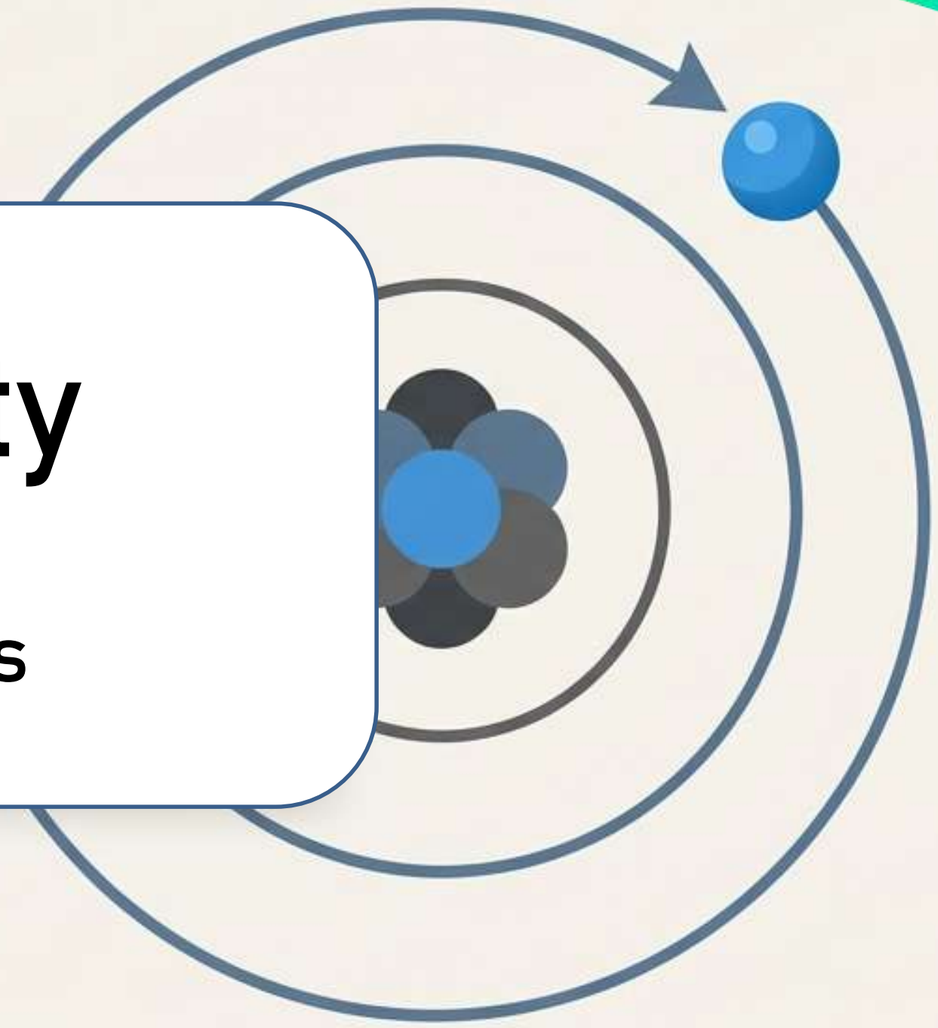
Electricity

Class 10

Revision Notes



Maximizing your study material

1

Step 1 (Pre-read):
Skim the topic before class to build a mental overview.

2

Step 2 (Detailed Review):
After class, review fine points and try exercises independently before checking solutions.

3

Step 3 (Note Reworking):
Reread class notes and re-solve all discussed problems.

4

Step 4 (Self-Testing):
Take home tests to build exam temperament.

5

Step 5 (Framing):
Modify existing questions and discuss with friends to expand your horizons.

The first recorded spark

In 600 B.C., Thales of Miletus—one of the founders of Greek science—observed that rubbing amber with wool gave it the power to attract light objects like feathers and dust.

600 B.C.

The Root of It All

The Greek word for amber is electrum (or elektron). This ancient fossilized resin is the namesake for electricity, electric force, and the electron itself.

Systematizing the science

Dr. William Gilbert (physician to Queen Elizabeth I) expanded on Thales' work in his book De magnate. He proved many substances besides amber possess this attractive property when rubbed.

