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TECXOTiC 2020

# TERA WIRE

**The Monthly Science Magazine of University of Calcutta**

UNIVERSITY OF CALCUTTA · ADVANCEMENT OF LEARNING

UCTSC TECH CLUB

**Introduction to Quantum Computing • Beyond the Dark matter • COVER STORY • CLUBS & EVENTS • TECXOTiC 2020 at University of Calcutta**

TERAWIRE

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# TERA WIRE

THE MONTHLY SCIENCE MAGAZINE OF UNIVERSITY OF CALCUTTA

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# COVER STORY

## UNCOVERING THE TRUTH OF THE APOLLO MISSIONS

BY: SOUJATYA SARKAR

The Apollo program, also known as Project Apollo, was the third United States human spaceflight program carried out by the National Aeronautics and Space Administration (NASA), which succeeded in landing the first humans on the Moon from 1969 to 1972. First conceived during Dwight D. Eisenhower's administration as a three-person spacecraft to follow the one-person Project Mercury which put the first Americans in space, Apollo was later dedicated to the national goal set by President John F. Kennedy of "landing a man on the Moon by the end of this decade and returning him safely to the Earth" in an address to Congress on May 25, 1961. It was the third US human spaceflight program to fly, preceded by the two-person Project Gemini conceived in 1961 to extend spaceflight capability in support of Apollo. Kennedy's goal was accomplished on the Apollo 11 mission when astronauts Neil Armstrong and Buzz Aldrin landed their Apollo Lunar Module (LM) on July 20, 1969, and walked on the lunar surface, while Michael Collins remained in lunar orbit in the command and service module (CSM), and all three landed safely on Earth on July 24. Five subsequent Apollo missions also landed astronauts on the Moon, the last in December 1972.

In these six spaceflights, twelve men walked on the Moon.
Apollo ran from 1961 to 1972, with the first crewed flight in 1968. It achieved its goal of crewed lunar landing, despite the major setback of a 1967 Apollo 1 cabin fire that killed the entire crew during a prelaunch test. After the first landing, sufficient flight hardware remained for nine follow-on landings with a plan for extended lunar geological and astrophysical exploration. Budget cuts forced the cancellation of three of these. Five of the remaining six missions achieved successful landings, but the Apollo 13 landing was prevented by an oxygen tank explosion in transit to the Moon, which destroyed the service module's capability to provide electrical power, crippling the CSM's propulsion and life support systems. The crew returned to Earth safely by using the lunar module as a "lifeboat" for these functions. Apollo used Saturn family rockets as launch vehicles, which were also used for an Apollo Applications Program, which consisted of Skylab, a space station that supported three crewed missions in 1973–74, and the Apollo–Soyuz Test Project, a joint US-Soviet Union Earth-orbit mission in 1975.

Apollo set several major human spaceflight milestones. It stands alone in sending crewed missions beyond low Earth orbit. Apollo 8 was the first crewed spacecraft to orbit another celestial body, while the final Apollo 17 mission marked the sixth Moon landing and the ninth crewed mission beyond low Earth orbit. The program returned 842 pounds (382 kg) of lunar rocks and soil to Earth, greatly contributing to the understanding of the Moon's composition and geological history. The program laid the foundation for NASA's subsequent human spaceflight capability and funded construction of its Johnson Space Center and Kennedy Space Center. Apollo also spurred advances in many areas of technology incidental to rocketry and human spaceflight, including avionics, telecommunications, and computers.

## But what if Apollo Missions weren't TRUE? Find out in next page.

Apollo 11 astronauts Neil Armstrong and Buzz Aldrin stepped onto the lunar surface on July 20, 1969. Even back then, some people were skeptical that the feat was technologically possible. The James Bond movie "Diamonds Are Forever," for example, had a joke about faked moon landings just two years later, in 1971.

But what really propelled the conspiracy theory into popular culture, Plait said, was the 1978 Peter Hyams film "Capricorn One," which portrays a faked human landing on Mars. (Also, a 1976 self-published pamphlet by Bill Kaysing, "We Never Went to the Moon," was popular among conspiracy-minded people of the day.)

That was 40 years ago, but moon-hoax enthusiasts are still with us today.

"The X-Files" brought all sorts of space conspiracies into the public consciousness in the 1990s and 2000s, and the rebooted version of the show addressed the moon landing in a 2018 episode. The conspiracy was also addressed in many other fictional TV shows, from "Futurama" to "Friends."

