

January 2023

Making Light to Compute

IOP Wolverhampton Centre hosted Professor Berloff in November for her talk about quantum computing

The November evening talk at the University of Wolverhampton was hosted by Professor Fabrice Laussy and delivered by Professor Natalia Berloff, a professor of Applied Mathematics at the University of Cambridge.

The topic of her talk—[Making Light to Compute](#)—addressed the general problem of the complexity of computation and how Physics can bring new resources and ideas to go beyond classical algorithms.

The culmination of this idea is the famous Quantum Computer, with theoretically demonstrated algorithms to do in polynomial (fast) time what would take a conventional computer an exponential (unending) time.

Professor Berloff gave a bemused audience the example of the N Queens problem, which consists of placing N chess queens on an N×N chessboard so that no queen attacks any other. There are 92 solutions on the standard 8×8 chessboard and some can be found easily by trial and error. Incredibly, top computers can only solve this problem for N up to 27. The closest estimate of that complexity barrier when querying the audience came from its youngest member who ventured 51, when many had thousands or millions in mind.

Computers are more limited than we think. But they could live up to our expectations. Professor Berloff proceeded to explain how photonic machines can be used as simulators to solve important algorithmic problems, by letting the laws of physics converge onto a solution. She introduced the Analog Iterative Machine (AIM) project that she pursues at Microsoft, extending an invitation for exclusive free access to this optical platform to challenge it with one's own optimization problems (to be launched in early 2023).

