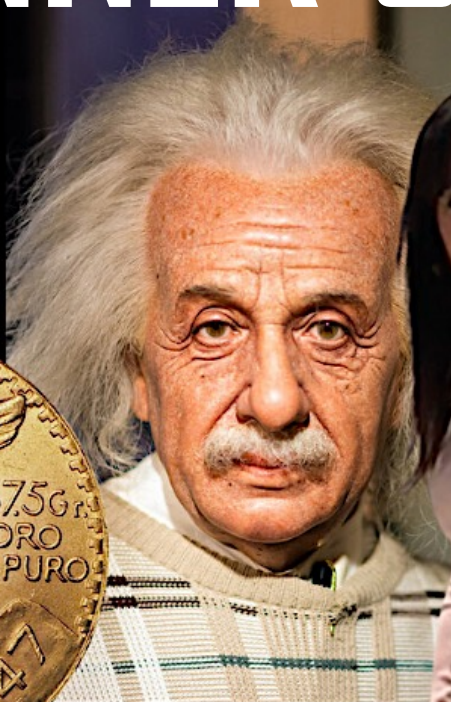


INNER SANCTUM

SPECIAL EDITION

LIBRARY OF CONGRESS

ISSN 2833-0455



QUANTUM BASICS

LINDA RESTREPO
CYBER SECURITY

AI,
EXPONENTIAL TECHNOLOGIES

VECTOR **N360** ©™



THE SMART MAN'S GUIDE TO QUANTUM

Linda Restrepo

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“ I believed my love would be
reciprocated
because it was pure.
But it wasn't.

Reaction to every action?
It doesn't work that way with a human heart.
Human minds resemble the quantum world.
Always uncertain.
Beyond any explanation.”

Quantum Technology

has an intimidating reputation but really it's just kind of a mental barrier that keeps us from learning. We try to fit it into a model of the World that we understand but that's not going to work. Understanding basic Quantum concepts is not really difficult it's just odd and we have to keep an open mind.

Have no qualms Quantum is here to stay, it will impact your life, career, and future. Quantum Technology reinvents almost everything and if you don't contribute to the input you cannot complain about the output. Those who do not understand technology will be left behind. We must go to Goliath because Goliath will not come to us. Estimates are that Quantum Computing Market will surpass \$64,988.3 Million by 2030.



Quantum computing is an area of computing focused on developing computer technology based on the principles of quantum theory.

Quantum technology is a place where everything goes awry, “universal” laws don’t apply and nothing makes sense. Quantum computing offers exponentially faster speeds than classical computing. The most exciting thing about a quantum-enhanced world, however, is that no one yet knows what it will bring.

The building of quantum computers works on three underlying principles. The **FIRST** is quantum theory;



the **SECOND** is that of superposition. This could mean that the quantum bit, also known as the qubit, can be a one or a zero, or pretty much anything in between. For example, if you have a coin - you have heads or tails, it's binary, it is either a head or a tail but if you spin that coin, then it can be both heads and tails at the same time. **ENTANGLEMENT** is the third one. With entanglement, if you have two coins that are spinning, the result of one impacts and changes the result of the other. In a nutshell entanglement, superposition, and quantum theory are the foundation of quantum computing.

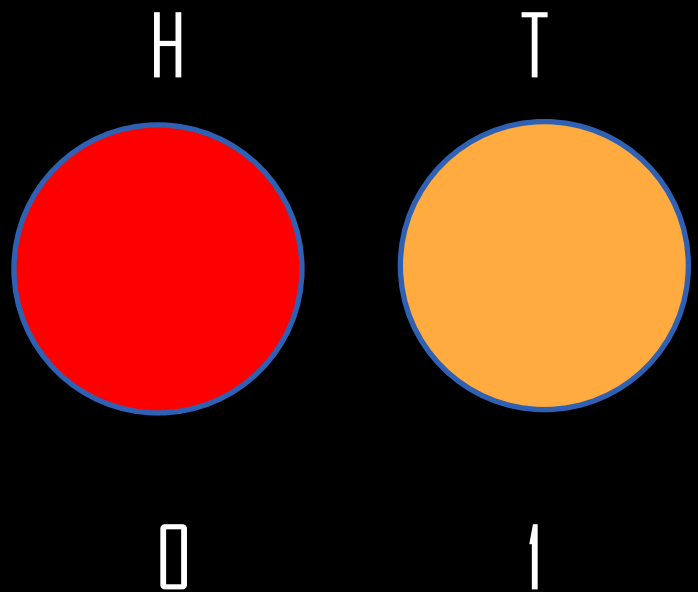


Keeping an open mind bring — in the cat. Schrodinger's cat was perhaps the most famous cat of all time. Born in Vienna Schrodinger was awarded the Nobel Prize in Physics in 1933. His research discusses the possibility that a cat can either be dead or alive when it is in a state of **SUPERPOSITION**.

