ENTANGLION

A game by IBM **Research**

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2 PLAYERS   **AGES 14+**   **~45 MINUTES**

Entanglion awaits your space navigation skills and strategic planning to explore a new galaxy and reconstruct an ancient quantum computer.

Welcome to the quantum universe, Captain!

Congratulations, your captain has retired and left you in charge of his galactic shipping business! Now it's time to make some upgrades.

For years, you've been obsessed with rumors of an ancient quantum computing technology that could revolutionize galactic cargo transport. If the rumors were true, it would allow your ships to calculate hyperspace paths in mere seconds! There's only one problem: the ancients dismantled their quantum computer out of fears that it was too powerful, and they left the components scattered across planets in the heavily-guarded Entanglion galaxy.

If you want to rebuild this incredible technology, you'll have to navigate your ships through the Entanglion galaxy and out-maneuver the defenses the ancients left behind. The good news is that your old captain left you enough money to outfit your ships with the quantum-powered engines you'll need to enter Entanglion. The bad news is that without a quantum computer to guide them, these engines can be a little... unpredictable.

Think you're up for the challenge?

Goal

Entanglion is a cooperative board game designed for two players. The goal is to reconstruct a quantum computer developed by an ancient race. Work together with your teammate to navigate the three galaxies of the quantum universe—Centarious, Superious, and Entanglion—in a quest to collect eight quantum computer components. Be careful to avoid detection by the planetary defense mechanisms guarding the components!

Game concepts

Entanglion was designed to expose players to several fundamental concepts in quantum computing:

Qubits are the building blocks of quantum computation.

Superposition is when a quantum system may exist in a probabilistic combination of multiple states at once.

Entanglement happens when the state of one qubit correlates with the state of another qubit.

Measurement is the process of observing the classical value of a qubit.

Error happens when random noise in the quantum system perturbs the measured value of a qubit.

Entanglion also exposes players to the different kinds of hardware and software components involved in building a real quantum computer.

Further discussion of how Entanglion relates to actual quantum computing can be found toward the end of this book.

1. Lay out the game & spaceship boards

Place the game board within easy reach from each player and distribute the spaceship boards to each player.

2. Place the quantum components

Shuffle the quantum components and place them face up on each planet in the Entanglion galaxy, one per planet.
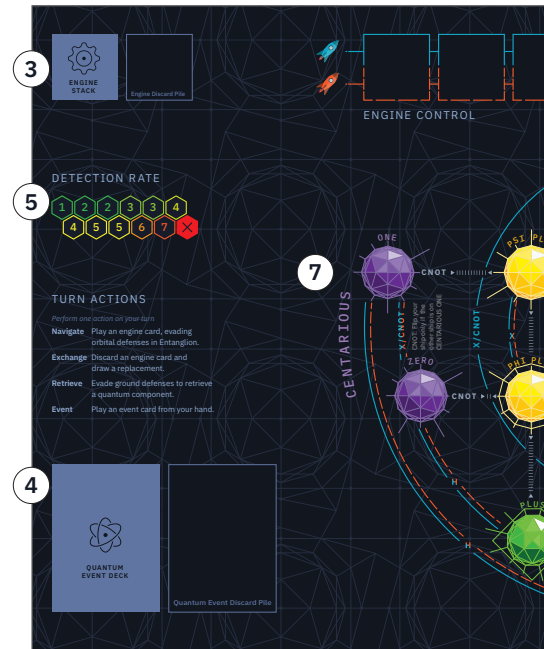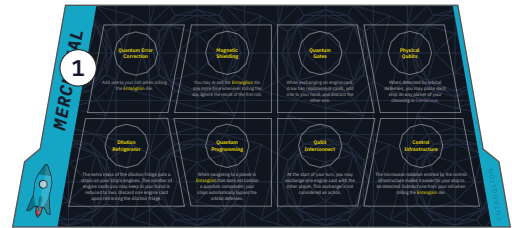
3. Shuffle the engine card stack

Set aside the PROBE card and shuffle the remaining engine cards. Place the PROBE card face down on the engine stack, then place the remaining engine cards on top, face down.
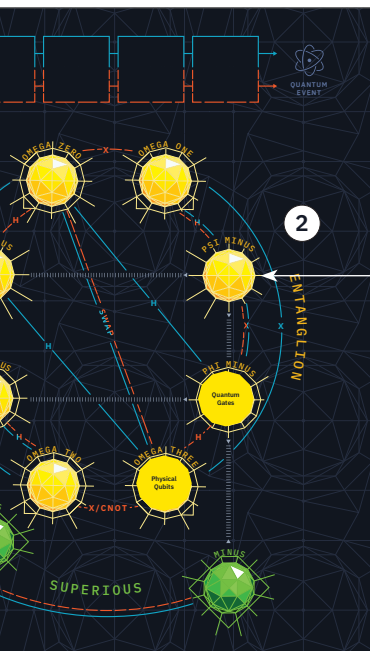
4. Prepare the quantum event deck

Set aside the Quantum Shuffle card and shuffle the remaining event cards. Deal out three event cards face down on the quantum event deck. Next, place the Quantum Shuffle card face down on the deck. Finally, place the remaining event cards face down on the deck.

