

COMPLEMENTARITY: BRIDGING SCIENCE AND RELIGION

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HOW IT BEGAN

Light as a wave (19th century)

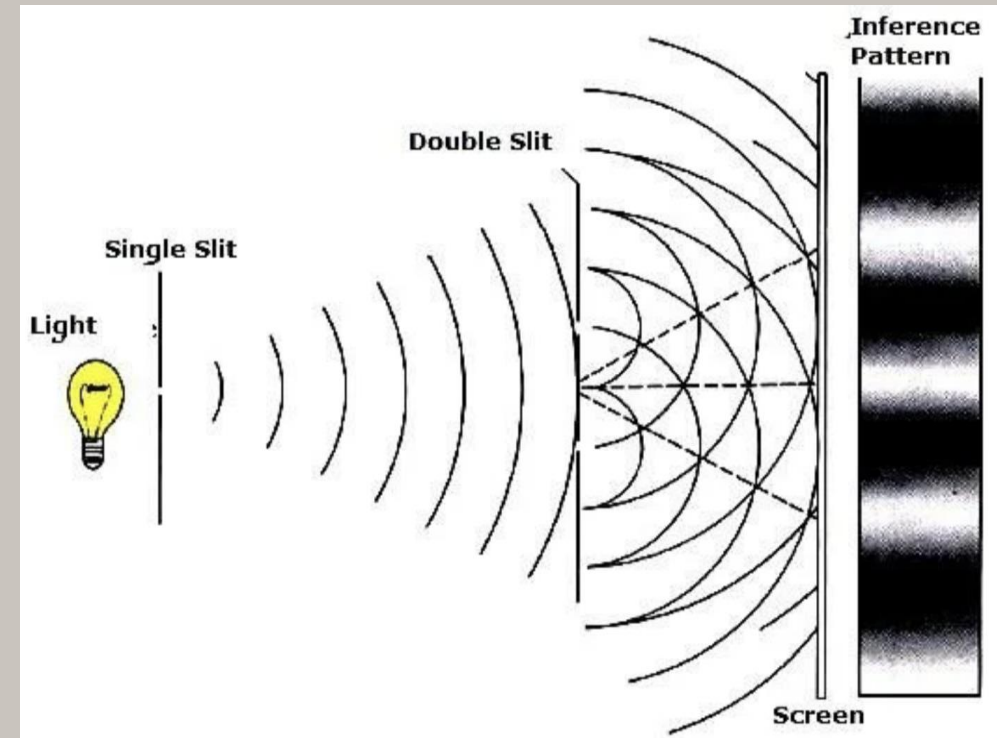
- Scientists like **Thomas Young** (1801) did the **double-slit experiment** with light, showing it creates an **interference pattern**, just like water waves.

This made most physicists think **light was purely a wave**.

Light as a particle (1900–1905)

- **Max Planck** introduced the idea of **quanta** to explain how objects emit light, suggesting light comes in discrete packets of energy.
- **Albert Einstein** (1905) explained the **photoelectric effect**, showing that light can knock electrons out of metal only if it has enough energy in a **particle-like “photon”** form.