Spinning the coin is the point in its superposition. When you stop the coin from spinning and you look at it, that's when you can determine which state it's ultimately in, it is heads or tails?

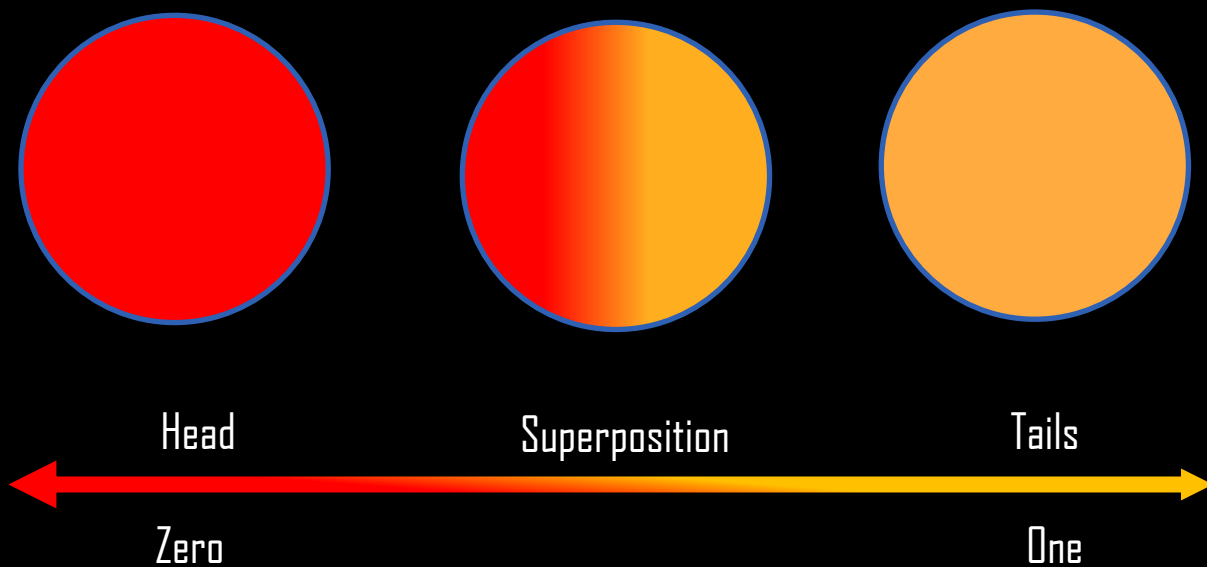
Quantum Computers are a totally new way of processing data. Just like a lightbulb is not a more powerful candle, a regular computer is not like a quantum computer.

You cannot build a better lightbulb by making more candles and you cannot make a Quantum Computer the same way you make a regular Computer. Classic computers work in a binary status: true or false; yes or no, left or right. They are based on "bits" a binary Number System which is a small amount of data that a computer can hold. A bit can hold only one of two values: 0 or 1.