5. Set the initial detection rate

Place the detection rate token on the detection rate scale. For an easy game, start with a detection rate of 1 or 2. For a more challenging game, start with a detection rate of 3. If the detection rate reaches the final level (X) before the quantum computer has been built, the game ends in a loss.

6. Determine the first player

Determine the first player by having each player roll the Entanglion die (8-sided). The player with the higher number goes first. Re-roll in case of a tie.

7. Determine the initial ship locations

Starting with the first player, roll the Centarious die to place each spaceship (0 goes to **ZERO**, 1 goes to **ONE**). This process is akin to initializing a quantum system.

8. Draw engine cards

Starting with the first player, each player draws three engine cards into their hand. Engine cards may be kept face up.

Materials

Boards

- 1 Game Board
- 2 Spaceship Boards

Cards

- 24 Engine Cards
  (8 H, 7 CNOT, 5 X,
  3 SWAP, 1 PROBE)
- 9 Quantum Event Cards

Pieces

- 1 Detection Rate Token
- 8 Quantum Components
- 1 Centarious Die
  (purple binary d6)
- 1 Entanglion Die
  (yellow d8)
- 2 Spaceship Tokens

Engine cards are used to navigate your ships around the quantum universe. Navigation paths on the game board are labeled with the card(s) needed to traverse them (e.g. "X/CNOT" means either X or CNOT can be used to traverse that path). In some cases, only one spaceship may traverse a path. Engine cards may be played with no effect when no transition is shown on the board.

X is used to navigate between ZERO and ONE and within the Entanglion galaxy.

H is used to travel between Centrious and Superious and within the Entanglion galaxy.

Outside of Entanglion, SWAP exchanges the positions of the two spaceships. Inside Entanglion, SWAP only transitions the spaceships between OMEGA ZERO and OMEGA THREE.

CNOT is used to enter the Entanglion galaxy and navigate within it. It also flips the position of your spaceship in Centarious, but only when the other spaceship is orbiting ONE.

Whenever PROBE is drawn, your ships have been discovered by an ancient defensive probe! Roll the Entanglion die. If the outcome is less than 4 (after accounting for quantum component effects), increase the detection rate by one. Otherwise, PROBE has no effect. Discard PROBE and draw a replacement engine card.

Orient engine cards in the engine control spaces such that the lines on the card line up with the line of your spaceship.

When the engine stack becomes depleted, immediately reshuffle the engine cards in the discard pile to replenish the engine stack. Include PROBE in the shuffle, do not place it at the bottom of the stack.

Turn overview

Perform *one* of the following actions on your turn.

Navigate. Play one engine card in engine control to navigate around the galaxy, and draw a replacement. You may only play engine cards for your own ship.

Exchange. Discard one engine card from your hand and draw a replacement.

Retrieve. Roll the Entanglion die to attempt to retrieve a quantum component if one is present.

Event. Play an event card from your hand (if you possess one).

Players may not pass their turns, they must perform one of the actions above.
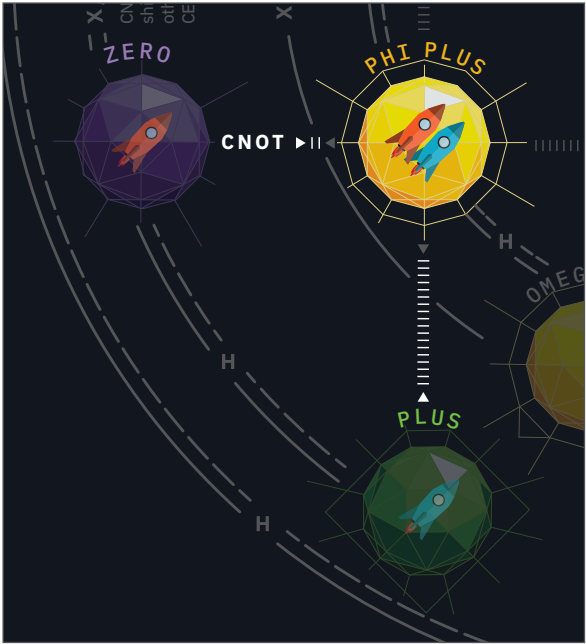
Entering & exiting Entanglion

In order to enter Entanglion, one spaceship needs to be in Centarious and the other spaceship needs to be in Superious. Only the spaceship in Centarious can use CNOT to enter Entanglion. The paths into Entanglion are represented with gray lines on the game board.

Outside of Entanglion, ships move independently. Inside Entanglion, both ships always move together, regardless of which player plays an engine card.

| Lead spaceship (playing the CNOT)	Other spaceship	Destination
ZERO	PLUS	PHI PLUS
ZERO	MINUS	PHI MINUS
ONE	PLUS	PSI PLUS
ONE	MINUS	PSI MINUS

It is also possible to exit Entanglion using CNOT when both ships are orbiting PHI PLUS, PHI MINUS, PSI PLUS, or PSI MINUS. The ship that plays the CNOT returns to Centarious and the other ship returns to Superious, on the planets indicated with the gray lines.

Example: Rubicon is orbiting ZERO and Mercurial is orbiting PLUS. When Rubicon plays a CNOT, both ships move to PHI PLUS.