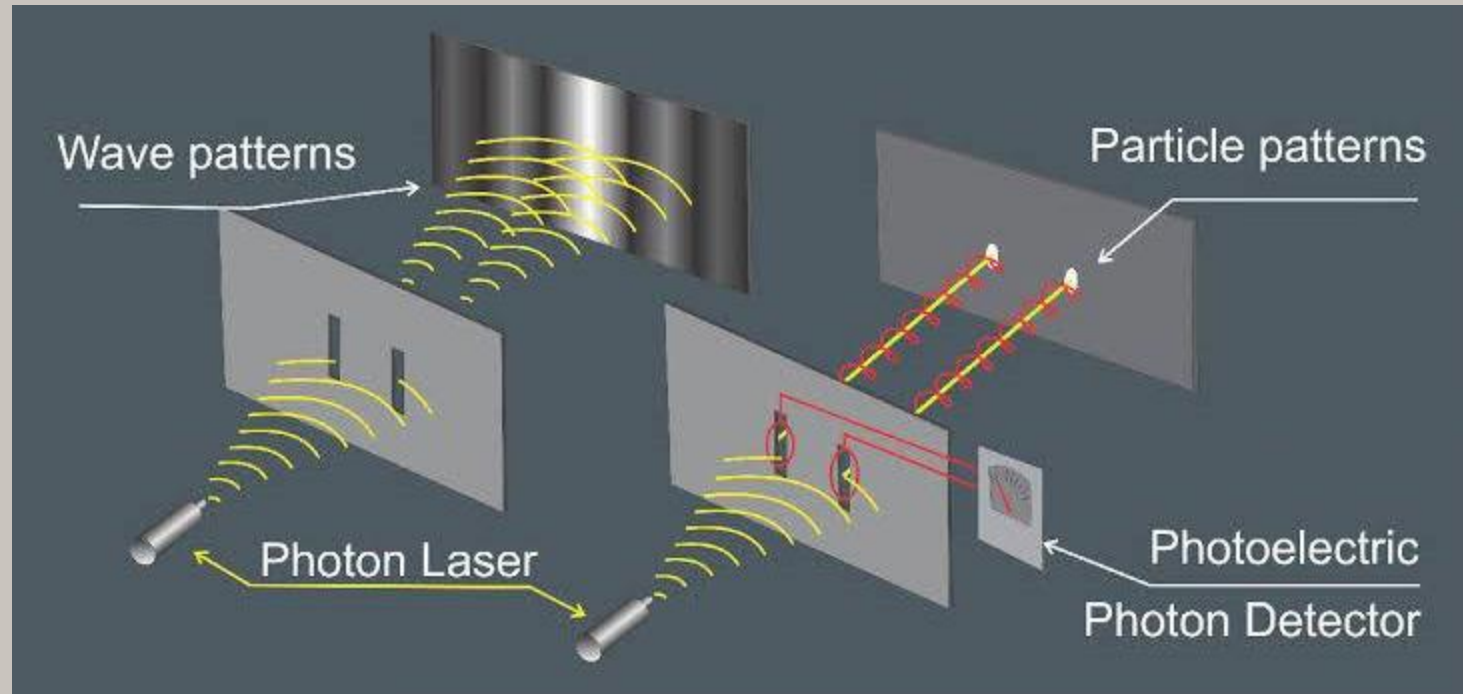
These discoveries suggested that **light behaves like both a wave and a particle**.



Zinc (Zn) Doped Carbon (C) Based Quantum Dot (QD) Synthesis & Characterization - Scientific Figure on ResearchGate. Available from: https://www.researchgate.net/figure/Thomas-Youngs-double-slit-experiment_fig3_366659739 [accessed 25 Mar 2026]

WAVE-PARTICLE DUALITY

- <https://youtube.com/shorts/mjeA6WrrxHM?si=dZDZV1glAMe3Brrj>
- <https://youtu.be/ZQAvVgnreWk?si=TR2mDa0JQod3GEuX>