A Zero or a One,
Heads or Tails

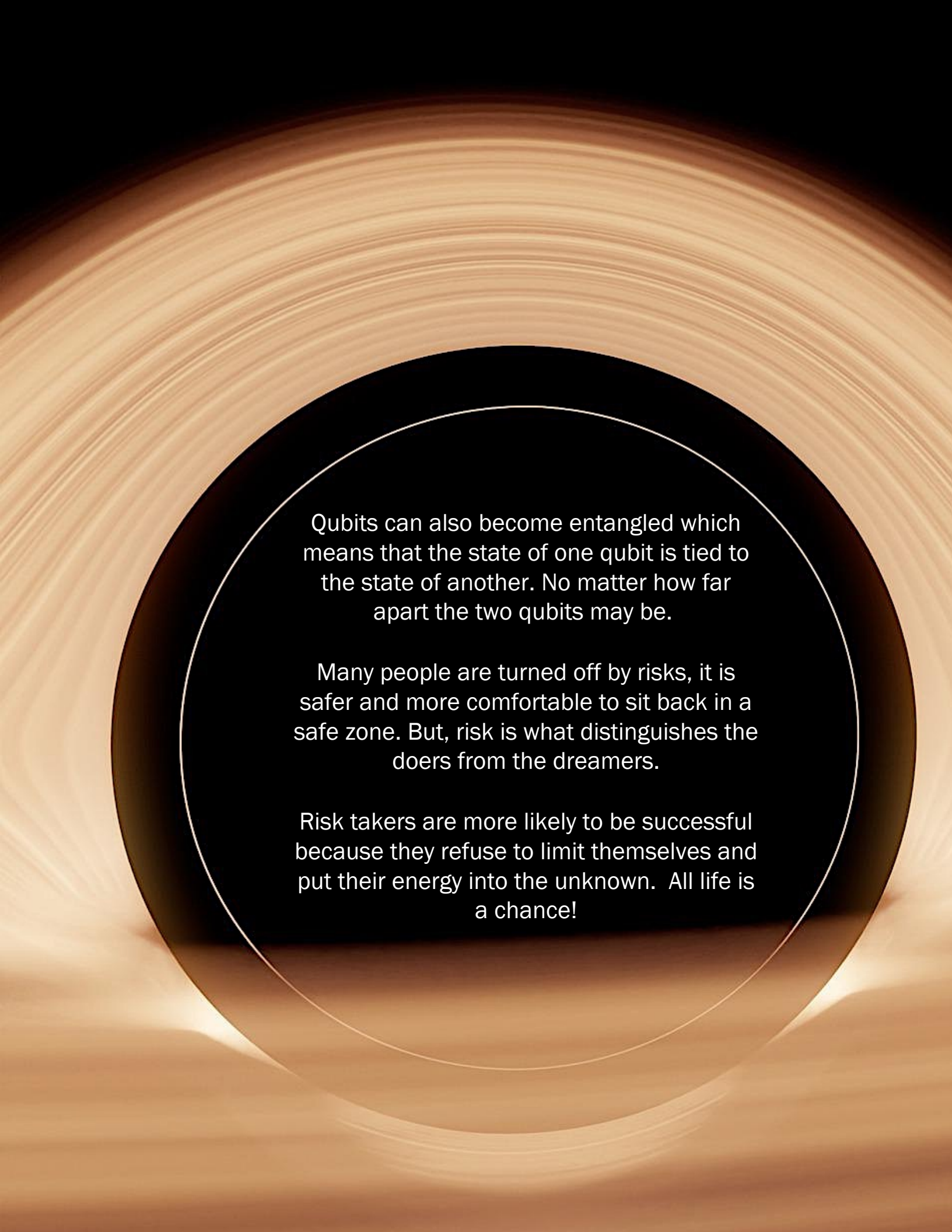
Quantum Computers also have bits but they are called Quantum bits or Qubit which refers to a basic unit of quantum information. Qubits can also function in a state of one to zero like classical computers. But the magic in Quantum Computer Qubits is that they can represent multiple combinations of 0 and 1. It can actually represent 0 and 1 at the same time, furthermore, they can be 0 and 1 simultaneously moving around in different directions.



It can exist in a **superposition**, a combination of zero and one.

Due to the phenomena of **superposition**, “qubits” can exist in more than one space at exactly the same time. Qubits can have a value of both “1” and “0” simultaneously but when the qubit is observed, it collapses to “1” or “0”.

In Quantum Computation qubits represent the probability that their observed state will be either “1” or “0” and because there is an infinite range of probabilities between “1” and “0”, this means that a qubit can represent a far larger range of data values than a classical bit.



Qubits can also become entangled which means that the state of one qubit is tied to the state of another. No matter how far apart the two qubits may be.

Many people are turned off by risks, it is safer and more comfortable to sit back in a safe zone. But, risk is what distinguishes the doers from the dreamers.

Risk takers are more likely to be successful because they refuse to limit themselves and put their energy into the unknown. All life is a chance!

So let's do some gambling and
take a risk against a classical
computer!

