Title: Alumni Stories: Sarah Croke

Speakers: Sarah Croke

Collection/Series: Beyond Perimeter - Alumni 25th Anniversary Event

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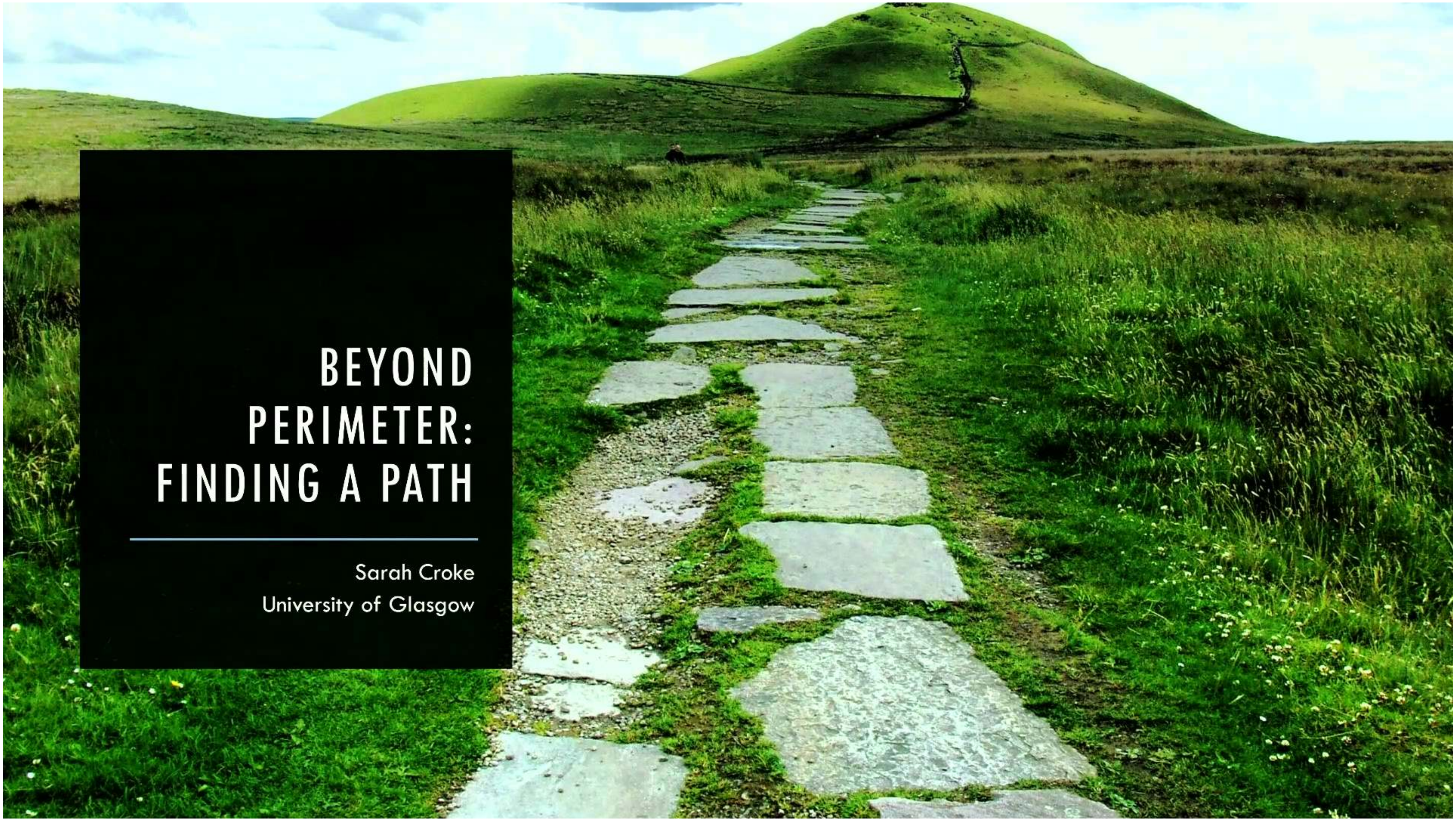

BEYOND
PERIMETER:
FINDING A PATH
Sarah Croke
University of Glasgow

AT PERIMETER

Arrived in 2007 as a postdoctoral fellow

Stayed as a PSI fellow in the (then still quite new) PSI programme 2011-2013

Took opportunities to be involved in outreach events: International Summer School for Young Physicists; Quantum2Cosmos; outreach videos

PSI

This was the early days of PSI

It was incredibly intense

I got to work on the Quantum Theory (with Adrian Kent), Quantum Information (with Daniel Gottesman and later Andrew Childs, and David Cory), and Quantum Foundations (with Rob Spekkens) courses.