Meanwhile, some documentary films and reality-TV efforts — a 2008 episode of "MythBusters," for example — tried to chase away the conspiracy theory by educating people. Other filmmakers, such as the folks behind the 2002 mockumentary "Dark Side of the Moon," spoofed moon hoaxers.

Opinion polls over the years regularly show that around 5% of Americans believe the Apollo moon landings were faked, former NASA chief historian Roger Launius recently told the Associated Press. That's more than 16 million people, assuming a U.S. population of 327 million.

NASA has done a lot of debunking work over the decades, including a 2018 offer to NBA superstar Stephen Curry to view moon rocks at the NASA Johnson Space Center in Houston after Curry said he didn't believe in the moon landings. (A few days later, Curry said he made the comments in jest.)

Earlier this year, NASA spokesperson Allard Beutel recited a pile of evidence supporting the moon landings to The Washington Post. He mentioned the returned moon rocks, the ability to bounce laser beams off gear the astronauts left behind and images NASA's Lunar Reconnaissance Orbiter took of the Apollo landing sites in 2011.

Nevertheless, even former astronauts have found themselves in the fray. Space shuttle astronaut Leland Melvin tackled the topic in the 2019 Science Channel series "Truth Behind the Moon Landing," which also features Space.com Editor-in-Chief Tariq Malik as a guest. And in 2002, Apollo 11 astronaut Buzz Aldrin punched moon-landing denier Bart Sibrel in the jaw during a taped confrontation. (Police later said Aldrin was provoked, and no charges were filed.)

## What Phil Plait says about this?

Phil Plait has mixed feelings about the moon-landing hoax.Plait — known as "The Bad Astronomer" to his many thousands of readers on Syfy — told Space.com he is frustrated that he and others like him still have to debunk the hoax theory from time to time, 50 years after the first moon landing. Then again, Plait became famous because he's so good at debunking in the first place. Back in February 2001, Fox Broadcasting ran a documentary titled "Conspiracy Theory: Did We Land on the Moon?" Plait coincidentally had a pile of research ready from a book he was working on, and a friend sent him an advance copy of the show so that he had time to write up a response.

Plait's essay on his personal blog, which he published shortly after the show aired, quickly generated thousands of views years before Facebook, Twitter and today's social media even existed. Fox's TV show propelled Plait's writing to a large audience, and his 2002 book "Bad Astronomy: Misconceptions and Misuses Revealed, from Astrology to the Moon Landing 'Hoax'" (Wiley) helped as well. Plait remains a popular science commentator nearly two decades later."I kind of wish it had never aired," Plait said about the Fox documentary, "because it opened a huge Pandora's box. On the other hand, it's exposing a wound to sunlight. That thing was there anyway, festering. Let it get out to the public, and let it heal, and let it kill the infection. But yeah, it's troubling. Just to know that if Fox hadn't aired that, who knows what my career path would have been."

# ABOUT PHIL PLAIT

Philip Cary Plait (born September 30, 1964), also known as The Bad Astronomer, is an American astronomer, skeptic, writer and popular science blogger.

Plait attended the University of Michigan and received his PhD in astronomy at the University of Virginia in 1995 with a thesis on supernova SN 1987A, which he studied with the Supernova Intensive Study (SINS). During the 1990s, Plait worked with the COBE satellite and later was part of the Hubble Space Telescope team at NASA Goddard Space Flight Center, working largely on the Space Telescope Imaging Spectrograph. In 1995, he published observations of a ring of circumstellar material around SN 1987A, which led to further study of explosion mechanisms in core-collapse supernovae. Plait's work with Grady, et al. resulted in the presentation of high-resolution images of isolated stellar objects (including AB Aurigae and HD 163296) from the Hubble Space Telescope, among the first of those recorded. These results have been used in further studies into the properties and structure of dim, young, moderate-size stars, called Herbig Ae/Be stars, which also confirmed results observed by Grady, et al.

He has written two books, *Bad Astronomy* and *Death from the Skies*. He has also appeared in several science documentaries, including Phil Plait's *Bad Universe and How the Universe Works* on the Discovery Channel. From August 2008 through 2009, he served as President of the *James Randi Educational Foundation*. Additionally, he wrote and hosted episodes of *Crash Course Astronomy*, which aired its last episode in 2016.