On **PHI PLUS**, when Rubicon plays CNOT, Rubicon moves to **ZERO** and Mercurial moves to **PLUS**.
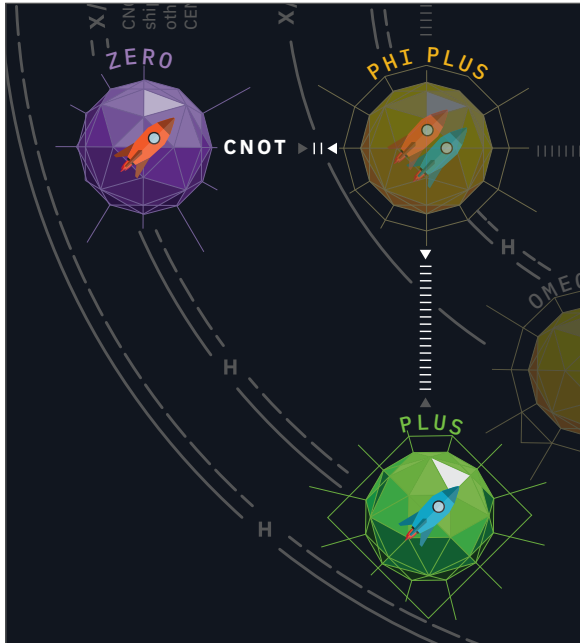
Detection rate

The detection rate determines the difficulty of successfully evading planetary defenses. The detection rate token is used to keep track of the current detection rate. When a player's spaceship has been detected by orbital defenses, or a player's away team has been detected by ground defenses, the detection rate is increased, making it easier for each planet's defenses to detect the player in the future. The game ends when the detection rate reaches the final level (designated with an X).

The detection rate increases by one whenever you are detected by a planet's orbital or ground defenses.

Orbital defenses

Planets in Entanglion are protected by orbital defenses that scan for ships looking to plunder the quantum components hidden there. It is possible to evade these defenses using your quantum engines. If you are detected, however, your navigation system will automatically take evasive maneuvers and jump to a random planet in the Centarious system. This jump triggers a quantum event.

When you navigate to any planet in Entanglion
Roll the Entanglion die. If the outcome is *greater* than the current detection rate, the orbital defenses have been evaded. If not, perform the following actions:

1. Roll the Centarious die and move both ships to the planet indicated. Both ships jump together.

2. Increase the detection rate by one.

3. Draw a quantum event card and perform the action indicated.

Physical Qubits lets you decide which planets in Centarious to place your spaceships.

Quantum Programming lets you bypass orbital defenses when a planet doesn't have a quantum component.

The Quantum Tunnel event card lets you bypass orbital defenses. If you play this card after entering the orbit of a planet in Entanglion, you do not need to roll the Entanglion die to determine if your ships were detected by orbital defenses.

When entering Entanglion via the Heisenberg card, you may ignore the orbital defenses.

If you play an engine card that does not transition your ships to a new planet in Entanglion, you do not need to re-check whether your ships have been detected.

Quantum components

There are eight components that players must obtain in order to build the quantum computer to win the game, shown on each of the spaceship boards. Each component also grants a permanent special ability or hindrance to your ship, so you must strategize with your teammate to obtain the components in an optimal order!

> Quantum components are permanent upgrades to your ship and alter gameplay for the rest of the game. They only affect your own ship.

When your ships are orbiting a planet with a quantum component, you may send an away team to the planet's surface to retrieve it. Quantum components are guarded by automated ground defenses which, as with orbital defenses, must be evaded.

To perform a retrieval mission
Roll the Entanglion die. If the outcome is *greater* than the current detection rate, collect the component and place it on your spaceship board. If not, your away team was detected by the ground defenses; increase the detection rate by one.

> If your away team fails to retrieve a quantum component, your ships remain in orbit on the current planet. You do not need to perform another orbital defense check on the next turn unless you navigate to another planet that has orbital defenses.

> The Quantum Tunnel event card lets you bypass ground defenses. If you play this card during your turn, your retrieval mission was successful. You do not need to roll the Entanglion die to determine if your away team was detected by ground defenses; add the quantum component to your ship.

Magnetic Shielding

Quantum Programming

Control Infrastructure

Dilution Refrigerator

Qubit Interconnect

Quantum Error Correction

Quantum Gates

Physical Qubits

Quantum events

Quantum engines can be unpredictable at times! Once all six engine control slots have been filled, perform a quantum event at the end of your turn. In addition, perform a quantum event whenever you have been detected by orbital defenses.

To perform a quantum event
Draw an event card and perform the instructions. Clear all engine cards from the game board and put them in engine discard pile.

> When Quantum Shuffle is drawn, reshuffle the quantum event cards as per the instructions in game setup.

> In the event that your ship was detected by orbital defenses on the same turn as having filled all six engine control slots, perform two quantum events.

