A Universe from Coulomb and Newton

Two Mirror Forces — Charge for the Small, Mass for the Large

Claes Johnson

KTH Royal Institute of Technology, Stockholm claesjohnson@gmail.com

August 9, 2026

Abstract

A non-technical companion to the article *A Proton–Electron Cosmology*. It asks whether the universe can be built from just two forces that obey the *same* law in mirror image — Coulomb's law for electric charge and Newton's law for gravity — with no Big Bang singularity, no inflation, no dark-matter particle and no cosmological constant. Coulomb, acting on charge, builds matter at the small scale; Newton, acting on the energy of that matter, gathers it at the large scale.

All cosmology is speculative

It is worth saying plainly at the start: every cosmology is speculative at its foundations. The early universe is not something we can visit or repeat. The standard account — a hot Big Bang, a burst of inflation, a cosmos dominated by dark matter and dark energy — fits the data, but it does so with ingredients that are inferred, not seen: a singularity no instrument reaches, an inflationary epoch invented to smooth things out, and two "dark" substances that make up most of the universe yet have never appeared in any laboratory. In a subject resting on such foundations, it is fair — and useful — to ask what a *simple* alternative would look like, built not from new and unseen things but from the most ordinary ingredients physics already has.

This essay sketches one such alternative. Its ingredients are two laws you already know — **Coulomb's law** for electric charge and **Newton's law** for gravity.

Two forces, mirror images of each other

Here is the first thing worth noticing, and it is old news that we rarely dwell on: Coulomb's law and Newton's law have *the same shape*. Both fall off as one over distance squared; both can be written as the same field equation. They differ in only two ways:

- **a sign.** For electric charge, *like repels like* (two positives push apart). For gravity, *like attracts like* (two masses pull together). Gravity is Coulomb with the sign flipped.
- **a strength.** Each force has its own constant fixing how strong it is — and gravity's is fantastically smaller.

So the two forces are mirror images: the same law, one attractive and one repulsive, each with its own strength. This essay's proposal is simply that these two mirror forces, acting on two things — *charge* and *mass* — are enough to build a universe.

Two sources, two scales

The division of labour is clean. **Coulomb, acting on charge, rules the small**: it builds nuclei, atoms, molecules — all of matter and chemistry. **Newton, acting on mass, rules the large**: it gathers matter into stars, galaxies and the cosmic web. Charge is the source of the one force; mass (which, as we will see, is just energy) is the source of the other. Two forces, two sources, two scales — running in parallel, neither derived from the other.

The small world: Coulomb builds matter

Electric charge comes in two signs, and in this picture they come out *different in size*. The positive charge forms small, dense clumps — **protons**. The negative charge spreads into large, diffuse clouds — **electrons**. From just these, Coulomb's law builds the rest by simple geometry: electrons bound around protons make **atoms**; electrons shared between atoms make **molecules** and all of chemistry.

Remarkably, the same force reaches inside the nucleus. In this picture a nucleus is not held together by a separate "strong force." It is protons glued by *compact* electrons — the very same electrons, squeezed small — again by ordinary Coulomb attraction, only at a tiny scale where it is correspondingly strong. What looks like a new and powerful nuclear force is just electricity at close range. One force, two scales.

The large world: Newton gathers matter

Now the other mirror force. The matter Coulomb has built carries *energy*, and energy is what gravitates (a word on that below). Newton's law acts on it with the mirror of Coulomb's rule: where like charges *repel*, like masses *attract* — and, symmetrically, unlike masses repel. Mass too comes in two signs, positive and negative, and the two behave *identically*: each kind attracts its own and repels the other. So the large scale sorts itself into **chunks of like mass** — positive-mass chunks and negative-mass chunks — which clump within and push apart between.

We are made of *positive* matter, so we see the positive chunks as the glowing **cosmic web** of filaments and clusters. The negative-mass chunks, holding no ordinary matter and repelling ours, look to us like empty **voids**. But they are not empty: the apparent voids are *regions of negative mass*, and their steady push on the positive matter is exactly what astronomers call **dark energy**. No dark matter, no dark-energy substance added by hand — just the two signs of one gravitational force, seen from inside the positive one.

A word about "mass"

We have been saying gravity acts on *mass*, then on *energy*, as if they were the same. They are. Mass, looked at closely, is just a name for *energy content*: a thing's resistance to being pushed is set by how much energy it holds — that is the real meaning of $E = mc^2$, and it is measured directly (a single particle can be weighed by its energy; a nucleus weighs less than its parts by exactly the energy of their binding). So gravity acts on the energy of matter, which is what we usually call its mass. We need no mysterious extra substance called mass; energy suffices.