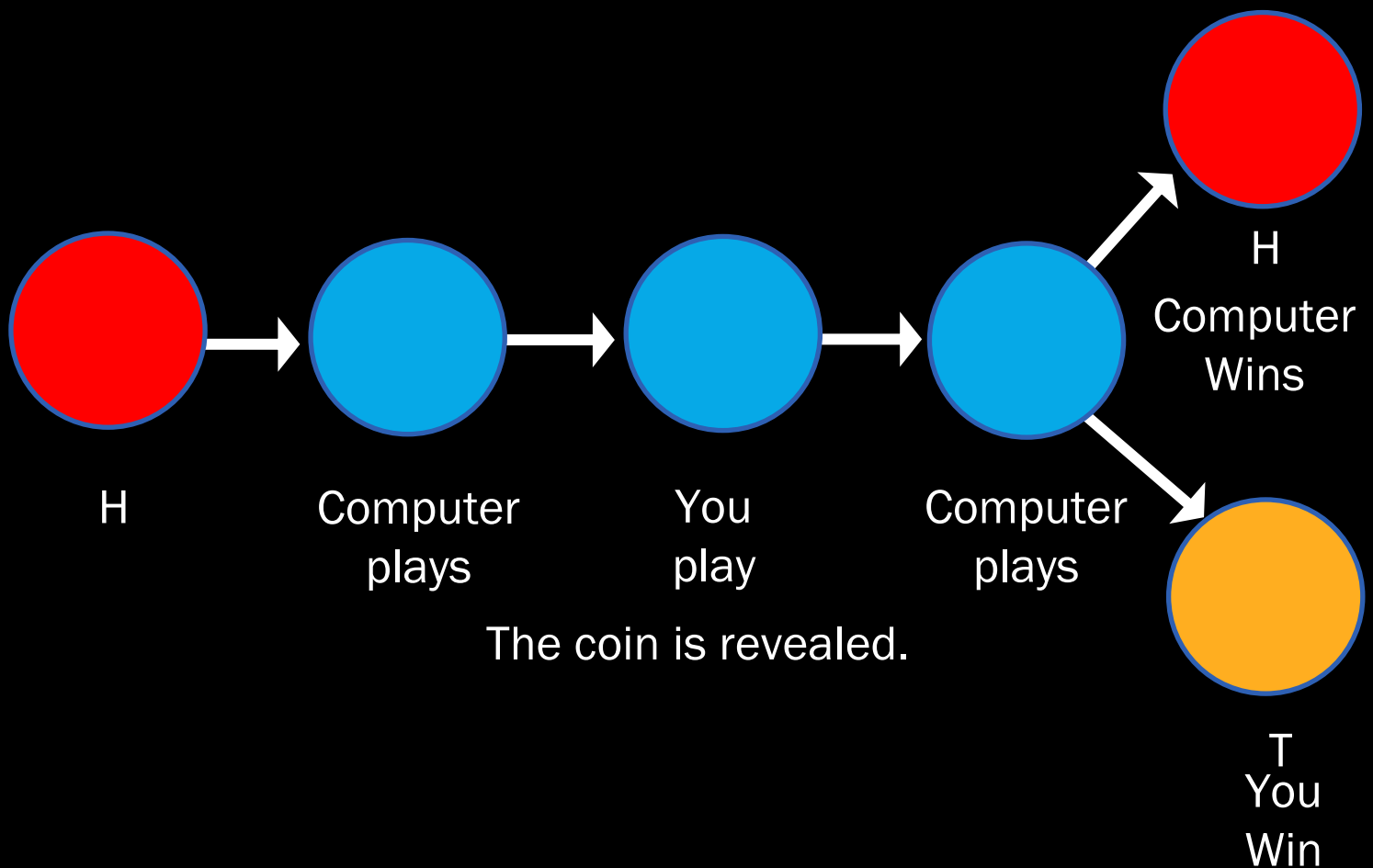
But before we do I'll make a
disclaimer, remember the warning
in Kenny Rogers's famous song:
You can't go home again. "Will you
ever learn, Will you ever see, Will
you just keep moving on?
Every Cowboy knows how
the story goes when
you're running out of
dreams

You can mend your ways, you can
walk for days, But you can't go
home again."

Quantum is going to make it
impossible for anyone to go home
again, it is an emerging
technology that will change the
world.

Every industry will be affected by
quantum computing. Quantum
computers are able to process
much larger data sets and perform
much more complex computations
than even the world's most
powerful supercomputers relying
on classical computing.

Let's play a game, a coin game heads or tails, with a regular computer.
We start with a coin showing heads,
The computer plays first - it chooses to flip the coin or not
But you do not know what its choice is
So now it's your turn you can also flip the coin or not, and since we all like to play fair, your move will not be revealed to your opponent, the computer and its move is not revealed to you.



In an ideal world, but not so realistic world, the hypothesis is if your competitor is honest and the coin is fair, you both have a fifty percent chance of winning in this scenario.

This happens because the regular computer is using Bits 0 and 1 for data and processing.

Example 4 bits in a row can represent a bunch of numbers:

4 bits

0000 0001 0010 0011

0100 0101 0110 0111

1000 1001 1010 1011

1100

Etc. and you can keep on going



So “one by one” the regular computer inputs the numbers to find what the correct response is.

This is also the manner in which cybersecurity hackers currently function, they will definitely try to crack your password using all the bits. Going back to our original batch he will utilize all of the numbers individually until he comes across the correct number.

How do I destroy thee? Let me count the ways...