Game end

Players immediately win the game when they have collected all eight components of the quantum computer. Players immediately lose the game when the detection rate reaches the end (X).
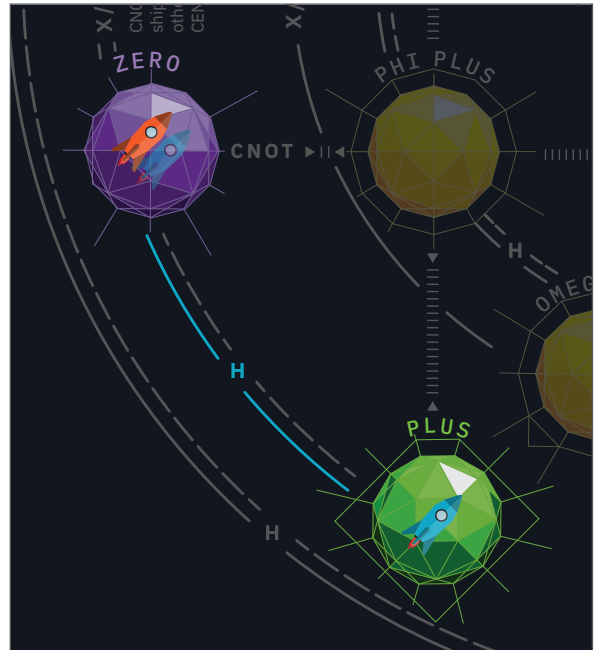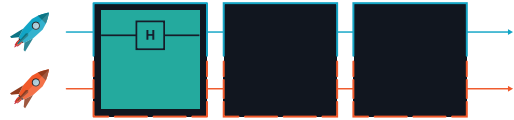
Your first game
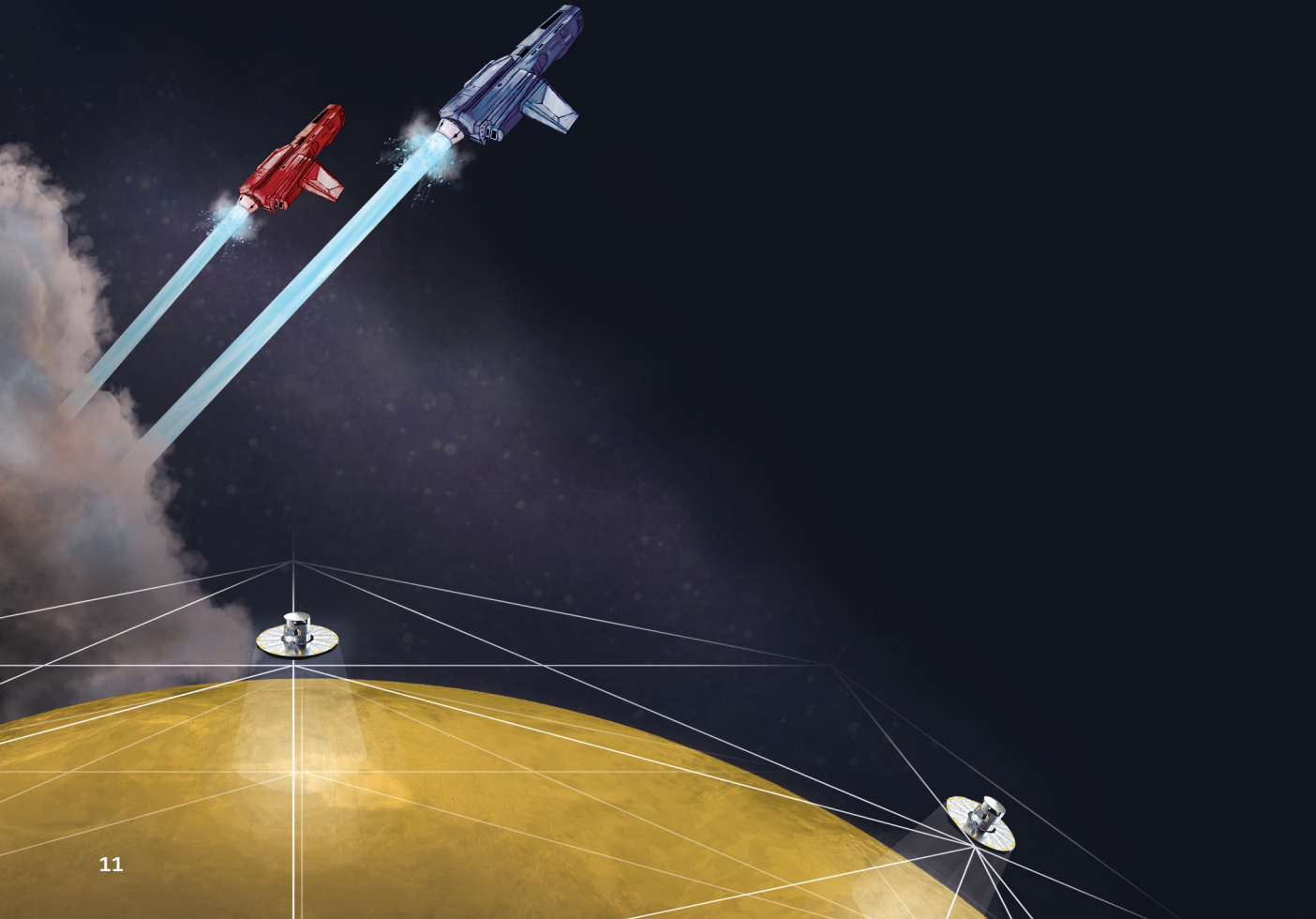
Set up the game board as described in Setup. In this game, Mercurial (the blue player) will go first. Mercurial draws three cards: X, H, and H. Rubicon draws three cards: CNOT, SWAP, and X. Both ships start on ZERO.