Introduction to

# QUANTUM COMPUTING

**What is behind the efficiency of Quantum Computers?**

## So, what is it?

**Quantum computing is the area of study focused on developing computer technology based on the principles of quantum theory, which explains the nature and behavior of energy and matter on the quantum (atomic and subatomic) level. To explain at a very basic level, a quantum computer is a computational device that relies on the phenomena of quantum physics. By using unusual occurrences in the quantum realm to its advantage, the computer is allowed to perform computations in a much faster and effective way.**

## Quantum Mechanics

**Quantum physics describes how all the molecules, atoms, and subatomic particles act. These particles don’t work the way that we are used to in our macroscopic dimensions, and even the smartest of the quantum physicists (think Albert Einstein level) still don’t have explanations for occurrences of certain phenomena in the quantum realm. Thankfully, we only need to know quantum mechanics at a basic level to understand how quantum computers work!!**

## Superposition

The principle of quantum superposition states that if a physical system may be in one of many configurations—arrangements of particles or fields—then the most general state is a combination of all of these possibilities. Now applying this concept—Our regular computers work with binary bits which store 1 of 2states—0 or 1. Combinations of these bits are used to store more complex information. A large enough number of bytes (8 bits) allows the computers to store a finite number of states like words on your screen if you are reading this article on your device as a pdf. But what if we could use something that in addition to being 0 or 1, could also be both 0 and 1 at the same time?? Wont it be damn cool and useful?? In comes the *Qubit*.

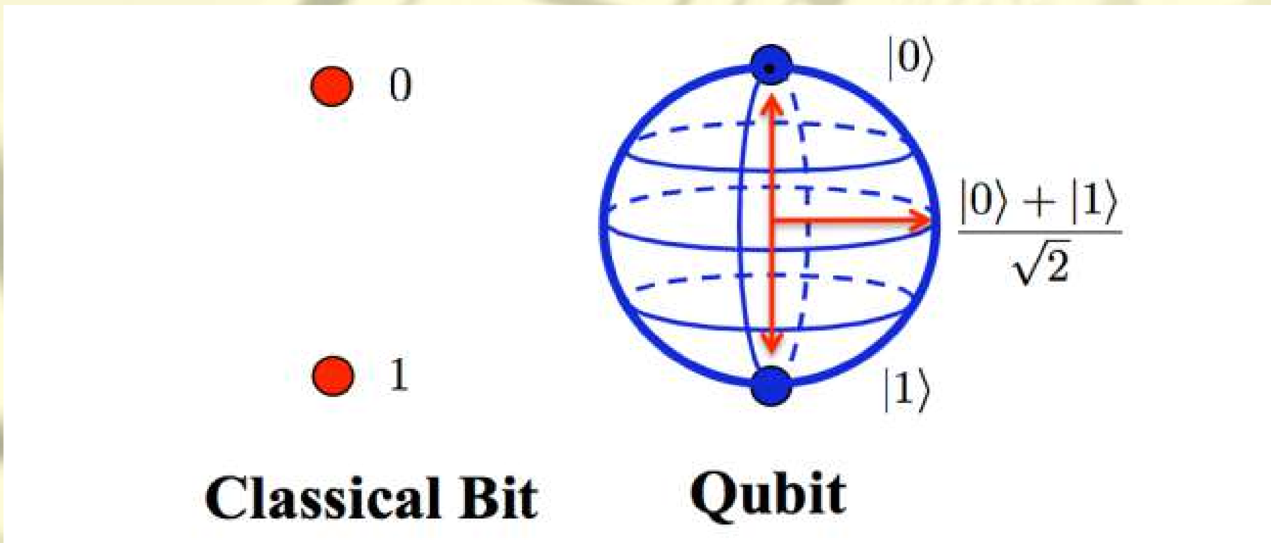
Quantum computers use Qubits to store information. Like photons, atoms, ions, electrons and other quantum particles which can exist in 1 of 2 values, while the superposition of those values is a combination of these two states, Bits can exist in two state 0 or 1, however Qubit is a combination of these two states. So where 4 regular bits represent 1 of the 16 combinations at one time, 4 qubits in superposition can be all 16 combinations at once.

The incorporation of superposition into computers is a game-changer. It is what allows qubits to have parallelism. Parallelism allows quantum computers to work a million computations at once, where desktop computers would only be able to do 1.