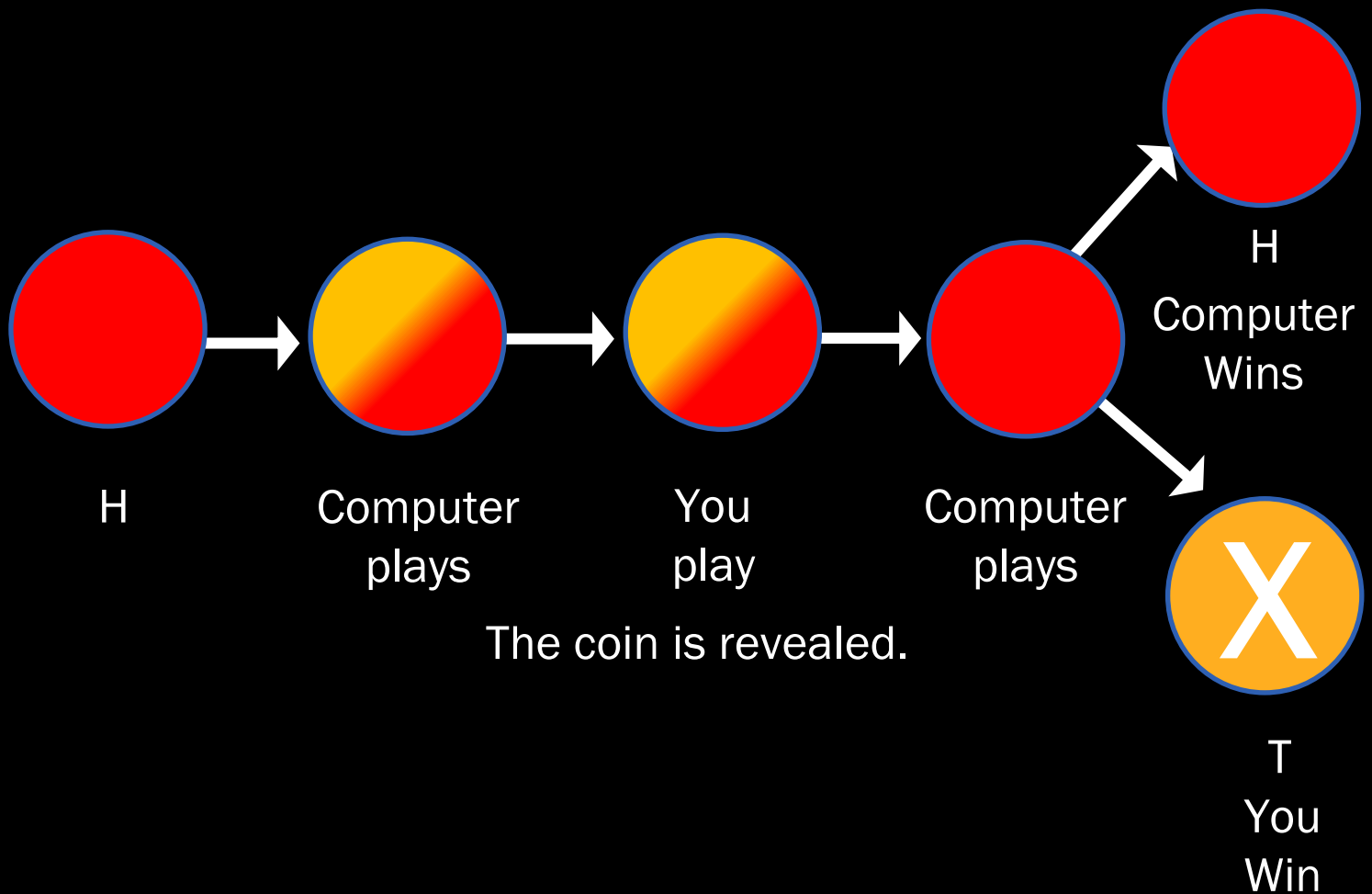
On average, it takes a hacker about two seconds to crack an 11-character password that uses only numbers. Throw in some upper- and lower-case letters, and it will take a hacker one minute to hack into a seven-character password.

Let's bet against a computer again except this time it will be a Quantum Computer.