1 Mercurial plays an H to navigate to PLUS. Mercurial draws X as a replacement card.

2 Rubicon plays CNOT to navigate both ships to **PHI PLUS**. Rubicon draws H as a replacement card.

After arriving at a planet in Entanglion, Rubicon must roll the Entanglion die to evade the orbital defenses. Since the detection rate is 1, Rubicon needs to roll a 2 or higher. Rubicon rolls the Entanglion die and gets a 3, just enough to evade detection!

DETECTION RATE

1 2 2 3 3 4
4 5 5 6 7 ✕
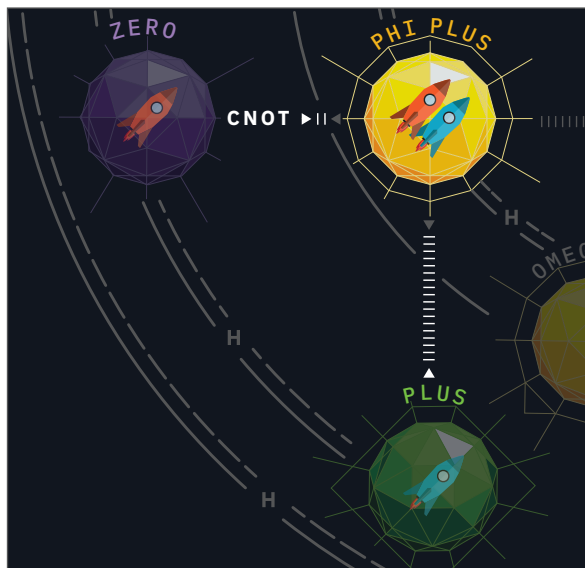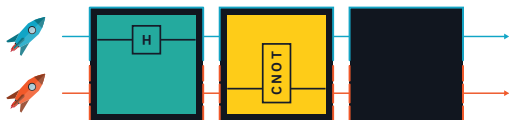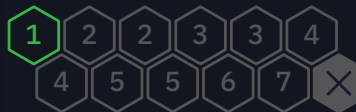
3 Mercurial decides to retrieve the Quantum Gates present on **PHI PLUS**. Mercurial rolls a 6, much higher than the detection rate of 1, and successfully retrieves the component.
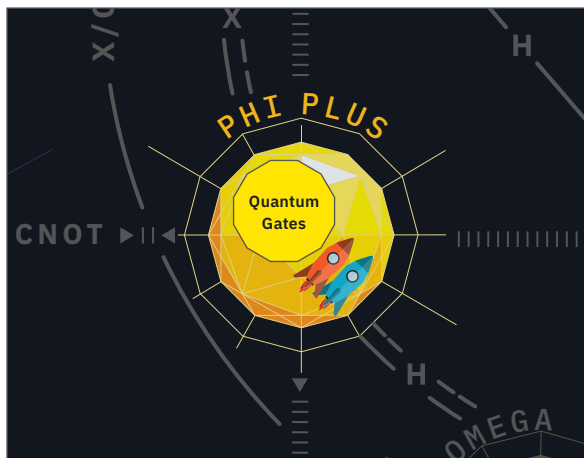
4 Rubicon decides the next destination is **OMEGA TWO** and plays an H to navigate both ships there.
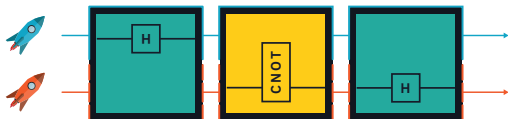
Rubicon rolls the Entanglion die and it comes up as 1. The ships have been detected, so they must retreat! Rubicon rolls a 1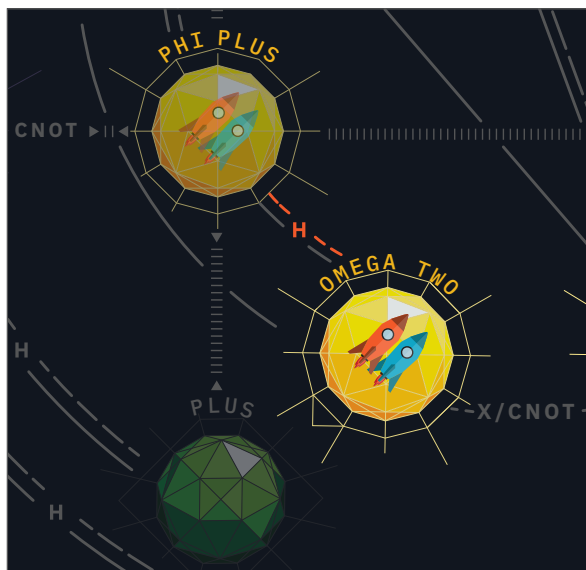 on the Centarious die, so both ships jump back to **ONE**. Since they were detected, the detection rate is increased by 1 and a quantum event is triggered. Rubicon draws a quantum event card—Heisenberg—which can be used on a future turn.
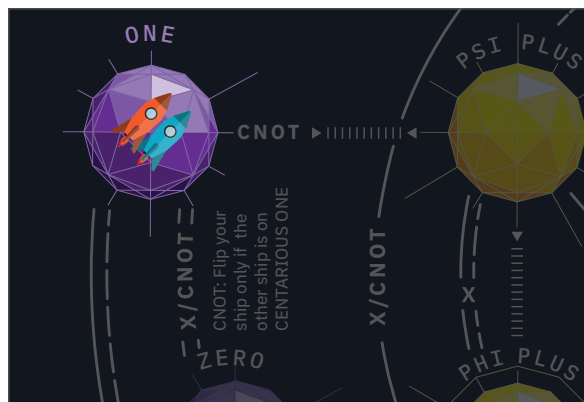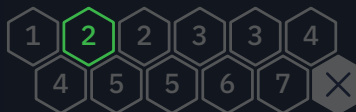
Play continues until either Rubicon and Mercurial have collected all of the quantum components in Entanglion, or until the detection rate reaches the final level.

