

QUANTUM 101

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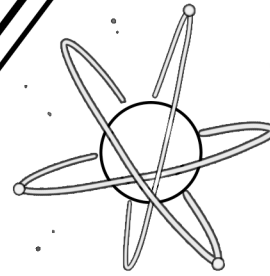
National Aeronautics and
Space Administration



Curious about quantum? Learn the basics of quantum physics and how NASA plans to use quantum to communicate in space.

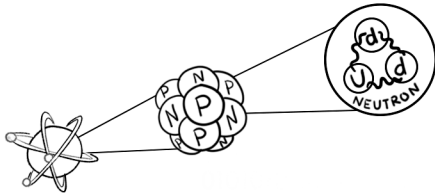


Everything physical around us is made of matter, from the air we breathe to the water we drink – even our own bodies are made of matter.



Atoms are an example of matter, and the basic building blocks of our world!

Atoms are made of even smaller units (or particles) of matter, called electrons, protons and neutrons – which are made of even smaller units of matter, called quarks.

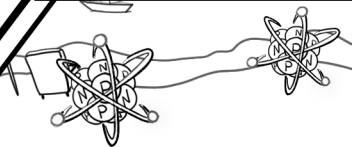


Quantum physics is the study of things that are very, very small – the size of an atom or smaller.



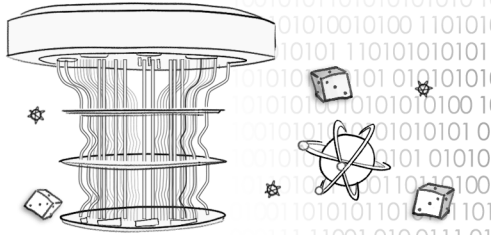
ATOMS ARE SMALLER THAN A GRAIN OF SAND!

It is a branch of science that investigates the nature of energy & matter...



...to make sense of the smallest things in nature.

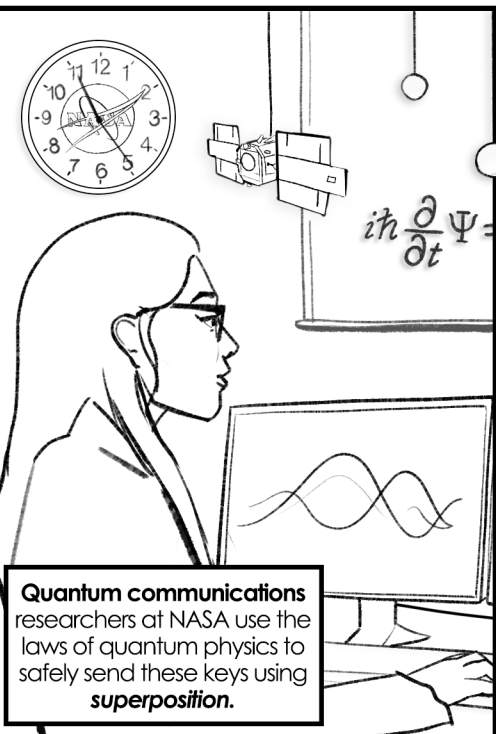
In quantum physics, predictions are given in terms of probability, which allows us to find answers traditional computers can't.



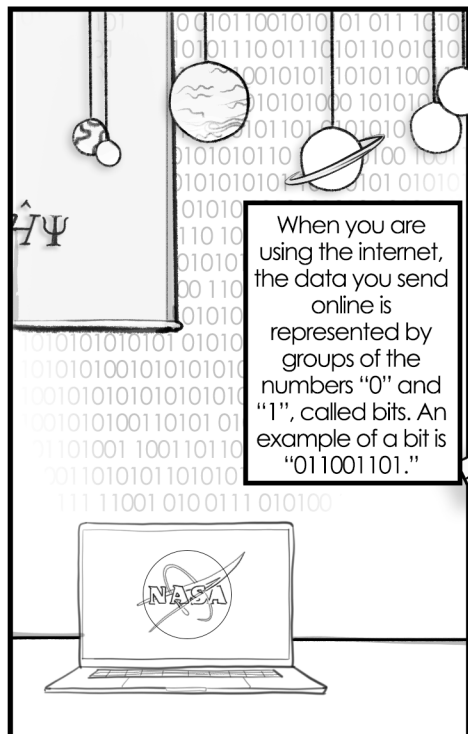
When sending important data, a message is encrypted, or turned into a secret code, & sent with decoding keys to view the message.



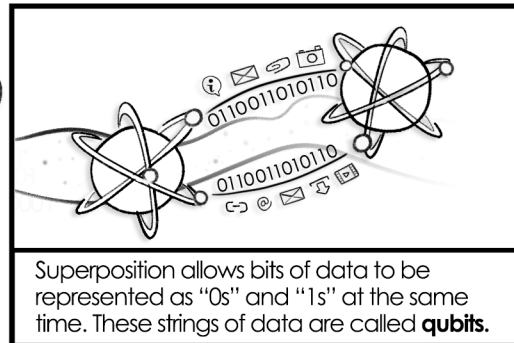
This stops eavesdroppers from "listening in" & stealing information. It is important to keep our keys safe & messages hidden.



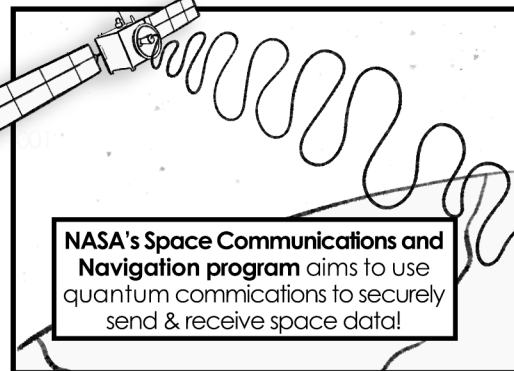
Quantum communications researchers at NASA use the laws of quantum physics to safely send these keys using **superposition**.



When you are using the internet, the data you send online is represented by groups of the numbers "0" and "1", called bits. An example of a bit is "011001101."



Superposition allows bits of data to be represented as "0s" and "1s" at the same time. These strings of data are called **qubits**.



NASA's Space Communications and Navigation program aims to use quantum communications to securely send & receive space data!