PROBLEM

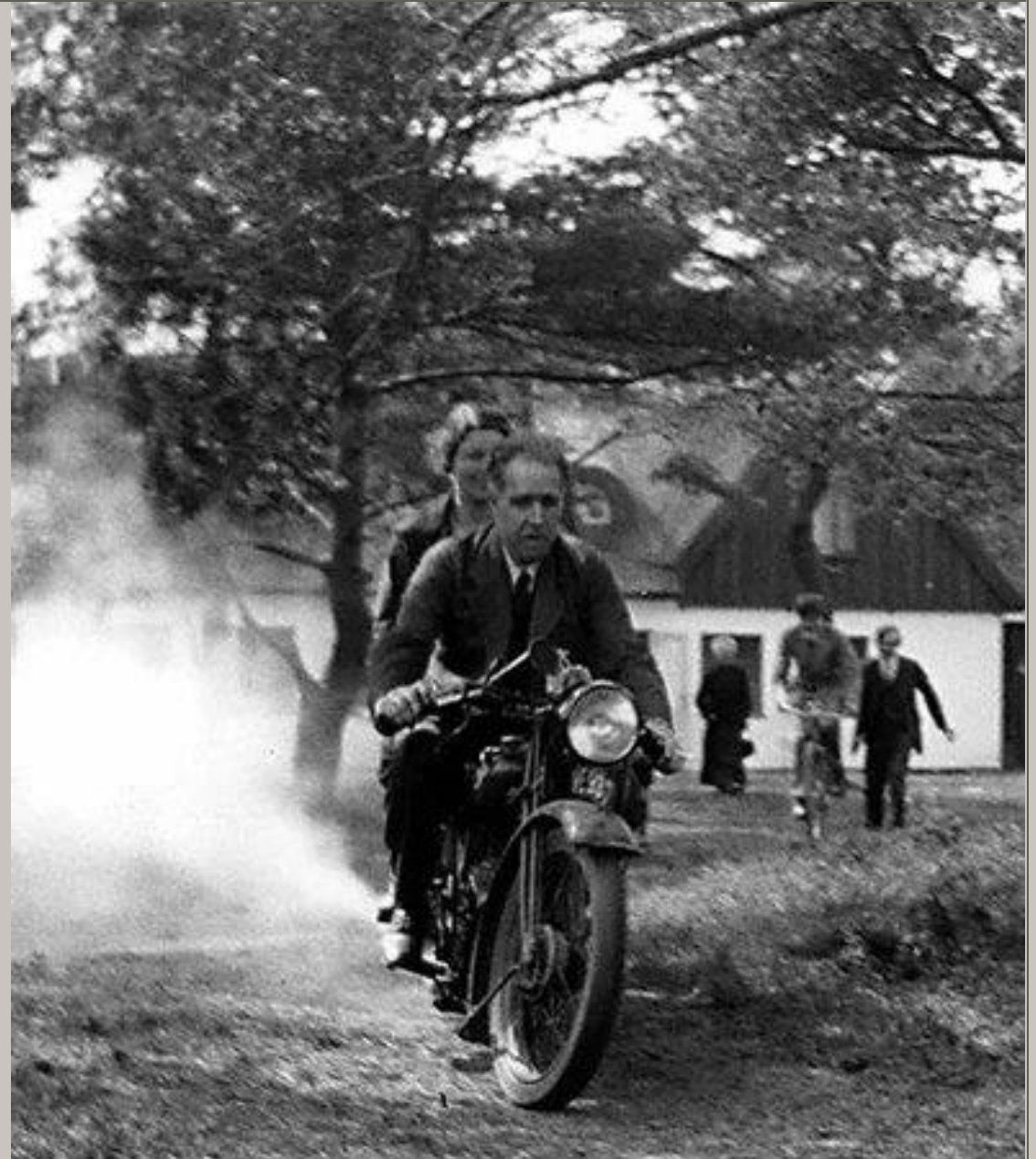
Photons and electrons behave both like **particles** and **waves**, depending on how we look at them.

- When we think of them as **particles**, they act like little dots or bullets—each electron or photon has a definite position and can hit a detector in one spot.
- When we think of them as **waves**, they spread out, can overlap, and create patterns like ripples in water—this is why light can make a **rainbow pattern** or electrons can create **interference patterns** in experiments.

The strange part is that they are **never just one or the other**. **Something cannot normally be both a particle and a wave at the same time**

NIELS BOHR'S THEORY OF COMPLEMENTARITY

- These different observations of wave-particle duality are not mutually exclusive but complementary: **They provide distinct, yet jointly necessary, perspectives on reality.**
- **Some things in nature cannot be fully described by just one explanation.** Instead, we need two or more different descriptions, which may even seem contradictory, but are all necessary to understand the whole reality.
- We can observe only one aspect of a phenomenon at a time. Though results may appear separate, they are all valid and together provide a more complete understanding.



COMPLEMENTARITY BEYOND PHYSICS

- Complex human issues cannot be understood from a single perspective
- Different, even opposing viewpoints are **complementary**, not contradictory
- Applies to **culture, science, and religion**: each reveals part of reality

Key idea: truth often requires combining multiple perspectives, not choosing one

"I think you theologians should make much more use than you are doing of the principle of complementarity."

The Sense of the Presence of God: Glifford Lectures, 1961–2
(London: Oxford University Press, 1962), 217.