How Entanglion relates to quantum computing

Entanglion models several aspects of a 2-qubit quantum computer. Specifically, the two spaceships represent two qubits, and each planet in each galaxy represents a different state of those qubits. Engine cards represent the quantum gates used to transition the qubits into different states.

The Centarious galaxy represents the classical states of 0 and 1, written in "ket notation" as $|0\rangle$ (ZERO) and $|1\rangle$ (ONE). The Superious galaxy represents states of quantum superposition, known as $|+\rangle$ (PLUS) and $|-\rangle$ (MINUS). The Entanglion galaxy represents states of entanglement. Four of the entangled states, $|\Psi^+\rangle$ (PSI PLUS), $|\Psi^-\rangle$ (PSI MINUS), $|\Phi^+\rangle$ (PHI PLUS), and $|\Phi^-\rangle$ (PHI MINUS), are known as the Bell states. The other entangled states, which we have labeled $|\omega_0\rangle$ (OMEGA ZERO) through $|\omega_3\rangle$ (OMEGA THREE), are additional states that are achievable through the combined operation of the X, H, SWAP, and CNOT gates.

The requirement that both ships must move together within Entanglion is a result of the fact that for entangled states, the state of the system is more complex than a simple combination of the states of the individual qubits. This one of the main ways in which quantum mechanics differs from classical physics.

Engine cards

The engine cards represent *some* of the different kinds of quantum logic gates used by quantum computers.

X. The X gate flips the value of a qubit. It is also known as the bit flip gate.

SWAP. SWAP exchanges the values of the two qubits.

CNOT. CNOT stands for "Controlled Not." It needs two qubits to work: one qubit is designated the "target," which gets flipped if the other qubit, known as the "control," has a value of 1.

H. The Hadamard gate is used to create or collapse superposition. It is one of the most important gates in quantum computing.

Quantum components

The quantum components in Entanglion represent different physical or logical components needed to construct an actual quantum computer.

Physical Qubits. Much like how classical computer processors are implemented via hardware transistors, quantum processors are implemented via hardware qubits. There are a number of different ways scientists are creating physical qubits, including Josephson junctions, ion traps, and quantum dots.

Qubit Interconnect. Qubits must be physically connected to each other in order to become entangled with one another.

Dilution Refrigerator. Physical qubits must be kept at very cold temperatures—colder even than outer space—in order to maintain their coherence. Dilution refrigerators are able to cool physical qubits to temperatures as low as 2 millikelvin.

Quantum Gates. In classical computing, logical gates such as AND, OR, NOT, and NAND are combined to create higher-order computation. In quantum computing, quantum gates such as X, CNOT, SWAP, and H are used for computation.

Quantum Programming. In order to improve the productivity of quantum programmers, higher-level quantum programming languages are needed. For example, IBM OpenQASM allows you to program a quantum computer with an assembly-style language, and IBM QISKit allows you to program a quantum computer in Python.

Quantum Error Correction. Physical qubits experience noise that may cause errors to occur during measurement. Quantum error correction is used to correct for these errors. The key insight of quantum error correction is to use multiple physical qubits to simulate one logical qubit.

Control Infrastructure. Quantum computers need some way to measure the internal state of a qubit. Control infrastructure uses microwave radiation to read the state of a qubit and digitize it into a binary state (0 or 1).

Magnetic Shielding. Qubits are extremely sensitive to stray magnetic fields. Magnetic shielding ensures qubits are protected from external sources of magnetism.

Event cards

Event cards add fun, random elements to the game. Some event cards are named after people who made significant contributions to the field of quantum physics and quantum information science, such as Werner Heisenberg and Erwrin Schrödinger. One event card is extra special, named after IBM researcher Charles Bennett, one of the founders of quantum information theory and a key contributor to the discovery of the quantum teleportation effect. Other event cards are named after quantum effects such as quantum tunneling, bit flip errors, wave function collapsing, and Einstein's "spooky action at a distance." We encourage avid players to research these people and topics to learn more about the physics of quantum information!

Defenses, measurement, and error

The process of encountering orbital defenses when navigating the Entanglion galaxy is akin to performing a classical measurement (also known as a Z measurement)

on the quantum state. Additionally, the act of retrieving a quantum component is akin to performing an entanglement measurement, also known as a Bell test. Sometimes, noise in the quantum system prevents us from seeing a reliable measurement. We call this a readout error. The effects of noise and errors are modeled via the detection rate.

