionally, resource theories focus on static resources present in quantum states. He is currently a postdoctoral scholar with Prof. Gilad Gour and Carlo Maria Scandolo at the University of Calgary. His main focus remains on resource theories, but with a shift from coherence to other resources.

### ABOUT PIMS PDF SEMINARS:

PIMS ongoing lecture series featuring our Postdoctoral Fellows every three weeks. You will have the opportunity to connect with emerging research in the mathematical sciences from a PIMS Postdoctoral Fellow. PIMS PDFs are amongst the top young researchers in Canada, and this is an excellent opportunity to learn about them, and their work.