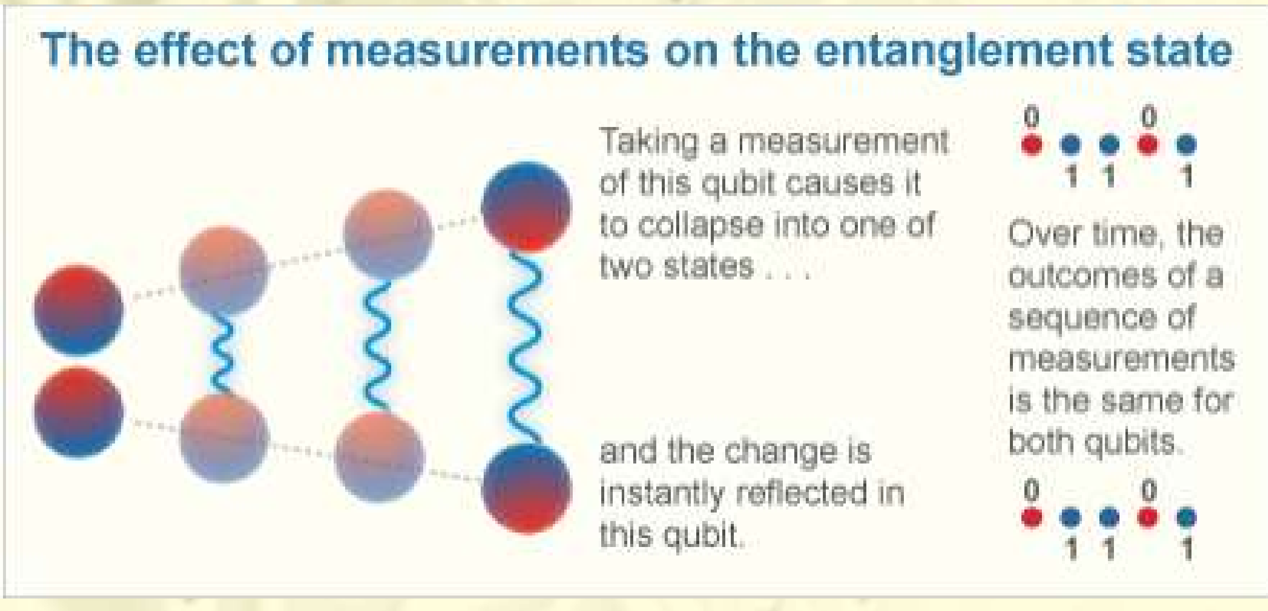
## Entanglement

Quantum entanglement is a physical phenomenon that occurs when pairs or groups of particles are generated, interact, or share spatial proximity in ways such that the quantum state of each particle cannot be described independently of the state of the others, even when the particles are separated by a large distance.

In simple words, when observing a single particle, we say it has its own quantum state. But when 2 of these particles get close together and act on one another, they become entangled, or an entangled system. So, if 2 qubits were to get entangled, it would cause each qubit to react to a change in others' state, instantaneously, no matter how far apart. This means that you could just measure the properties of one entangled qubit to figure out the properties of the other half of its pair.




**The issue with observing sub-atomic particles in superposition is that you could bump them, and thereby change their value to observe either 0 or 1, but not both. If this happens, this would cause the quantum computers to have the same abilities as a regular computer. Implementing the phenomenon that is quantum entanglement into a quantum computer solves this problem. If scientists use outside forces to entangle 2 qubits, and the second qubit can take on the properties of the first qubit.**
**When left alone, the qubits will spin in all directions. But, the instant one of the qubits in the pair is disturbed it will choose one state/value. At the same time, the second entangled qubit will react and choose am opposite state/value. This allows scientists to know the value of the qubits without actually looking at them.**



## Key Takeaways

- By tapping into the strange and unknown realities of quantum mechanics, we can use quantum computing to solve problems that would take traditional computers lifetimes to solve.
- A qubit can be either—0 or 1, or 0 and 1, which describes superposition before measurements are made.
- Quantum entanglement allows scientists to only measure 1 qubit and figure out the value of the other qubit in pair instantaneously because they are a part of the same entangled system.
- Implementing the phenomena of superposition and entanglement would make quantum computers more efficient than a regular computer.

**CHIRANTAN GANGULY**

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# beyond
# DARK MATTER

The mystery of what dark matter actually is remains the ultimate challenge of modern fundamental physics. The core question is whether it is indeed a missing mass source, such as a new type of matter, or whether the gravitational law is simply different at gigantic length scales. While the first option seems very tempting, we haven't actually found any dark matter yet. Also, while gravity laws are well tested within the solar system, one has to be careful extrapolating this to scales which are at least one billion times larger.