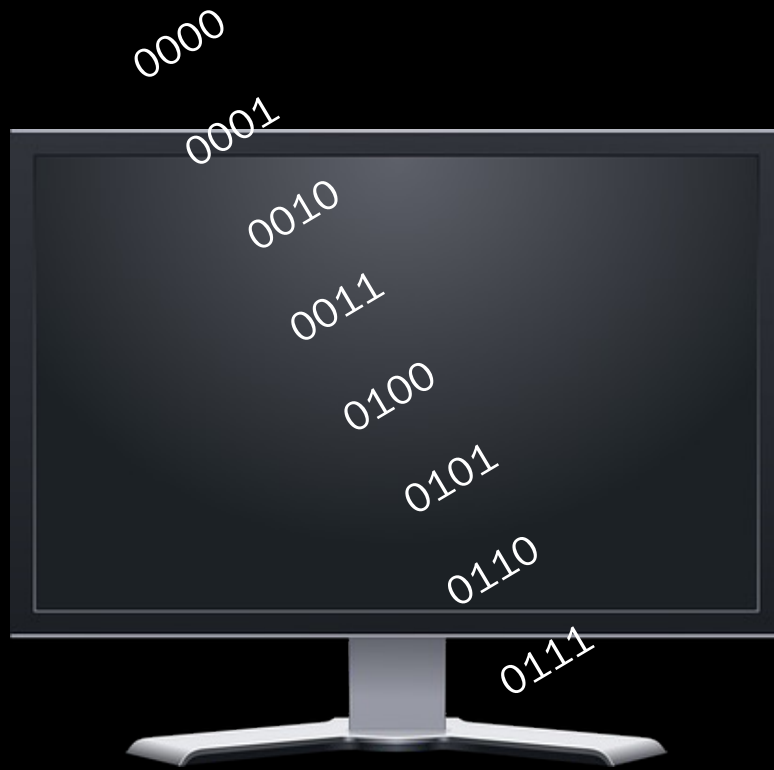
Now quantum Bits (Qubits) are also 0 and 1 BUT they can also be zero and one at the same time! Remember the phenomena of **superposition**.

For example a coin can either be heads or tails
Zero or one

But when you toss it in the air it can either be heads or tails at the same time, it does not make sense until the coin lands and you can see what it



is, perfectly recovering heads so that you lose every time



Regular computer one number at a time



Quantum computer all of the numbers – all of the time

CYBERSECURITY

While the promise of quantum computing is speeding up conventional computing it goes deeper by delivering an exponential advantage for certain classes of problems. With cybersecurity breaches on the rise, academia, companies, the government, and institutions more than ever need to be concerned about protecting digital resources from cybercriminals.

While the concept of quantum computing was presented in 1980 and has received a lot of attention during the last few decades, quantum cybersecurity is still in its infancy.

Quantum computers can easily become one of the most significant problems for internet safety in the near future. With the ability to transform cybersecurity it can also emerge as a solution.

As with all emerging technologies quantum cybersecurity can be utilized for the betterment of cybersecurity threats as well as a threat.

So now let's see how a cybersecurity hacker could function, he will definitely try to crack your password using all the bits. In a regular computer and going back to our original batch he will utilize all of the numbers individually until he comes across the correct number.

4 bits

0000 0001 0010 0011

0100 0101 0110 0111

1000 1001 1010 1011

1100

Etc. and you can keep on going

So now cybersecurity hackers will use a Quantum computer with Quantum bits. Remember a Quantum Bit is both a zero and a one (heads and tails). This means that the quantum bits are all of the numbers, all at the same time. So in order to find the password, the Quantum bits put into a Quantum Computer can analyze all of the numbers at the same time.

A grovers operator can sweep away all the wrong answers/passwords at the same time and give you the right one. So a quantum computer can evaluate every solution in the universe and give you the absolutely correct one.

ARTIFICIAL INTELLIGENCE

Now what about AI who has the ability to reprogram itself. But like a regular computer it has to go through trial and error to find out what is best possible solution.

in Quantum Computing AI can track every single possible program, and circuit design to find the right one to make itself the best. This can be done in a second with a quantum computer.

UTILIZING QUANTUM TECHNOLOGY IN THE REAL WORLD

Regular coins do not exist in combinations of heads and tails. We do not experience the fluid quantum reality in our everyday lives.

First of all quantum uncertainty can be used to create private keys For encrypting messages sent from one location to another so that hackers could not secretly copy the key perfectly because of quantum uncertainty. We have always utilized encrypted messages as far back as World War II. "In the early part of World War II, the enemy was breaking every military code that was being used in the Pacific. This created a huge problem for strategizing against the enemies. The Code Talkers and their native American Navajo language were utilized to convey messages by telephone and radio, a code that was never broken by the Japanese.

In order to hack quantum private keys, Hackers would technically have to break the laws of quantum physics to hack the key. Banks are already testing this kind of unbreakable encryption.