Additional resources

We recommend a few resources for learning more about quantum computing.

IBM Q Experience Beginner's Guide
by IBM Research
http://ibm.biz/qx-guide

Q is for Quantum
by T. Rudolph

Quantum Computing for Computer Scientists
by N. Yanofsky and M. Mannucci

Quantum Computation and Quantum Information
by M. A. Nielsen and I. L. Chuang

Quantum Computer Science: An Introduction
by N. D. Mermin

Quantum Computing Since Democritus
by S. Aaronson

The Mysterious Fate of the Quantics

by Mbiyimoh Ghogomu and Justin D. Weisz

Thousands of years ago, a people known as the Quantics dominated the known universe.

At the heart of Quantic culture was a deep reverence for science and technology. At the age when most kids learned to tie their shoes, Quantic children studied algebra, astronomy and physics; by the time middle school rolled around, most Quantic children steeped themselves in the principles of computing, the laws of thermodynamics, and a whole host of other complex sciences.

The Quantics were pacifists by nature. They viewed academic debate as the highest, most enlightened form of conflict. They were not conquerers and never actively sought power, though their military technologies (all designed for defensive purposes) far outclassed those of any other race.

However, the sheer velocity of their technological advancement, combined with an increasing scarcity of resources on their home planet, propelled them rapidly outwards into neighboring worlds. Within a generation, they had terraformed and colonized dozens of planets. Within another generation, they had created the most advanced galactic alliance in recorded history, spanning tens of thousands of worlds.

But just as quickly as they came, the Quantics began to disappear. It started with individuals—a scientist here, an engineer there. But soon, whole planets began to go dark. Thousands of Quantics would vanish at once without a trace, as if swallowed up by some parallel dimension that had been lying dormant in the earth beneath them.

As more and more Quantics disappeared, rumors began to swirl about a rogue technology, a highly-advanced machine that had started behaving in ways that even the best scientists couldn't control.

As intelligent as they were, the Quantics were, like most races, vulnerable to their own knowledge and ambition. They were smart enough to design technologies that most would consider pure magic, but also smart enough to convince themselves that the technologies they developed would never outpace their own prodigious intelligence.

Or maybe they were completely aware of the risks and simply chose to ignore them. Why think about potential dangers when you can instead focus on all the wealth and prosperity your advancements are delivering? As wise Quantic author Qual Bellow once said, "A great deal of intelligence can be invested in ignorance when the need for illusion is deep." Quantic scientists tended

to pursue technology for technology's sake, and it hadn't failed them yet.

Whatever the case, the legends all seem to agree that the disappearance of the Quantics was tied directly to the development of an extremely advanced computer, one that leveraged the mysterious properties of quantum physics, properties that even the smartest Quantics had trouble wrapping their heads around.

If you believed the stories (few people did these days), this quantum computer allowed objects to exist in two different potential states at once—a real-life version of Schrödinger's box, as crazy as that sounds.

Conspiracy theorists tended to point to this machine as the root cause of the disappearances, the idea being that Quantic scientists had somehow started putting their own people into this "neither here nor there but also both here and there" state (superposition, they called it), without actually knowing how to bring them back.

Some people believe that the whole Quantic population is stuck in a purgatory of superposition somewhere, waiting in vain to be collapsed back into reality. Others believe that they only existed in superposition for a fraction of a second, but were shunted over to a parallel universe when they returned to the physical world. Still others believe that they were simply vaporized by the subatomic forces that powered the quantum computer.

But the ultimate fate of the machine itself—assuming, of course, that it was once real—is just as nebulous as the fate of its creators.

It was never actually seen by anyone outside of the Quantic race, and, of course, there are no Quantics around today to tell the tale. Most people who believe in the machine believe that it was either destroyed by the last of the Quantics or gutted by galactic salvagers who sold the meticulously-tuned instruments as scrap metal.

But there's one other, less prevalent theory out there: that a small group of fanatical Quantics dismantled the machine and scattered it across the cosmos in hopes that it would one day be reassembled by someone wise enough to use it responsibly.

Of course, it could all be a load of quantum nonsense, just a bunch of stories that people tell each other while traveling on long haul missions. But then again, it could also be very, very real. There's only one way to find out...

The Promotion

"Today is a truly historic day, one that will be remembered for generations to come."

Despite being the captain of a simple cargo fleet, John Bell had always had a serious flair for the dramatic.

"After decades at the helm, the valiant John S. Bell the Third, condor of the cosmos and falcon of the Fifth Quasar, hangs up his captain's gloves for good." He speaks of himself in the third person, as if reading a passage from some future text on the history of cargo ship captains (what a riveting book that would be).

"The galaxies have seen many a great captain, but few have flown…" As Bell launches into a lengthy monologue on the meaning of the word "legacy," your mind wanders to a chance encounter you had a few weeks back.

While waiting for repairs on Xenophon 12, you'd run into a hitchhiker who claimed to have spoken with a real-life Quantic during a visit to Centarious ZERO. You'd initially written him off as a quack, but the more he spoke, the more intrigued you'd become. He seemed to possess intimate knowledge about the Quantic people and culture, and even spoke at length about the so-called quantum computer that was said to have sealed their fate. Could it really all be true?