One well known attempt to get rid of the need for dark matter is Modified Newtonian Dynamics (MOND), which suggests that Newton's law of gravity becomes irregular when the gravitational pull is very weak – as is the case in the outer regions of the galaxy. But this theory, although successful in many respects, hasn't passed the same stringent tests as our standard model of cosmology, which includes dark matter.

The main problem is that MOND cannot explain the missing mass problem in galaxies and galaxy clusters at the same time. Another very strong argument against MOND is based on the observation of colliding galaxy clusters, where the stars of each galaxy pass through each other, but the gas clouds stick together and stay behind. A famous example is the Bullet Cluster, which consists of two such colliding clusters. Observations suggest that dark matter follows the stars in these events, which have a lower total mass than the gas cloud. MOND cannot explain why that is. Reasearch is still going on to find and prove the existence of the hypothetical Dark Matter but beyond that this can be the harsh reality too. So TERA WIRE keeps you informed about this dark theory beyond Dark Matter.  Adios!

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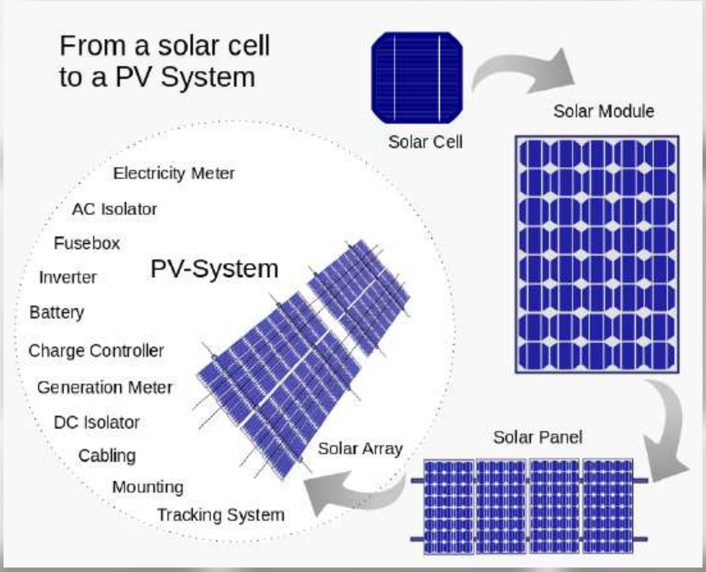
SOUJATYA SARKAR
(CHIEF EDITOR)

# A Ride through Solar Panels

Photovoltaic modules use light energy (photons) from the Sun to generate electricity through the photovoltaic effect. Most modules use wafer-based crystalline silicon cells or thin-film cells. The structural (load carrying) member of a module can be either the top layer or the back layer. Cells must be protected from mechanical damage and moisture. Most modules are rigid, but semi-flexible ones based on thin-film cells are also available.




The cells are connected electrically in series, one to another to a desired voltage, and then in parallel to increase amperage. The wattage of the module is the mathematical product of the voltage and the amperage of the module.A PV junction box is attached to the back of the solar panel and functions as its output interface. External connections for most photovoltaic modules use MC4 connectors to facilitate easy weatherproof connections to the rest of the system. Also, a USB power interface can be used. Module electrical connections are made in series to achieve a desired output voltage or in parallel to provide a desired current capability (amperes) of the solar panel or the PV system. The conducting wires that take the current off the modules are sized according to the ampacity and may contain silver, copper or other non-magnetic conductive transition metals. Bypass diodes may be incorporated or used externally, in case of partial module shading, to maximize the output of module sections still illuminated.Some special solar PV modules include concentrators in which light is focused by lenses or mirrors onto smaller cells. This enables the use of cells with a high cost per unit area (such as gallium arsenide) in a cost-effective way.Solar panels also use metal frames consisting of racking components, brackets, reflector shapes, and troughs to better support the panel structure.

University of Calcutta

# CLUBS & EVENTS

Learn with Google AI | Explore ML

## Google ExploreML Workshop

Intermediate Track will begin on December and is open for all students of University of Calcutta.

For more information, contact Facilitator - **Subham Das - +91 8583057474**

## CodeChef Programming Contest

Programming Compettition will be held on **27th November, 2019** on CodeChef Platform by CodeClub University of Calcutta (FREE OF COST).
**Timing: 7pm to 9.30pm.**
**Programming Languages Supported: All.**

Contact **Pratik Mishra (+91 9929308308)** for more details.