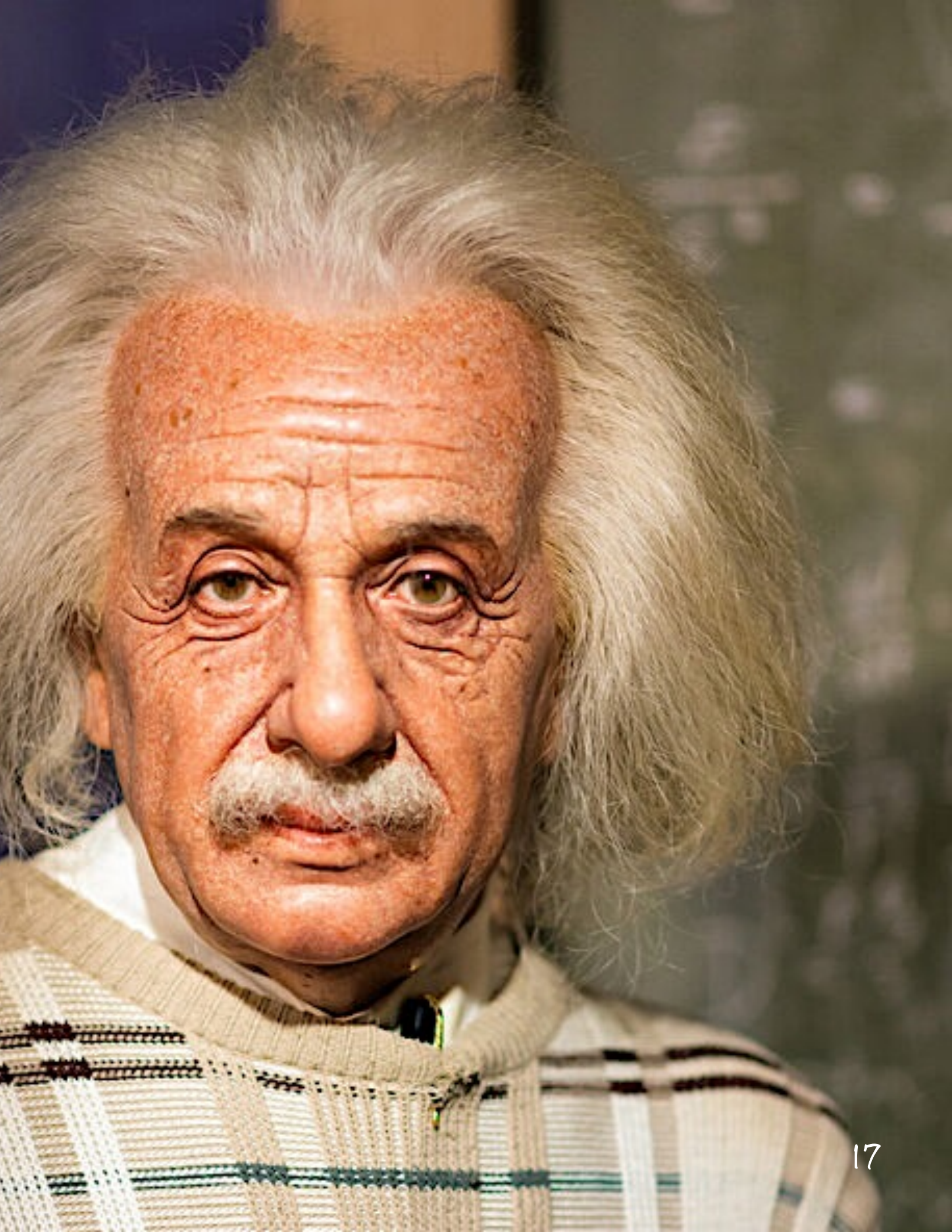
*When Albert Einstein
met Charlie Chaplin in
1931, Einstein said,
“What I admire most
about your art is its
universality. You do not
say a word, and yet the
world understands
you.”*

*“It’s true.” Replied
Chaplin, “but your fame
is even greater. The
world admires you,
When no one
understands you.”*

The future is fundamentally uncertain
Will we be or will we not be????

Linda Restrepo





A portrait of Linda Restrepo, a woman with long dark hair and bangs, wearing a grey blazer over a patterned scarf. She is looking directly at the camera with a neutral expression. The background is a blurred indoor setting with shelves holding various items like bottles and a plant.

LINDA RESTREPO

**CYBERSECURITY
EXPONENTIAL
TECHNOLOGIES**

**DIRECTOR OF EDUCATION AND INNOVATION.
HUMAN HEALTH EDUCATION AND RESEARCH
FOUNDATION**



United States

EXECUTIVE BIO

Linda Restrepo is Director of Education and Innovation Human Health Education and Research Foundation. She is a recognized Women in Technology Leader Cybersecurity and Artificial Intelligence.