One further temptation should be resisted, honestly. It is tempting to say a particle's energy is fixed *entirely* by the size of its charge cloud — small and tight meaning high energy, like a stiff spring. Qualitatively that is surely right (the small proton is the heavy one). But the exact numbers do not line up: the proton is more compact than a simple size–energy rule would make it, by about a factor of ten. So we say only what is safe — energy and size are closely *related*, not exactly *identified* — and we do *not* claim that gravity is somehow secretly derived from electricity. The two forces run side by side; whether they are ultimately one is an open question, not a claim of this picture.

Two forces, two constants

Strip the picture to essentials and it rests on remarkably little: *two forces, each with a single strength.* Coulomb has its strength — the number physicists call the fine-structure constant — which, once fixed, settles all of atoms, chemistry and nuclei. Newton has its strength — the gravitational constant G — which settles how the energy of matter gathers into structure. Two constants, two mirror forces, two sources.

Compare the bookkeeping. The standard model of cosmology needs a singularity, an inflaton field, a dark-matter particle and a cosmological constant — a lengthening list of unseen ingredients. This picture asks for two force-strengths. The open questions are correspondingly few and sharp: neither constant is derived from anything deeper (nor are they in the Standard Model), gravity's extreme weakness is unexplained, and whether the two forces are at bottom one remains genuinely open. Two clean unknowns, in place of a menagerie of invisible substances.

A comparison with the standard model, and a soft spot in it

The standard cosmology — ΛCDM — rests on a hot Big Bang, with the cosmic microwave background (CMB) as its relic glow, supplemented by dark matter, dark energy and an early burst of inflation. Its single proudest piece of evidence is the CMB's spectrum: an almost perfect *Planck* (blackbody) curve, read as the thermal radiation of a hot, dense early universe once in equilibrium.

But this reads the evidence backwards. A perfect Planck spectrum is not something a hot dense gas naturally makes. In the author's analysis of blackbody radiation, a true Planck curve is the signature of a *resonant lattice* — a regular array of oscillators (a metallic crystal, a *gitter*) with a sharp high-frequency cutoff — and *not* of the disordered collisions of a hot gas or plasma, which have no such lattice and no such cutoff. On that analysis a hot dense fireball simply *cannot* generate a perfect Planck spectrum. (This contests the textbook view, by which any body in thermal equilibrium is supposed to radiate Planckian whatever its make-up; it is the author's position, developed at length in the blackbody work cited below.)

If so, the conclusion is sharp: **the CMB's near-perfect Planck spectrum is exactly what a hot dense gas would *not* produce** — so it cannot serve as evidence that any such hot dense initial state ever existed. **The CMB can say nothing about the existence of a hot dense beginning.** Its Planck form points, if anything, toward a resonant, lattice-like source — whatever and wherever that turns out to be — not toward a primordial fireball.

This is where the present picture simply steps aside. It has *no* hot Big Bang and no primordial fireball, so it neither needs nor claims the CMB as the relic of one. What the CMB is, and why it is so smooth and so Planckian, is left here as a separate open question — but its spectrum is *not* read as proof of a hot dense beginning, because on the blackbody analysis above it is no such proof.

A universe you could almost draw

That is the appeal. In place of an unrepeatable explosion followed by a cascade of unseen ingredients, here is a universe you could nearly sketch on a napkin: two mirror forces, one repulsive and one attractive, obeying the same law; electric charge of two sizes — small dense protons, large diffuse electrons; Coulomb assembling them into nuclei, atoms and chemistry; and Newton, acting on the energy of all that matter, gathering it into a cosmic web of positive-mass filaments and clusters, interleaved with negative-mass voids that push it apart. Two old laws, two constants — and the simplest question of all left standing: is nature really this economical? It may not be. But it is worth knowing what the simple answer looks like before reaching for the complicated one.

For the mathematics — the two-valued Poisson equations, the RealQM / RealNucleus computations, the ±-mass cosmic web, and the quantitative claims and open problems only gestured at here — see the companion technical article, C. Johnson, *A Coulomb–Newton Cosmology: Based on a Proton–Electron Model (RealQM/RealNucleus), and the treatise Real Quantum Mechanics (∼340 pp), both free from the RealQM gallery,* `https://claes542.github.io/RealMolecule/`.

For the blackbody argument — that a perfect Planck spectrum is the signature of a resonant lattice, not of a hot dense gas — see C. Johnson, *Computational Blackbody Radiation (online book).*