CHRISTOLOGY AND COMPLEMENTARITY

Christopher B. Kaiser - "Christology and Complementarity"
(1976)

The Problem - Understanding Christ

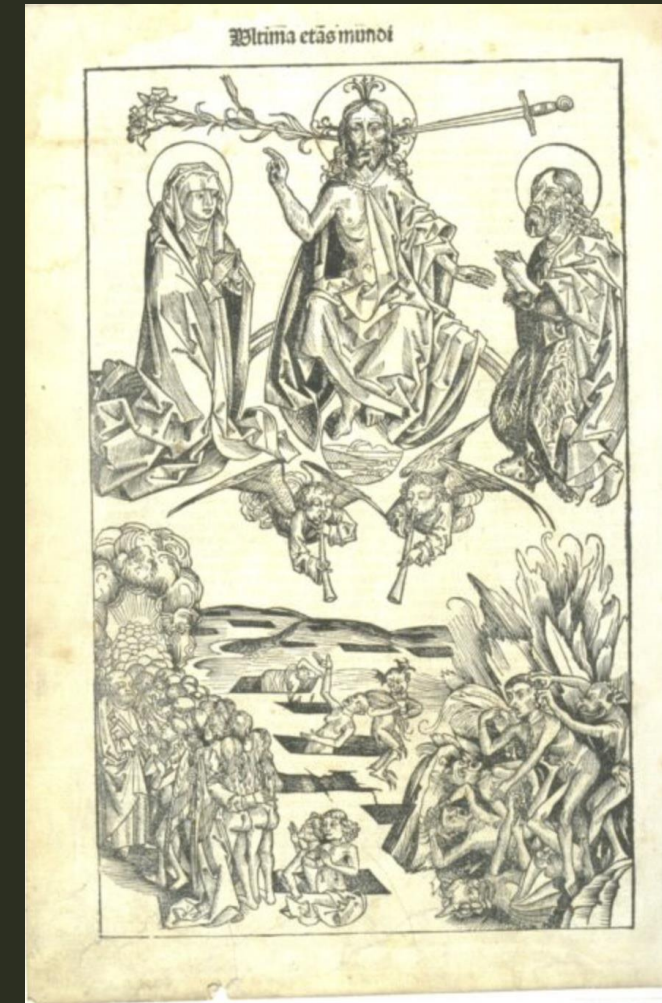
- The nature of Jesus as both God and man presents a deep intellectual and theological challenge
- The disciples experienced Jesus as human, yet recognized him as God incarnate
- Unlike earlier traditions, this was not a temporary divine appearance, but a full incarnation

A key difficulty: in earlier thought, God and man were seen as separate and incompatible, communicating this idea required using familiar categories while expanding their meaning



COMPLEMENTARITY AND MEANING

- Jesus must be understood as both **true man** (fully participating in human life) and **true God** (revealing divine reality)
- These two aspects may seem contradictory, but they are **complementary**, not mutually exclusive
- Attempts to simplify (e.g., making Jesus only human or something “in between”) fail to capture his full significance
- The concepts of **God and man are not abandoned but expanded**:
God can fully enter human existence (birth, suffering, death)
Humans can attain transformation, resurrection, and closeness to God
- This reflects the logic of **complementarity**: different perspectives are needed to grasp a deeper truth



The Last Judgment, from the Nuremberg Chronicle, circa 1493

- Niels Bohr showed that atomic reality can be understood in two ways: **as particles and as waves**
- These represent **two modes of knowing**, each revealing a different aspect of the same reality

- Similarly, in Christology, Jesus is known in two modes:
Observation → as a human being in history
Worship / discernment → as divine

- Observation requires **distance and analysis**, while worship implies **recognition and relationship**

- Though different in method, both cases share the same structure:
•→ **one reality understood through two complementary perspectives**



*The "Poor Man's Bible," the Biblia Pauperum
Christ Carrying the Cross c. 1410*

THREE MAIN SIMILARITIES:

- Challenge of expressing the new

Both deal with realities that are difficult to describe:

- Jesus as fully God and fully man

- Atoms as both wave and particle

→ Ordinary language struggles to capture these ideas

- Epistemological aspect (ways of knowing)

- Jesus: known through **observation** (human) and **worship/insight** (divine)

- Atoms: known through **measurement** (particles) and **theoretical laws** (waves)

→ Different methods reveal different aspects of the same reality

- Ontological aspect (nature of being)