The students were amazing

It is unlike teaching anywhere else

I BECAME A PARENT WHILE AT PERIMETER


University of Glasgow
VIA VERITAS VITA
A WORLD TOP 100 UNIVERSITY

MY CURRENT ROLE

Moved to the University of Glasgow in 2013, where I am now a Professor of Theoretical Physics.

I am also the Convenor of Learning and Teaching for the School of Physics and Astronomy.

Our School has around 1000 students (undergraduate and postgraduate taught) and 60 full time academic staff.

I lead a research group with 3 postdocs and 4 PhD students, and an interdisciplinary collaboration with the Institute for Gravitational Research.

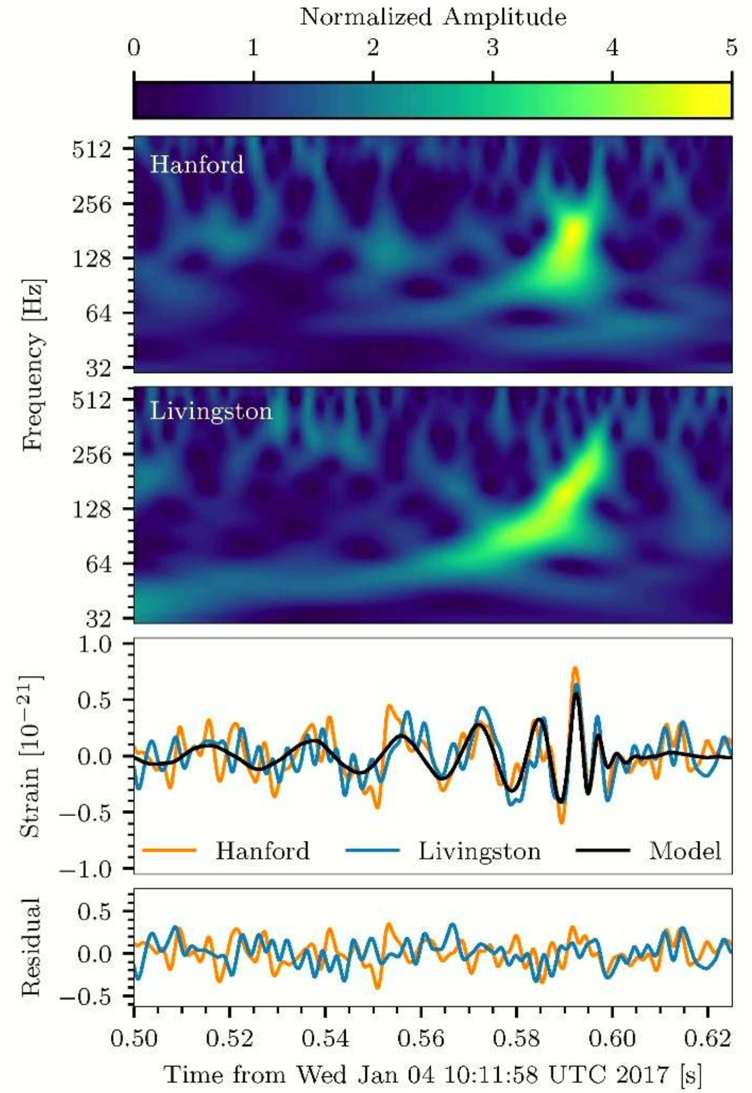
QUANTUM ALGORITHMS FOR DATA ANALYSIS

Matched filtering is a key technique to detect the presence of a signal in noisy data.

This involves calculating a signal to noise figure of merit between the possible signal and the data.

If the source parameters are not known, this becomes a brute force search, testing the data against waveforms drawn from a template bank.