Restrepo's expertise also includes Exponential Technologies, Computer Algorithms, Research, Implementation Management of Complex Human-machine Systems. Interstellar exploration and Mars Human Habitats; Global Economic Impacts Research. Restrepo is President of a global government and military defense multidisciplinary research and strategic development firm.

She has directed Corporate Technology Commercialization through the US National Laboratories. Emerging Infectious Diseases, Restrepo is also the Chief Executive Officer of Professional Global Outreach. Restrepo has advanced degrees from The University of Texas and New Mexico State University.

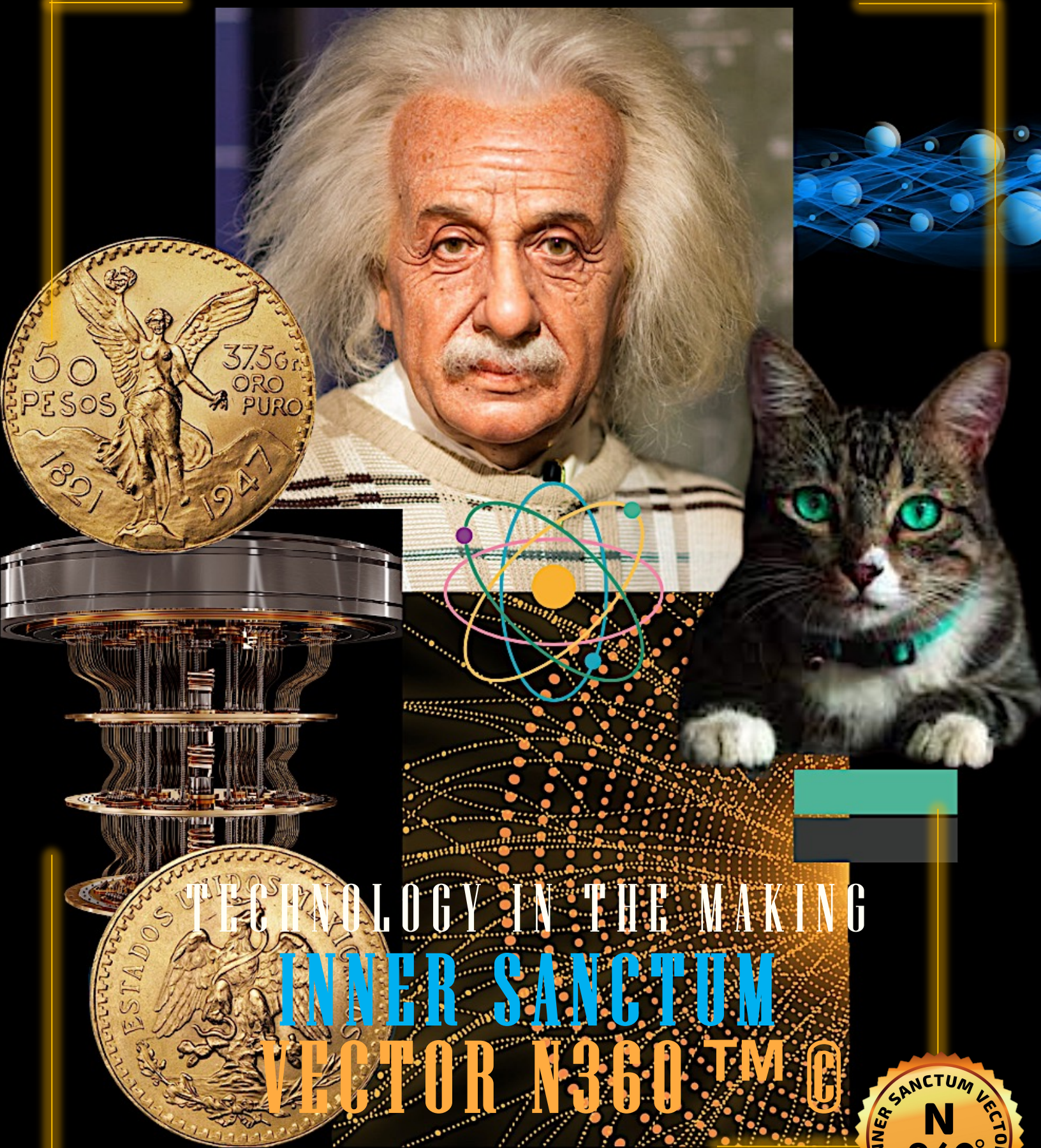




TECHNOLOGY IN THE MAKING

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