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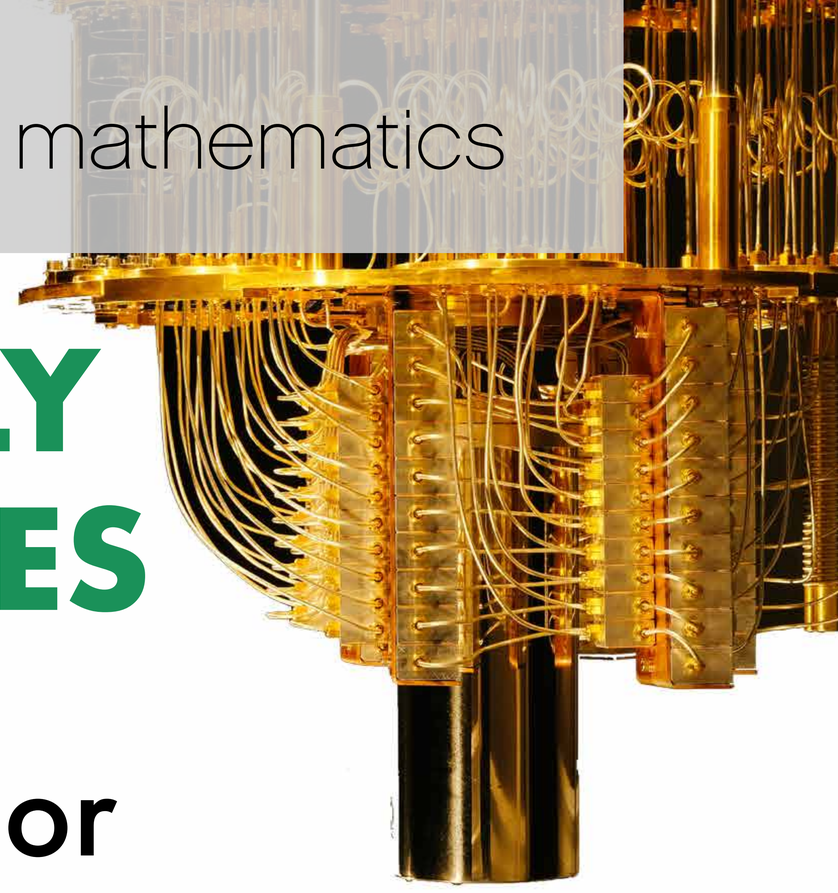

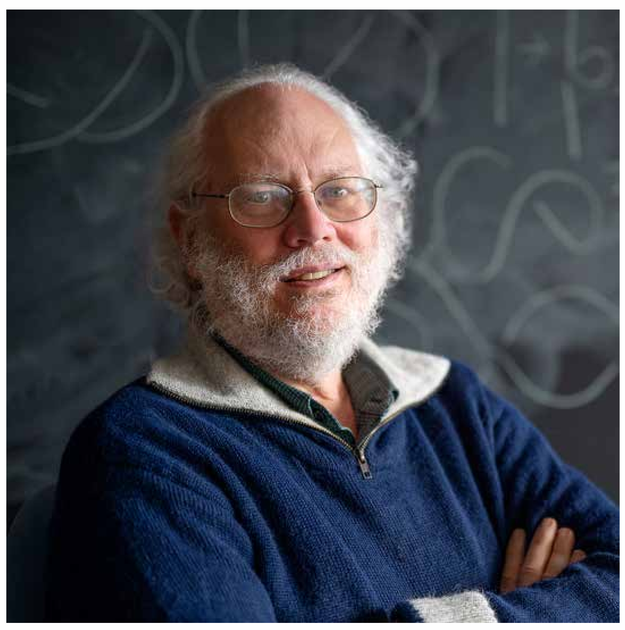

GREEN FAMILY LECTURE SERIES

Professor Peter Shor

Massachusetts Institute of Technology

Quantum Computing

Monday, November 27, 2023 @ 4:30 PM

Mong Auditorium, UCLA Samueli School of Engineering

Shortly after quantum mechanics was first formulated around 1930, the strangeness of the theory became evident. It took over 50 years, however, for people to realize just how pervasive its strangeness was.

Now, we know that information theory, the theory of computation, and the theory of cryptography all change substantially when we account for quantum mechanics. This strangeness can be used to accomplish tasks with quantum information processing that are not possible classically. One example—the one that really drew attention to this phenomenon—was my discovery that quantum computers can factor large numbers into primes in manageable time frames, something that digital computers would take an inordinate amount of time to do.The rapid factorization is only one example of the many strange impacts of quantum mechanics. We have discovered that the theory of information transmission changes substantially when information is transmitted over quantum channels rather than classical ones, as well as the existence of cryptographic protocols that use quantum information to perform tasks that are impossible classically.

I will discuss the factoring of primes and survey other discoveries in quantum computing—and offer recollections of my role in them.

Reception immediately following at IPAM.

This lecture will be accessible to a general public audience.

The Development of Quantum Error Correction

Tuesday, November 28, 2023 @ 4:30 PM

Mong Auditorium, UCLA Samueli School of Engineering

When quantum computers were first discovered, it wasn't clear that they could ever become practical, because it looked like it was impossible to correct errors on them. This was due to a theorems of quantum theory: the Heisenberg Uncertain Principle, which says that any measurement of a quantum system unavoidably changes the quantum state of the system. Thus, to figure out what the error is (so that you can correct it), you need to measure the system, which will inevitably disrupt the computation. This reasoning actually doesn't hold, and it is possible to design quantum error correcting codes that can be used to make quantum computers fault-tolerant. We will survey the early developments of these fault-tolerant techniques.

Reception immediately following at IPAM.

This lecture is intended for a scientific audience.

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For more information, visit the program webpage:
www.ipam.ucla.edu/programs/publlc-lectures-events/