Key terms introduced by Gilbert:

- Electric force
- Electric attraction
- Electrica (materials charged by rubbing)

600 B.C.

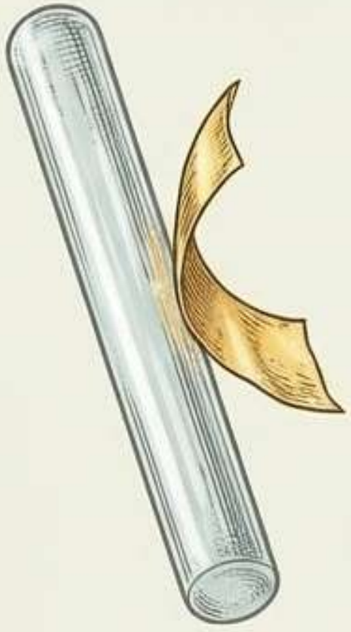
1500s

The Blind Spot

Gilbert systematically studied attraction, but he entirely missed observing electric repulsion.

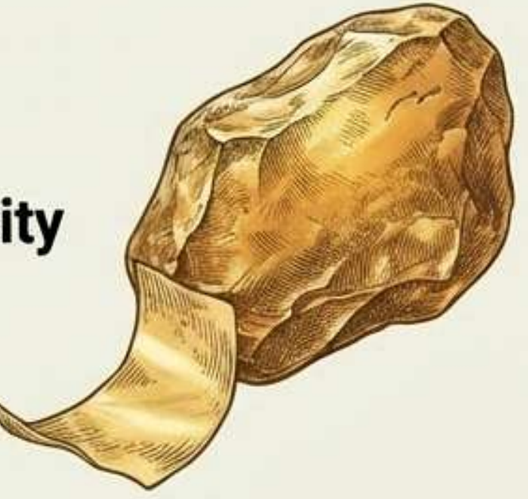
The Two-Fluid Theory

C.F. Du Fay discovered that electricity can repel as well as attract. He postulated that every uncharged body contains equal amounts of two weightless fluids.



Vitreous Electricity
(from glass)

Resinous Electricity
(from amber)



600 B.C.

1500s

Concept:

Charging a body simply means creating an imbalance, causing one fluid to be in excess.

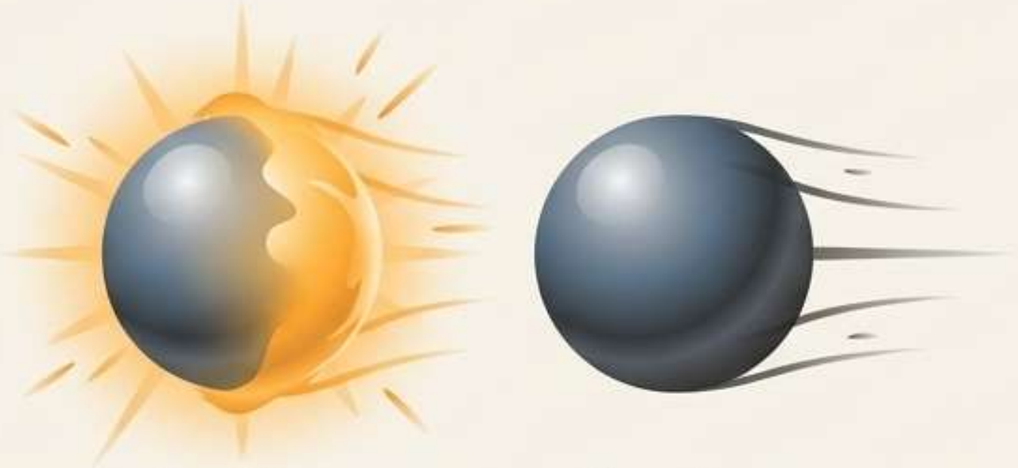
1700s

The One-Fluid Model

Benjamin Franklin proposed that all bodies contain a “normal” amount of a single weightless electric electric fluid (or “electric fire”). Rubbing transfers this from one body to another.