Can be improved in principle using Grover's algorithm

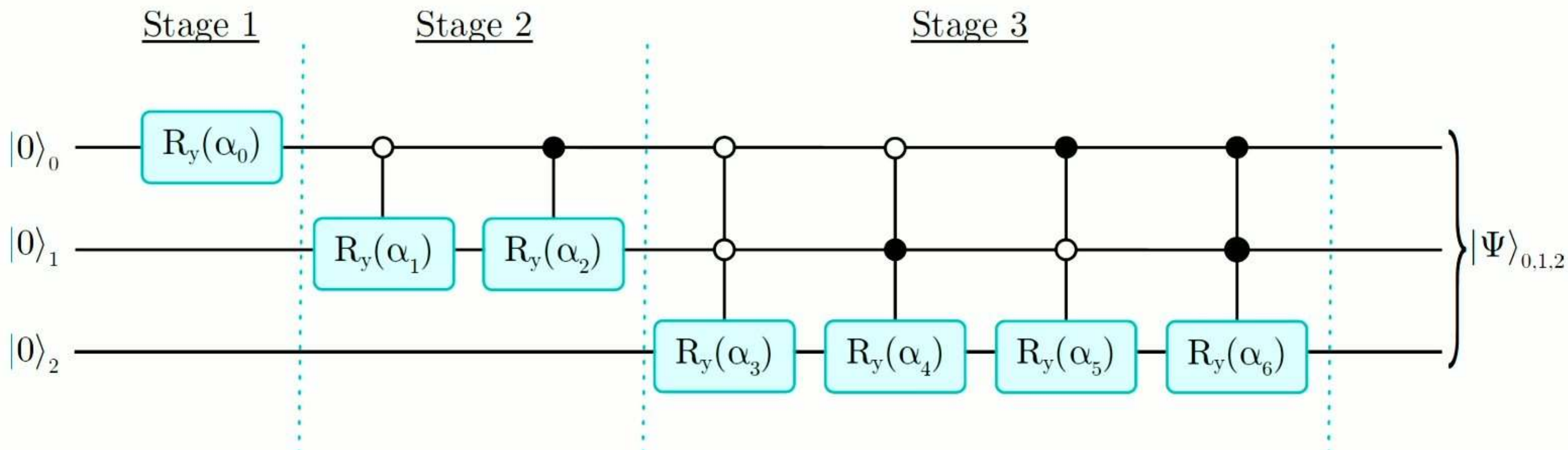


LIGO data from 170104 detection. Credit: LIGO/Caltech/MIT

STATE PREPARATION ALGORITHMS

We would like to explore other algorithms for gravitational wave data analysis. A known problem in suggesting quantum algorithms for processing classical data is how to load in the classical data.

This has led us to construct new state preparation algorithms.



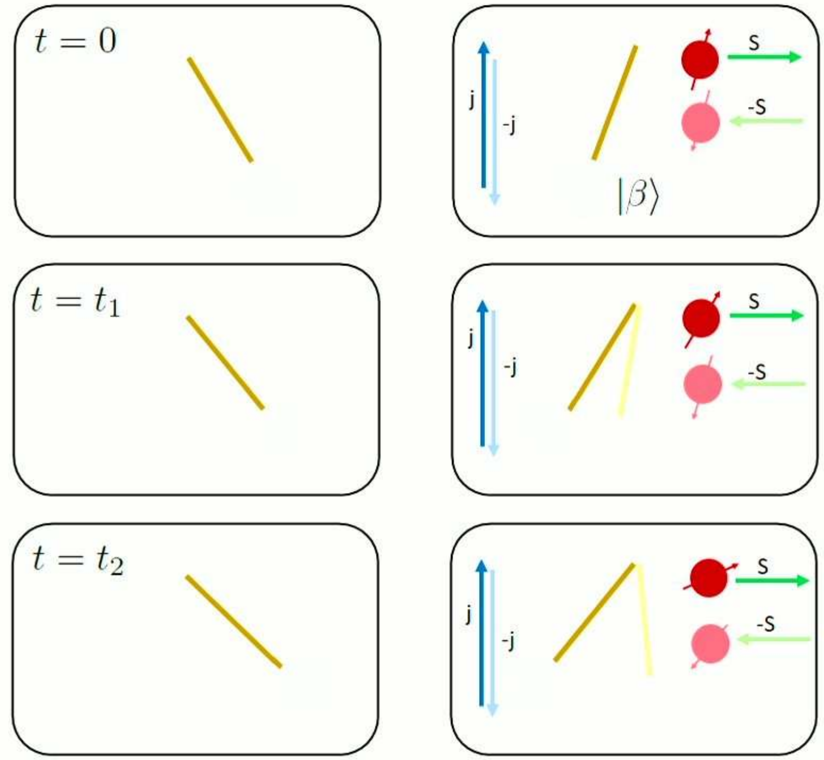
SYMMETRY OPERATIONS

Came back to Perimeter in 2022 as an Emmy Noether fellow (as part of a sabbatical year funded by the Leverhulme trust).

