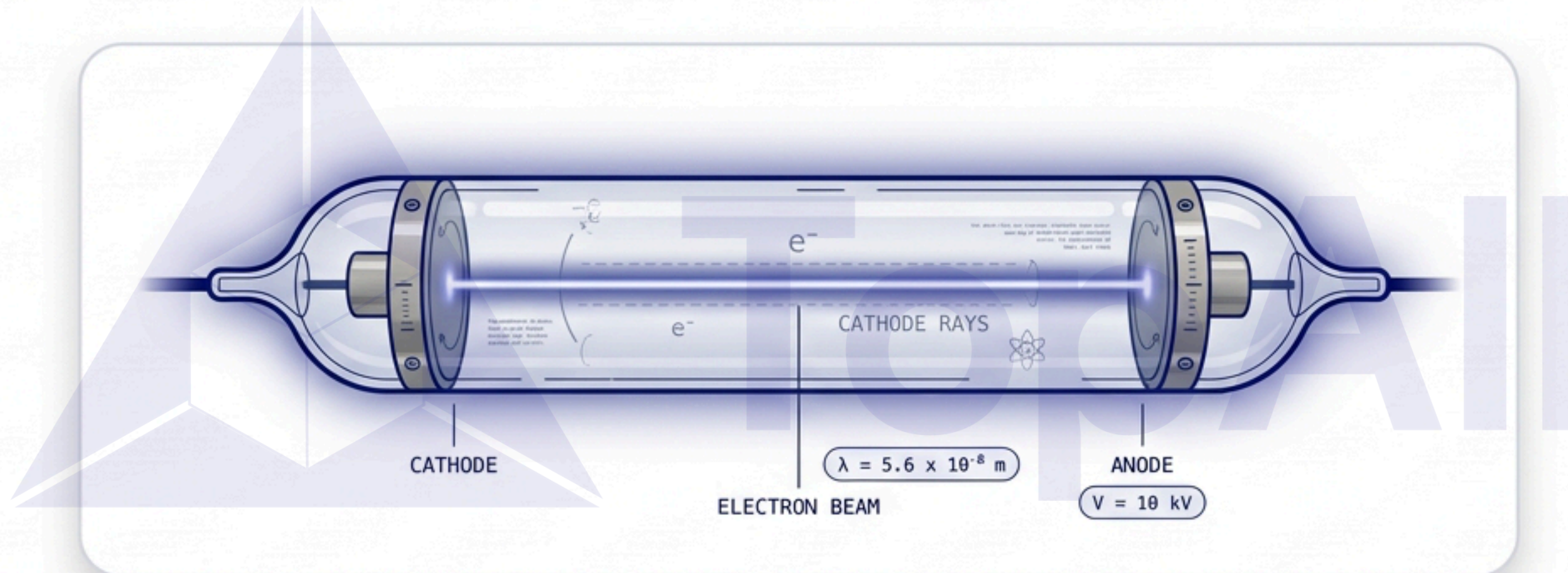


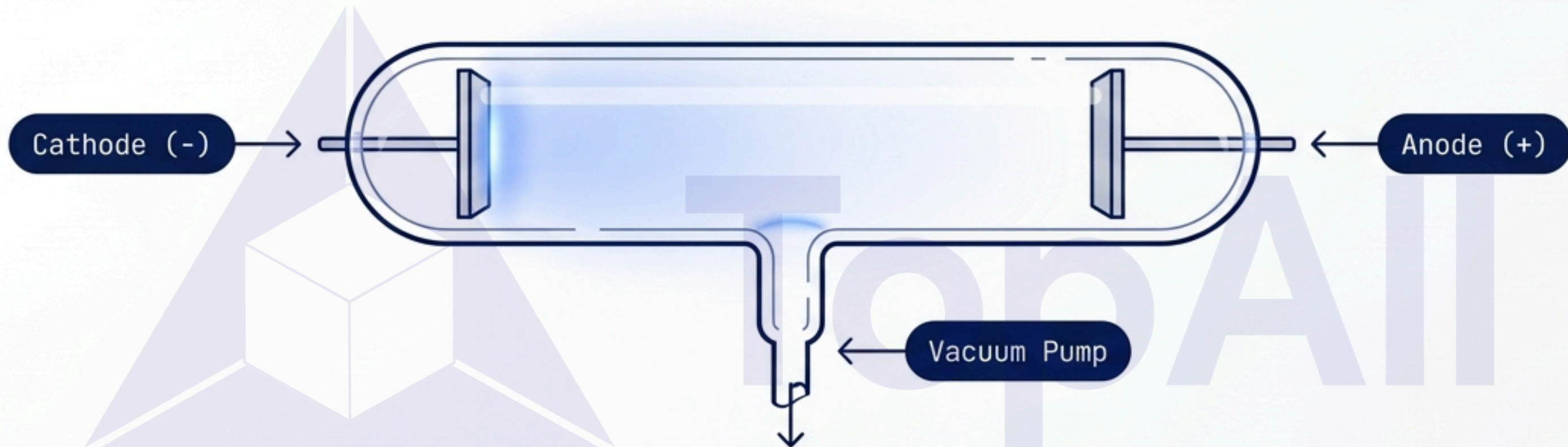
2.1.1 Discovery of Electron

Uncovering the first sub-atomic particle.



For decades, **Dalton's atomic theory** declared the atom as the ultimate, **indivisible particle** of matter. The experiments of the mid-1850s shattered this theory forever.

Inside the Cathode Ray Tube



The Setup

A sealed glass tube containing two thin pieces of metal (electrodes).

The Triggers

Electrical discharge in gases requires precise conditions: **Very Low Pressure** **Very High Voltage**.

Igniting the Cathode Ray



Process Strip

1

High voltage applied across electrodes.

2

Current flows from negative (cathode) to positive (anode).

3

Invisible ray passes through the hole in the perforated anode.

4

Ray strikes the Zinc Sulphide (ZnS) coating, developing a bright glowing spot.



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$$E=mc^2$$



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How Do Cathode Rays Behave?



Straight Lines

In the absence of electrical or magnetic fields, cathode rays travel in perfectly straight lines.



Visibility

The rays themselves are invisible, but their behavior is observed when they hit fluorescent or phosphorescent materials (the basis for early television picture tubes).



Independence

Characteristics do not depend on the material of the electrodes or the nature of the gas present in the tube.