Franklin’s Lasting Convention:

- Excess fluid = Positive
- Deficient fluid = Negative

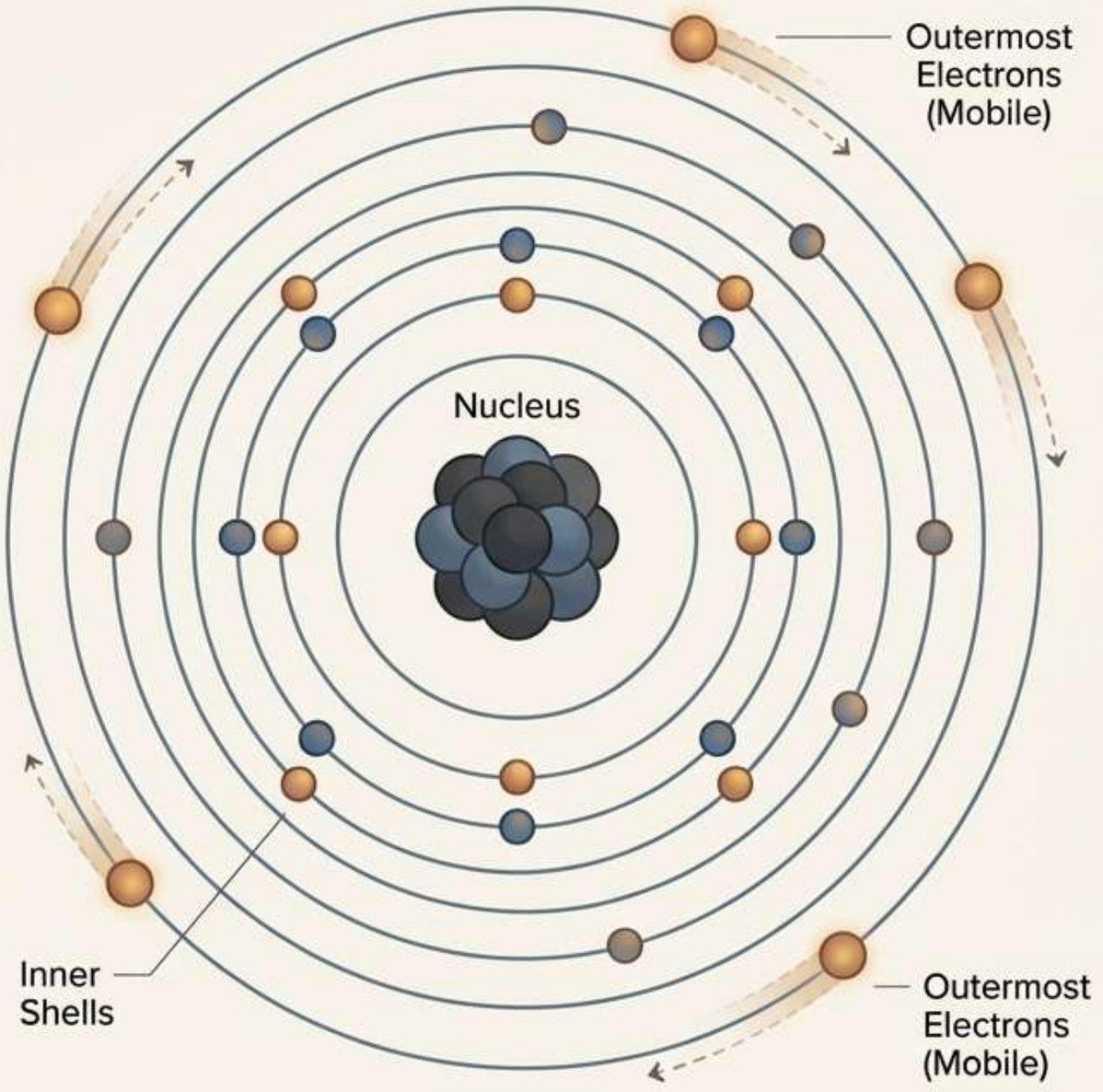


Positive Negative

An Arbitrary Choice

Franklin's choice of terms was purely arbitrary, but it stuck. Because of this 18th-century convention, the electron is considered negatively charged today.

600 B.C. 1500s 1700s 1747



The reality of electrification

The phenomenon of charging a body is called electrification. It has nothing to do with weightless fluids—it is entirely about the movement of electrons.

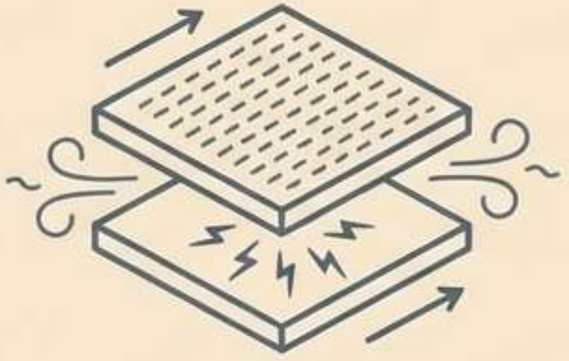
The Rule of Charge:

- Excess of electrons = Negative Charge
- Deficiency of electrons = Positive Charge

Electrostatics

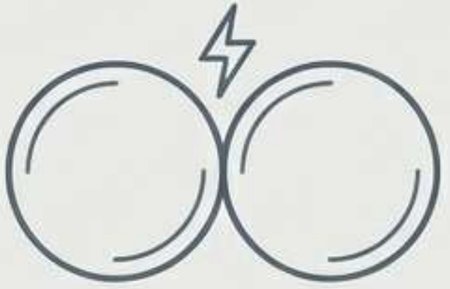
The branch of science dealing with stationary charges (charge that is acquired but not allowed to flow).

Three pathways to charge



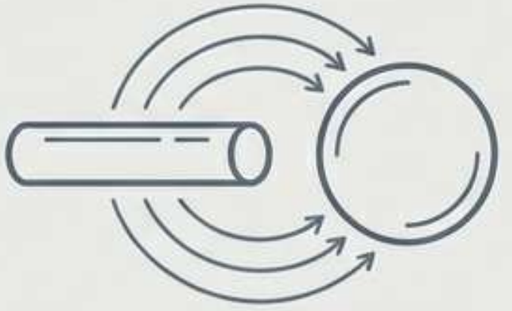
Frictional (Rubbing)

Electricity developed on the surfaces of insulating bodies when rubbed against each other.



Conduction (Contact)

Transfer of charge through direct physical contact with a conductor.

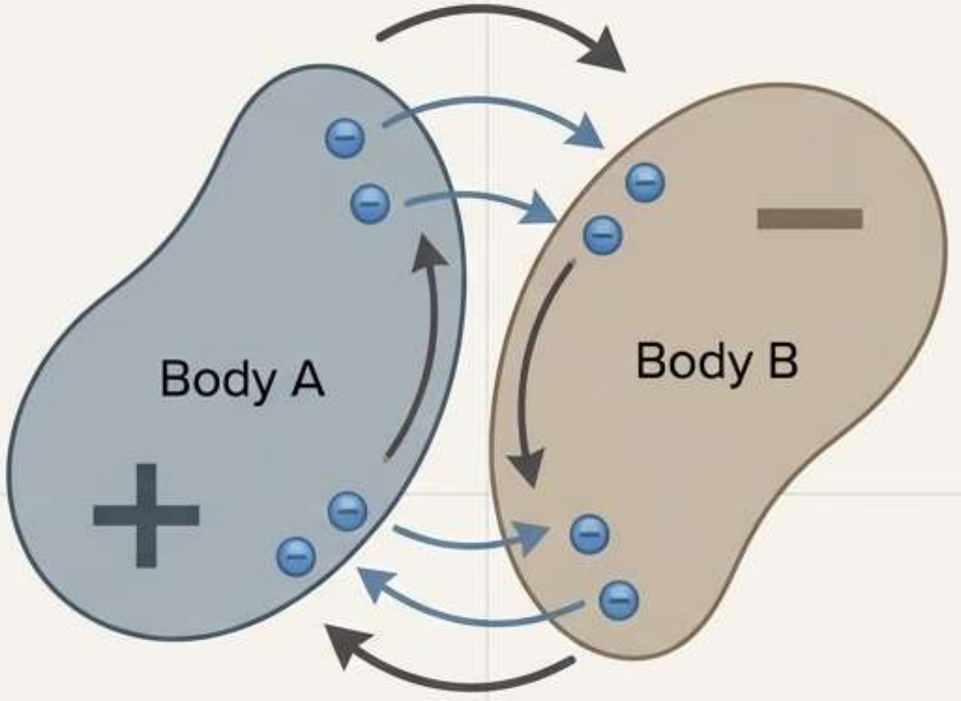


Induction (Proximity)

Charging a body by bringing it near a charged object without physical contact.

The mechanics of friction

When two insulators are rubbed together, equal amounts of opposite charges are developed. But which one becomes positive?



Electron Affinity:

The body with the greater affinity for electrons accepts them and becomes negatively charged. The other loses electrons and becomes positively charged.

The Triboelectric Series

A scientific list where materials are arranged in increasing order of their electron affinity.

Everyday physics: The metal knob spark

1

Friction.

As you walk, the sole of your shoe rubs against the carpet (frictional electrification).

2

Transfer.

Electrons move from the carpet to your body. You now carry an excess of electrons (Static Electricity).

3

Conduction.