# BULLETIN

TECXOTiC 2020

# TECXOTiC 2020

Hello Folks!
TECXOTiC 2020 hype is racing in the blood of CUians! The Organization Team Selection will start on December 2nd week.

**So stay tuned for updates @ http://www.tecxotic.cf/**

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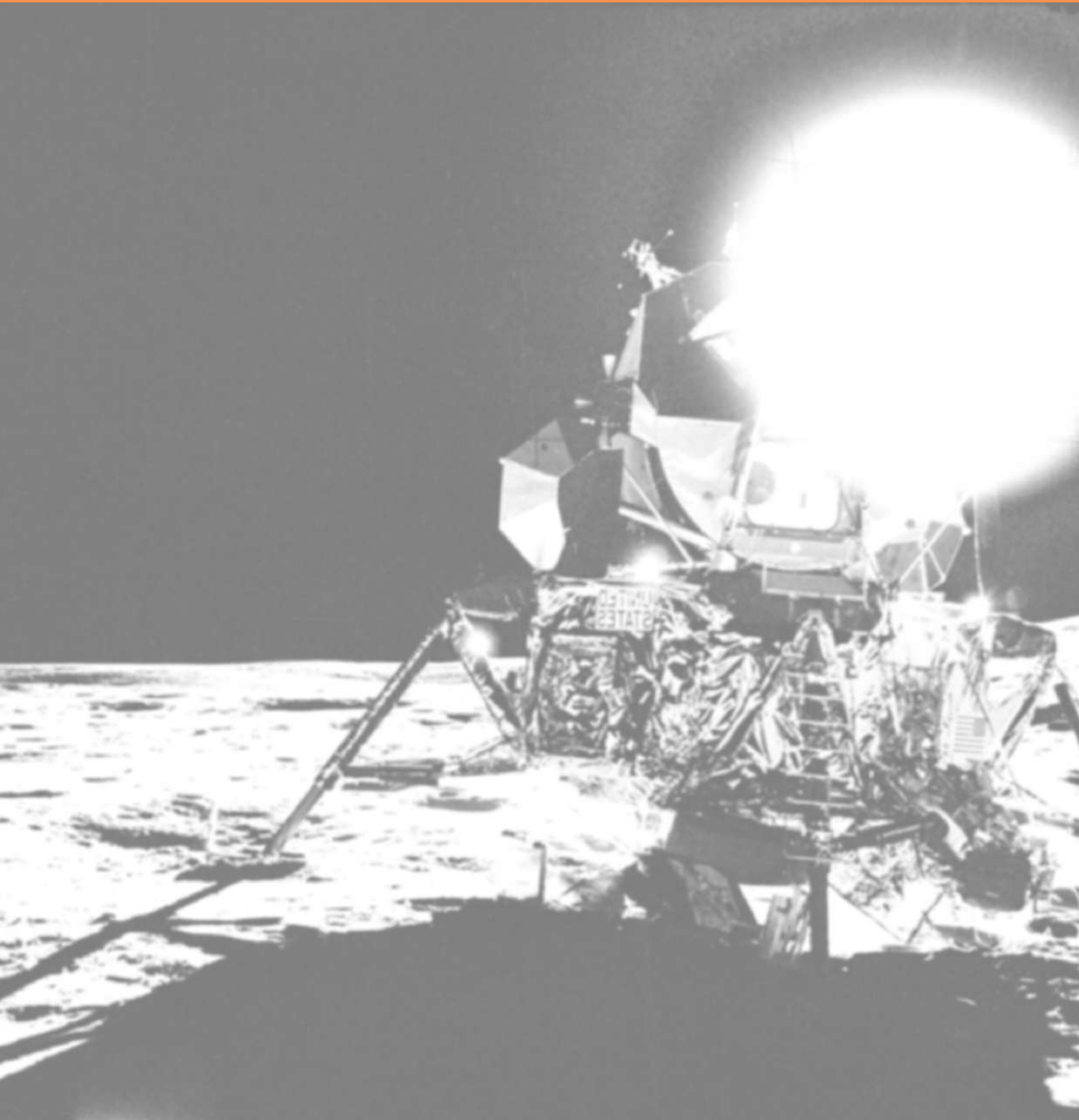


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