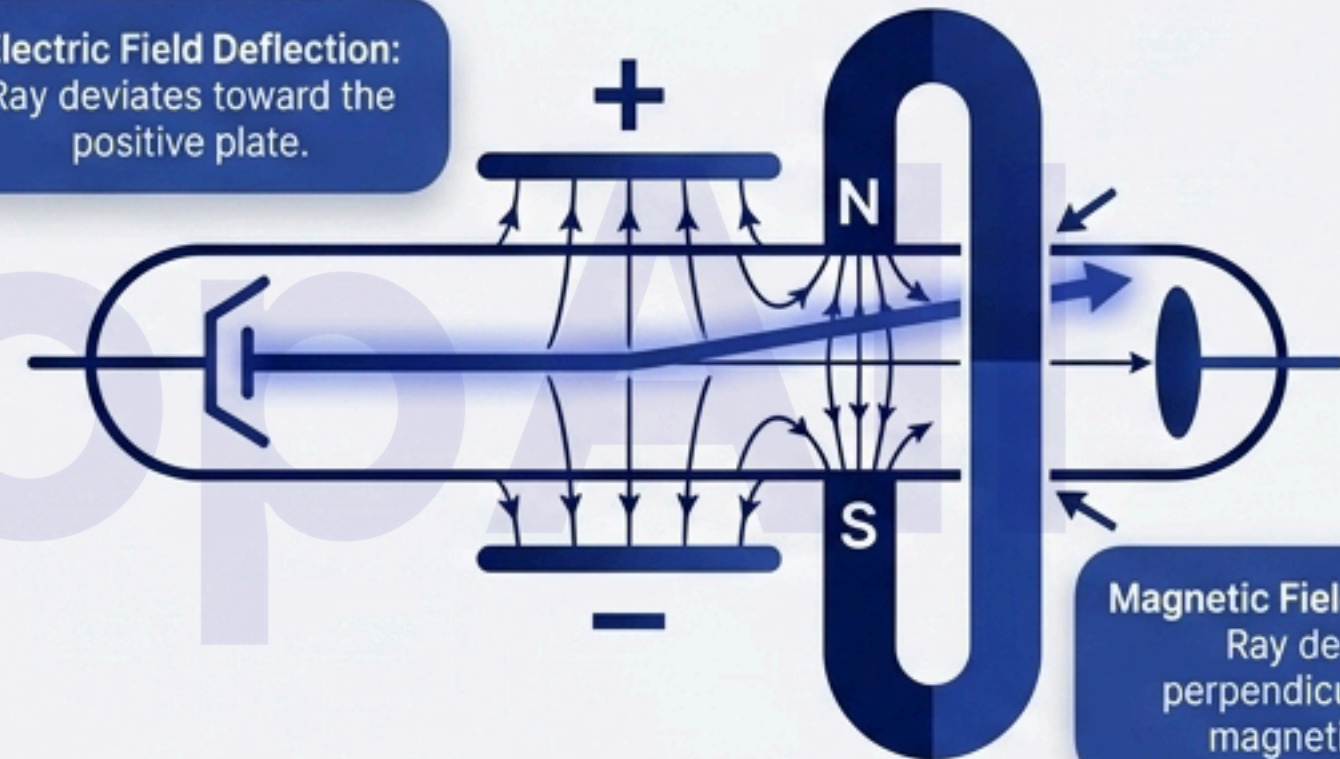
Proving the Negative Charge

Expected behavior of negative particles.



Observed behavior of cathode rays.

Electric Field Deflection:
Ray deviates toward the
positive plate.

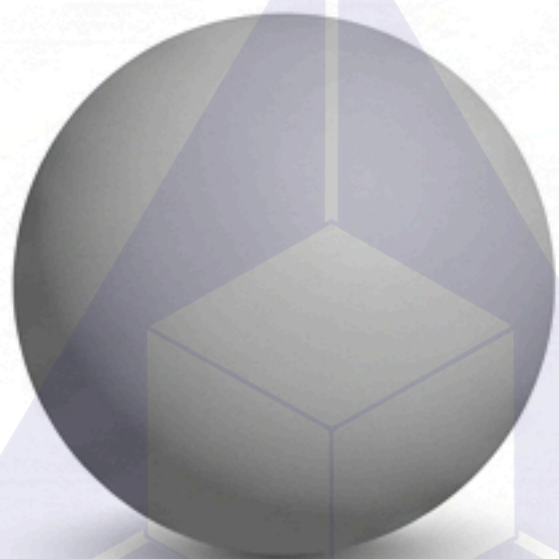


Magnetic Field Deflection:
Ray deviates
perpendicular to the
magnetic field.

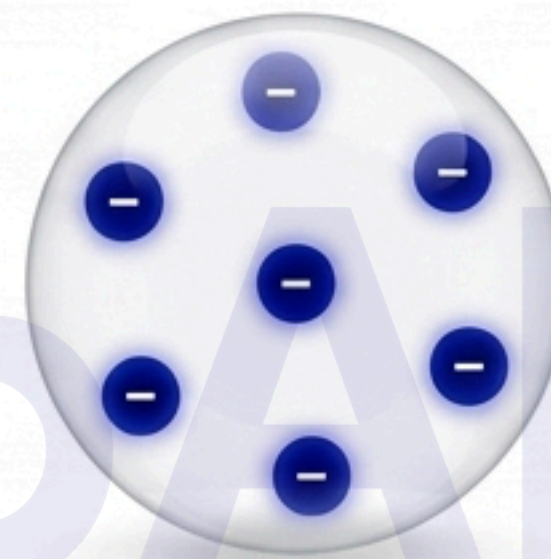
Because cathode rays behaved exactly like negatively charged particles in the presence of fields, scientists deduced they were streams of negatively charged particles—subsequently named **electrons**.

The Universal Building Block

Pre-1850



Post-Discovery



Because cathodode rays behave identically regardless of the gas or electrode metal used, these negative particles must be universally present in every element.

Electrons are the basic, negatively charged constituents of all atoms, fundamentally altering our understanding of matter.

Symbol: e^-



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