You touch a metal door knob (a conductor). The electrons move rapidly from you to the knob, resulting in a sudden flow of current—a shock!

Everyday physics: A hair-raising experience

1 Friction.

Removing a woolen hat rubs it against your hair.

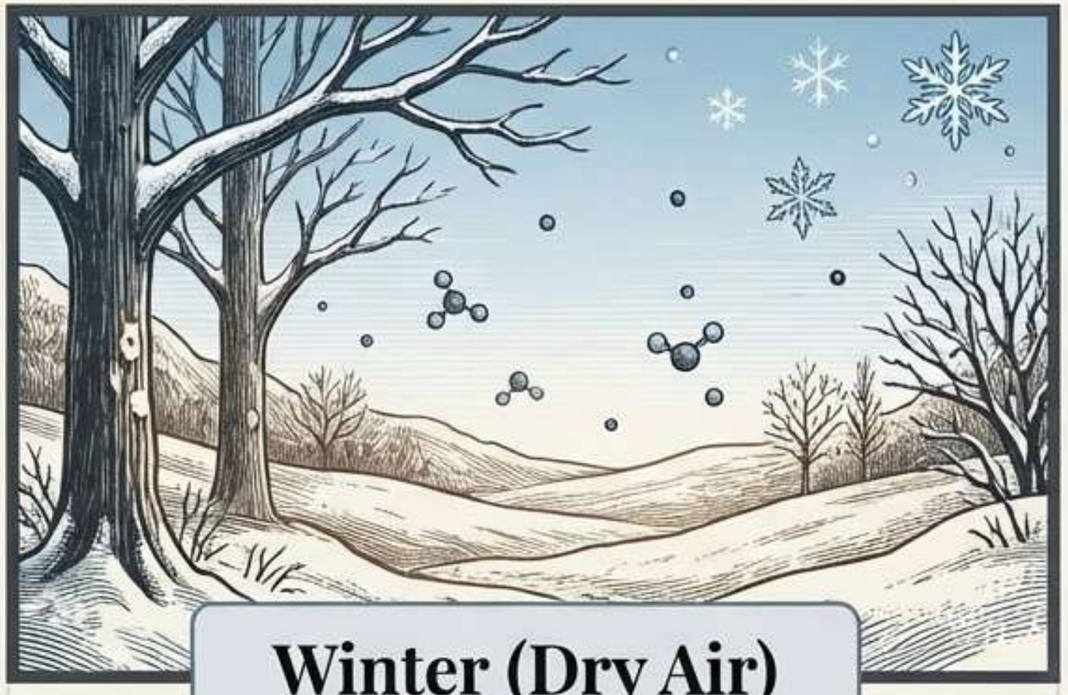
2 Transfer.

Electrons move from your hair to the hat. The hat becomes negatively charged; your hair becomes positively charged.

3 Repulsion.

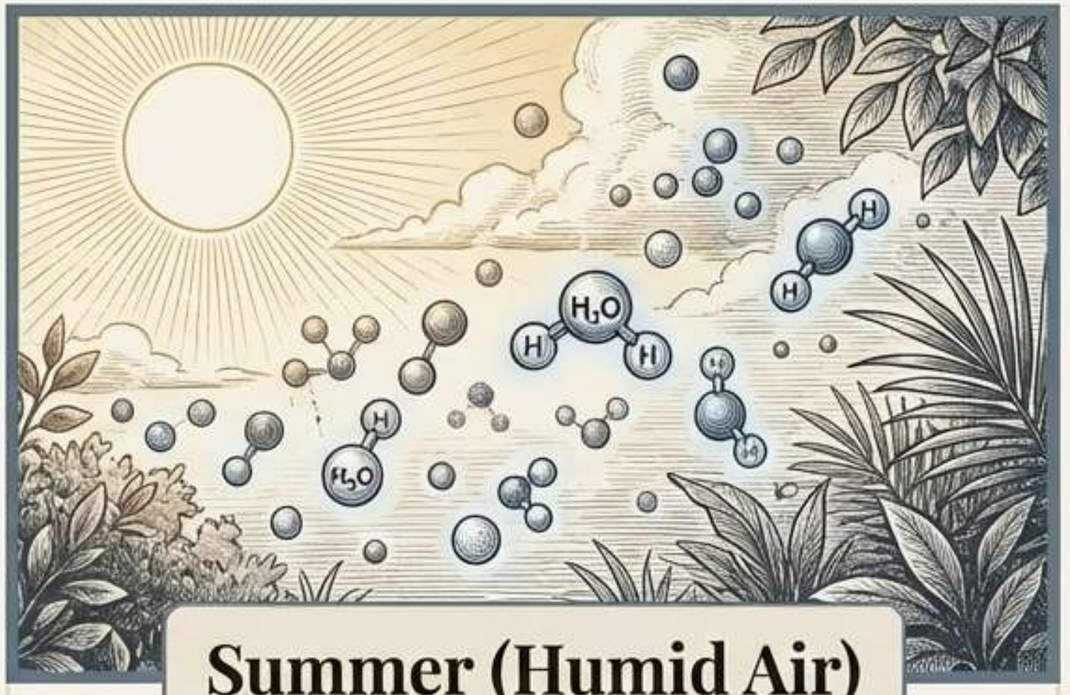
Every individual strand of hair now holds the same positive charge. Since like charges repel, the hairs stand up to get as far away from each other as possible.