Interested in exotic symmetry operations: is there a continuous symmetry group including the time reversal operator as an element?

$$\mathcal{S}(\alpha) = \exp(\alpha \mathcal{T}) = \sum_{n=0}^{\infty} \frac{(\alpha \mathcal{T})^n}{n!}$$

This project is just for fun, but is heavily influenced by my time at PI.



LEVERHULME TRUST

LEARNING AND TEACHING

Learning and teaching is a huge part of my role now.

I've always been passionate about teaching, and communicating; the PSI programme was a really good fit for me at the right time.

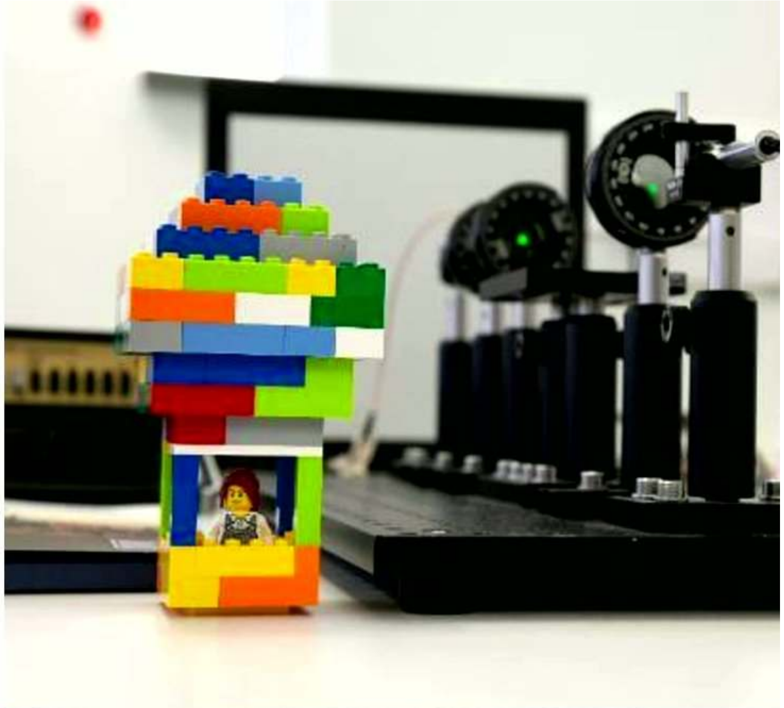
QUANTUM TECHNOLOGY SCHOOL

In 2018, together with a colleague, I set up a two-day Quantum Technology School for high school pupils. It has grown from 80 pupils in the first year to almost 300 students over two events in 2025.

Teachers are asked to encourage pupils who are taking physics but may not be considering further study to attend.

We focus on hands-on activities, as well as opportunities to hear from current students and recent graduates.

Feedback shows event helps students to make a more informed choice about further study.



LEADERSHIP

These days I find myself increasingly in leadership roles.

Leadership for me is about helping others find their path.

I value communication: listening and being open to other ideas.

My job as a leader is to make space for others to thrive.

I struggle with lots of aspects: in particular juggling responsibilities, and identifying which are the things that need my full attention.

BUILDING COMMUNITY: THINGS I AM PROUD OF

Course lead for Physics 1 during the pandemic. Student feedback:

"…the lecturers and coordinators clearly care a lot and listen to feedback to try and improve the course, there is a feeling of support and community in the way the course is run which makes it feel safe"

Amplify mentoring programme:

"It was an incredible experience to have a mentor and friend outside of university who works in the industry. As a first-generation university student, I was incredibly fortunate to receive support from someone knowledgeable in the field."


THANK YOU FOR LISTENING!