

THEN IN 1994 . . .

SHOR

wait... is that a key???

1300477  
18807

11453300939

I developed a quantum algorithm to factor multiples of large prime numbers!!

AND THE WORLD WENT BERSERK BECAUSE RSA ENCRYPTION SCHEMES WERE BUILT ON THE ASSUMPTION THAT CLASSICAL COMPUTERS WOULD TAKE AGES TO FACTOR SUCH NUMBERS!

Ahhhhh!

Quick! More research into quantum computing!

AND SO COMPUTERS WOULD MIMIC NATURE'S PROBABILITIES . . . DAVID DEUTSCH LAID OUT A BASIC THEORETICAL STRUCTURE OF A QUANTUM COMPUTER (1985)

DEUTSCH

And I developed one of the first quantum algorithms with Jozsa!

I'm exponentially faster than any deterministic classical algorithm!

P-J ALGORITHM

THIS IS QUANTUM SUPREMACY I can do things in a week that classical computers need hundreds of years to do!

THE ACTUAL HARDWARE IS NOT YET CAPABLE OF SUCH BIG CALCULATIONS . . .

Hey, we got a so-qubit computer!

2018

I think we got a 72-qubit processor!

But is it stable? Universal? How many gates?

Oh wow, we need many thousands of qubits to perform Shor's algorithm!

And we need stable machines!

WHILE COMPUTERS ADVANCED, SIMULATING EVEN SIMPLE MOLECULAR SYSTEMS WITH SO MANY PROBABILITIES WAS NEARLY IMPOSSIBLE! THEN, RICHARD FEYNMAN PROPOSED AN INTERESTING IDEA

FEYNMAN

If you want to make a simulation of nature, you better make it quantum mechanical!

-1982

INSTEAD OF BITS SET TO 0'S OR 1'S LIKE NORMAL COMPUTERS,



A QUANTUM BIT (QUBIT) WOULD MAKE UP A QUANTUM COMPUTER

A proton or other small particle with quantum mechanical properties that can represent a 0 and a 1 at the same time!

BUT WITH RAPID ADVANCES, QUANTUM COMPUTING IS CONSTANTLY SHOWING NEW POSSIBILITIES . . .

AND THE QUANTUM COMPUTING RACE HAS ONLY JUST BEGUN

<https://www.epiqc.cs.uchicago.edu/resources/>

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AN NSF EXPEDITION IN COMPUTING

EPIQC

<https://www.epiqc.cs.uchicago.edu/>

THE IDEA THAT SO MANY THINGS WERE PROBABLE AND UNCERTAIN WAS BIZARRE . . .

this electron can be here OR here

and this glass of water is made of those molecules!

This molecule holds 8 or more atoms & each atom has its own probability of being in a certain place

BUT EVEN WITH GREATLY REMOVED SKEPTICS,

God does not play dice with the universe!

Einstein, stop telling God what to do with his dice!

EINSTEIN

BOHR

QUANTUM MECHANICS WAS BORN.

- HISTORY OF QUANTUM COMPUTING -

HOW DID QUANTUM COMPUTING COME TO BE?

From atoms to algorithms:  
A brief history of quantum computing

SCIENTISTS FOUND OUT THAT AS THINGS GET SMALLER AND SMALLER CLASSICAL PHYSICS DOES NOT HOLD!



IN THE EARLY 1900s, THE WORLD OF PHYSICS WAS TURNED...



HEISENBERG

SCHRODINGER

PLANCK

Energy is quantized!!!

Until measured, an electron can be in many places at the same time!

You can never know both the position and momentum of a particle with certainty!

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