You snap back to the present—Bell has finally gotten to the part you've been waiting for: "But today is not about endings, it's about beginnings. You've been my loyal understudy for nearly ten years now, and it's time for you to take the reins."

Despite the comic nature of the ceremony, you can't help but feel a wave of pride at being named captain.

"But before I make it official, I have one final word of advice: stick to what you know. You're one of the smartest, most skilled navigators I've ever met, but you're also one of the most inquisitive. That might be a good trait for a young cargo hand, but being a captain requires focus and discipline. Always remember," Bell says with a twinkle in his eye, "curiosity didn't just kill the cat, it killed the Quantics as well."

You try to hide your surprise at the comment, electing to laugh it off in what you hope is casual nonchalance. "Don't worry captain, I gave up on those old fairy tales long ago."

In your head, however, you're already plotting a course to Centarious ZERO…

Quazi's Mission

"What was I thinking coming here…"

After three lunar lagers (and twice as many fruitless conversations), it's hard not to feel like you wasted your time traveling to Centarious.

Of the six people you talked to, three had never heard of a quantum computer, two laughed in your face ("You really believe all that nonsense?!"), and the last guy kept trying to rope you into a nutritional supplement pyramid scheme.

With a long sigh of defeat, you drain your draught and get up to leave the bar. But just as you're about to walk off, a firm hand plants itself on your shoulder. You turn to see the bartender staring at you with an intense, searching gaze on his face.

"Look son, if you have an ounce of sense in your body, you'll forget you ever heard about the quantum computer. But if you're really determined to do something foolish, you should go speak with Quazi over there." You follow the line of his calloused finger; your eyes settle upon a

cloaked man huddled in a dark corner of the bar. "He has the answers you seek."

You walk cautiously across the room, planning out how you're going to broach the topic. But just as you prepare to say, "excuse me," the man begins to speak.

"I heard you are a skilled navigator, please, come sit."

You stare back, a dumb look on your face. After a second or two of awkward silence, you blurt out, "Is the quantum computer real? Were the Quantics even real? How did they disappear?" So much for all that speech planning.

The man sighs wearily. "Yes, the Quantics were real, the quantum computer was real, and, as you probably already suspect, they disappeared because of the computer."

"What you don't know is that not all of Quantics disappeared." After glancing around to make sure no one is looking, he pulls back his sleeve, revealing a small glowing "Q" on his upper forearm.

You open your mouth to say something, but Quazi immediately cuts you off. "Yes, I'm a Quantic, but no more questions for now. Just listen." You close your mouth immediately.

You had grown up believing the Quantic race had died out thousands of years ago. Not in your wildest dreams did you imagine you would meet a real life Quantic!

"My ancestors were scientists, and long ago they built a quantum computer," Quazi beings.

"The computer was supposed to revolutionize Quantic society, enabling us to penetrate farther and farther into the deep recesses of the universe. And it very well may have—if it didn't start swallowing people up first. One of my ancestors, a brilliant quantum engineer named Qemo, was convinced he could fix the problem. And he very well may have, given enough time."

"But a rogue group of anti-technology Quantics emerged once people started disappearing. They called themselves 'NQ' and were determined to destroy any quantum-related technology they could get their hands on. They felt the power was too great to be wielded responsibly, even by a well-intended Quantic government. 'The Quantic mind is holy,' was both their mantra and their battlecry as they laid waste to countless research stations and outposts in an attempt to purge the Quantic empire of all things quantum." Your eyes remain fixed upon Quazi's face as he recounts the story.

"Despite their efforts, the NQ's carnage was limited to peripheral quantum research: an engine here, a defense system there. They had no leads on the quantum computer responsible for disappearing their friends and families. That is, until Qemo's wife disappeared. This engineer, who had devoted his entire life to the development of a quantum computer, and who had spoken out countless times against the NQ, lost his beloved wife in a tragic quantum event." You feel a shiver run down your spine as you begin to piece together the rest of the story.

"After Qemo joined NQ, it was all over. He helped them gain access to the lab where the quantum computer was kept, and he helped them steal it. They thought they were saving the Quantics, and to an extent, they were. But something happened when the machine was moved; it was sensitive in a way no one had realized, and it triggered a massive quantum event. All of the remaining Quantics in the universe disappeared, except for those in the room. Of course, they didn't realize it at the time, but eventually they figured it out."

"Horrified by what had happened, they made the difficult decision to dismantle the computer and spread its pieces far and wide across the Entanglion galaxy. Better to accept their losses and try to keep their race alive than further tamper with such an unstable technology. They had hoped that over time, hundreds of generations perhaps, their descendants would figure out how to recover their lost populations and restore the Quantic race to its former glory. Qemo installed special defense mechanisms that could be evaded only when a mastery of quantum mechanics had been obtained."

"That's where you come in. I'm one of a small group of Quantic descendants remaining in the universe today. We recently made a scientific breakthrough that we believe could bring our people back, but only if we're able to reassemble the computer. Unfortunately, we don't have the ships or resources to do that."

He pauses for a second, then looks you dead in the eyes: "But you do."

Acknowledgments