- Jesus truly possesses **two natures**: human and divine

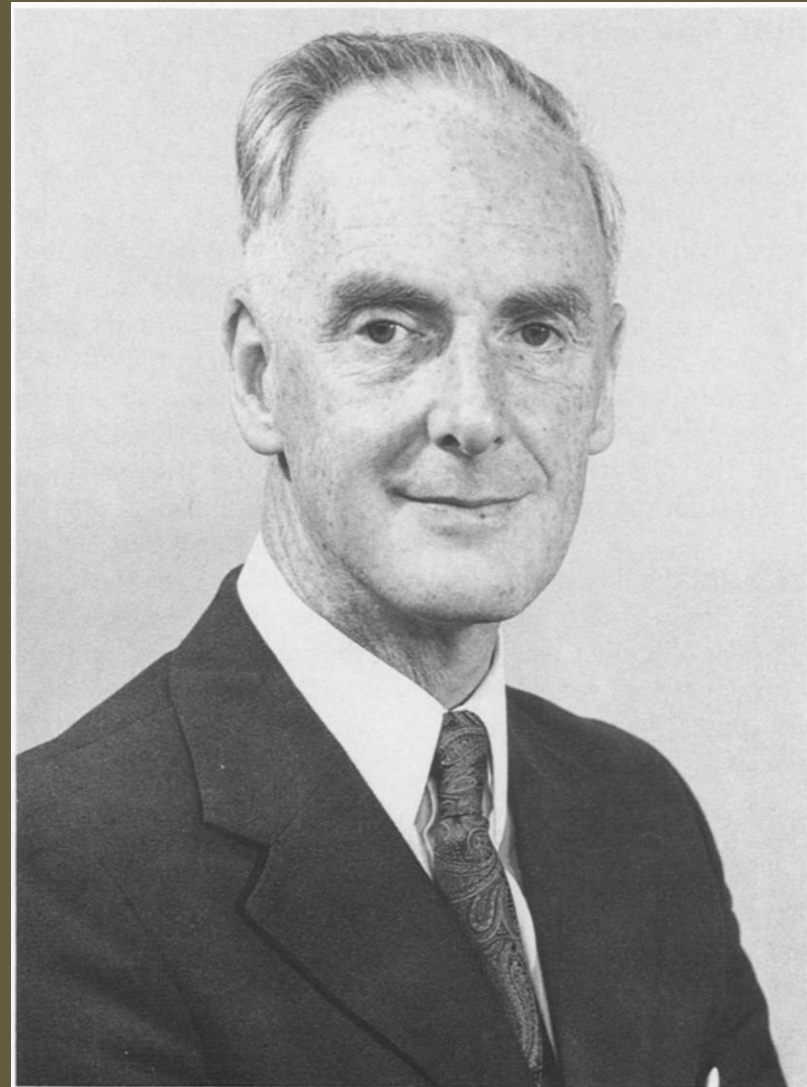
- Atoms truly exhibit **two modes of being**: wave and particle

→ Duality belongs to reality itself, not just to our perception

A NEW APPROACH TO SCIENCE AND RELIGION

Donald M. MacKay - "Symposium: Complementarity" (1958)

- Traditionally, science and religion were seen as **competing explanations** of reality
- Their relationship was reduced to four possibilities:
→ **different, identical, incomplete, or contradictory**
- This framework is **overly simplistic and misleading**
- Instead, many statements in science and religion are **complementary**
- → They offer **different but meaningful perspectives** on the same reality, rather than opposing each other



Donald MacCrimmon MacKay, 1922–1987

COMPLEMENTARITY OF SCIENCE AND RELIGION

- Biblical example: Jesus says God feeds the sparrows
- Not replacing or denying scientific explanation (e.g., biology, food chains)
- Does not introduce a new physical cause
- Science → explains how the event happens (mechanisms, processes)
- Religion → explains why or the deeper meaning of the event
- After science explains the mechanics, a second layer of understanding remains possible
- Analogy: like Morse code, where physical signals also convey meaningful messages

Key idea: scientific and religious perspectives describe the same reality in complementary ways

COMPLEMENTARITY VS. CONFLICT BETWEEN SCIENCE AND RELIGION

Scientific and religious explanations operate on different levels, so they do not automatically contradict each other.

- Methodological caution: conflict should not be assumed before examining possible complementarity
- Important note: complementarity does not prove truth—it only shows the perspectives can coexist without contradiction

Summary:

Science → explains processes and causes

Religion → provides meaning and interpretation

Together, they offer a richer understanding without



By Gustave Doré - Bible by Doré, Public Domain,
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