Why is static worse in winter?



Winter (Dry Air)

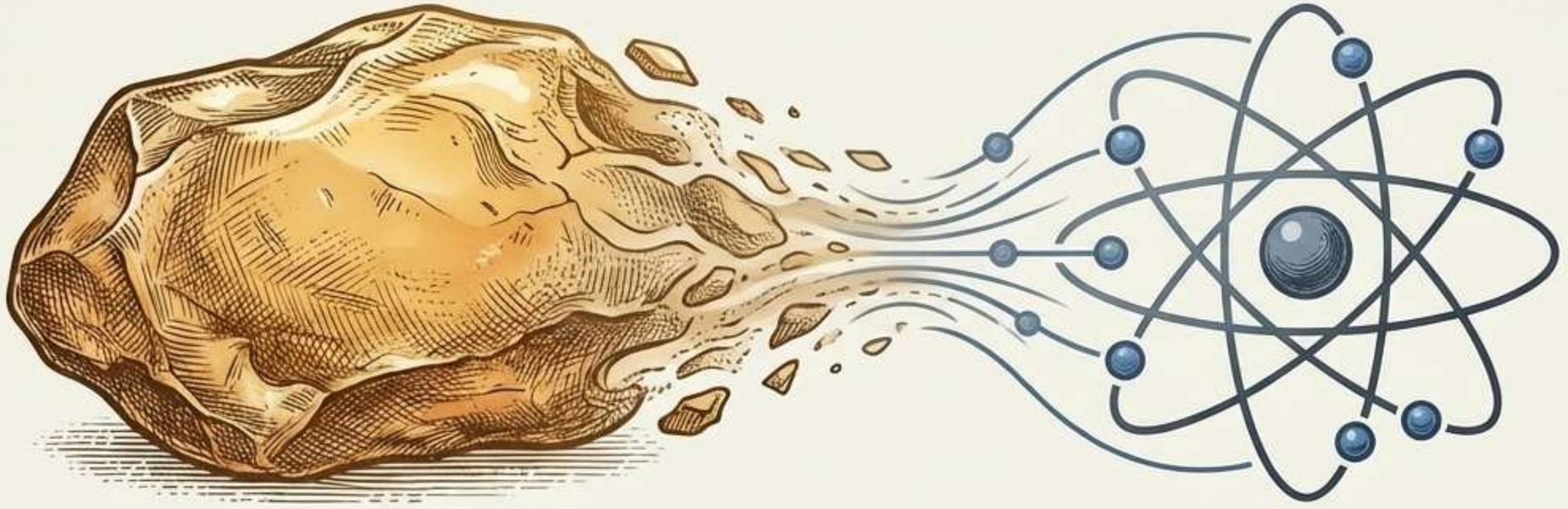
Air acts as a very good insulator. Charges cannot easily escape, allowing a massive static charge to build up on your body.



Summer (Humid Air)

The air is full of moisture. Water molecules in the air help extra electrons move away from you quickly and dissipate, preventing large charges from building up.

The full circle of electrostatics



A 2,300-Year Mystery

What began with Thales rubbing amber in 600 B.C. was categorized by Gilbert, debated by Du Fay, and finally systematized by Franklin's fluid conventions.

The Electron Reality

Electrification isn't a mysterious fluid; it is the physical transfer of electrons driven by electron affinity.

The World Around Us

From door knob shocks to hair standing on end, electrostatics is the invisible, mechanical transfer of charge dictating our everyday interactions.