

# *On the Origin of Electric Charge: A Speculative Model for the Emergence of the Electron and Proton from the Neutron*

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## **Abstract**

*This paper addresses a foundational question that has received little direct attention in the physical sciences: what is the ontological basis for attributing negative charge to the electron and positive charge to the proton? Rather than accepting the conventional sign assignment as primitive, this study proposes a speculative model grounded in a monistic assumption – namely, that all atomic constituents emerge from a single primordial substance (prime matter). The model posits that the neutron is the first formed particle, arising from the aggregation of prime matter. Subsequently, the electron is emitted from the neutron, resulting in a loss of mass and internal energy by the neutron, which simultaneously transforms into a proton. Within this framework, energy deviation from a neutral equilibrium state (represented by the neutron) constitutes the physical correlate of electric charge. Specifically, the electron, as an energy-gaining entity, would more consistently be described as "positively charged" according to linguistic convention, while the proton, as an energy-deficient entity, would be described as "negatively charged." The paper acknowledges that this reverses established terminology but argues that the proposed model offers conceptual clarity regarding the relationship between charge, internal energy, and mass deficit. While speculative and philosophical in nature, the model is shown to be consistent with known mass relationships (neutron mass exceeding the sum of proton and electron masses). Implications for the conventional understanding of electrical neutrality are briefly discussed.*

*Keywords: Electric charge; electron; proton; neutron; philosophy of physics; energy deviation; prime matter.*

## **1. Introduction**

*It is well established that the net electric charge of a macroscopic object is determined by the imbalance between the number of electrons and protons it contains. An excess of electrons (relative to protons) yields a net negative charge; a deficit yields a net positive charge. At the atomic level, an atom becomes negatively charged if and only if it acquires one or more extra electrons in its outer shell, and positively charged if and only if it loses one or more of its outer electrons.*

*However, this standard account leaves a more fundamental question unanswered: What originally endowed the electron with its negative charge, and the proton with its positive charge? This question has occupied my thinking for many years. Each time I believed I had arrived at a satisfactory resolution, I found myself returning to the same starting point – the same foundational puzzle.*

*The present article does not claim to offer an experimentally verified theory. Rather, it proposes a speculative, philosophical model that re-examines the very concept of charge by tracing the hypothetical emergence of atomic constituents from a primordial substrate. I begin by considering four possible sequences for the appearance of the electron, proton, and neutron. After eliminating three possibilities on logical and mass-based grounds, I adopt the fourth – neutron-first emergence – as the basis for a reinterpretation of electric charge as an expression of internal energy deviation from a neutral equilibrium.*

## **2. Four Hypothetical Scenarios for the Emergence of Atomic Constituents**

*Let us denote the three fundamental constituents of the atom as the electron ( $e^-$ ), proton ( $p^+$ ), and neutron ( $n^0$ ). Their masses are known to differ significantly: the neutron is the most massive, followed by the proton, and the electron is the least massive (by a factor of approximately 1836). This mass hierarchy imposes constraints on any plausible emergence sequence.*

### **2.1 Scenario 1: Simultaneous emergence**

*One might hypothesize that all three constituents, or at least two of them, emerged simultaneously from prime matter. I consider this scenario unlikely for two reasons. First, it conflicts with the monistic assumption that all things originate from a single source (prime matter). Second, it is inconsistent with the matter-antimatter symmetry hypothesis, which would require the emergence of particle-antiparticle pairs of equal mass – a condition not satisfied by the electron, proton, and neutron.*

## **2.2 Scenario 2: Electron first**

*At first glance, the electron's small mass might suggest it as the earliest emergent particle. However, this scenario faces a serious explanatory burden: how could a negatively charged particle give rise to a positively charged proton or a neutral neutron? One might appeal to matter-antimatter pair production – specifically, the combination of positrons (antielectrons) to form protons, and the combination of equal numbers of electrons and positrons to form neutrons. While theoretically conceivable, this account lacks a compelling reason why the resulting numbers of electrons and protons in an atom should be equal. I therefore find this scenario insufficiently justified, despite its appeal to proponents of matter-antimatter symmetry.*

## **2.3 Scenario 3: Proton first**

*This scenario is readily dismissed. On the matter-antimatter emergence scale, the electron (as the lighter particle) would appear before the proton. On the prime-matter emergence scale, the neutron – being more massive and electrically neutral – is a more plausible first entity, as argued below.*

## **2.4 Scenario 4: Neutron first (adopted)**

*This is the scenario I adopt on the basis of theoretical parsimony and consistency with known mass relations. The core hypothesis is as follows:*

- Prime matter, conceived as the original substrate of all existence, coalesces to form the neutron.*
- The neutron is initially electrically neutral and possesses a characteristic internal energy level, which I term the energy equilibrium.*

- *The neutron then emits an electron. In doing so, it loses a portion of its mass and internal energy. This lost mass and energy become the properties of the emitted electron.*
- *Simultaneously, the neutron itself undergoes an instantaneous transformation into a proton.*

*This model has three immediate consequences:*

- 1. Mass consistency: The neutron's mass should be greater than or equal to the combined mass of the proton and electron. Empirically, the neutron's mass exceeds the proton's mass by approximately 2.5 electron masses, which is compatible with the model (the extra mass difference corresponds to binding energy and kinetic energy of the emitted electron).*
- 2. Number equality: In any atom formed through this process, the number of electrons must equal the number of protons. This follows directly from the one-to-one correspondence: each neutron that decays (or transforms) produces exactly one electron and one proton.*
- 3. Charge magnitude equality: The electron's charge and proton's charge must be equal in magnitude and opposite in sign. This is an empirical fact, and the model is consistent with it.*

### ***3. Reinterpreting Charge as Energy Deviation***

*Within the proposed neutron-first model, the neutron represents a state of energy equilibrium. The electron, having gained energy from the neutron, manifests a surplus of internal energy relative to this equilibrium. The proton, having lost energy, manifests a deficit.*

*If we take the linguistic connotations of "positive" and "negative" seriously – where "positive" suggests gain, increase, or surplus, and "negative" suggests loss, decrease, or deficit – then the electron would more appropriately be described as*

*positively charged and the proton as negatively charged. This is the reverse of conventional terminology.*

*Nevertheless, given the deeply entrenched nature of the existing convention (negative for electron, positive for proton) and the vast body of theory and experiment built upon it, I do not advocate for an actual reversal. Instead, I propose a conceptual reinterpretation: the conventionally "negative" charge of the electron should be understood as a marker of energy surplus, and the conventionally "positive" charge of the proton as a marker of energy deficit.*

#### ***4. The Neutron's Charge: Neutrality as a Secondary Concept***

*The neutron is conventionally described as electrically neutral. Within the present model, neutrality is not a primitive property but a derived one. It emerges as the designation for the state of energy equilibrium from which both positive and negative deviations (i.e., charge) arise. In this sense, the neutron's neutrality is meaningful only in relation to the electron's surplus and the proton's deficit. Without those deviations, the concept of neutrality would have no referent.*

#### ***5. Addressing the Mass Discrepancy***

*A careful reader may note that the mass difference between the neutron and the proton is approximately 2.5 electron masses, not exactly 1 electron mass as a naive reading of the model might suggest. This requires explanation.*

*The neutron loses not only the rest mass of one electron but also a portion of its internal binding energy. Part of this energy is consumed in the very act of electron emission (the "birth" process), and the remainder is carried away as the kinetic energy of the emitted electron. In relativistic physics, any loss of internal energy corresponds to a loss of mass (mass-energy equivalence). Hence, the neutron's mass deficit exceeds the rest mass of the electron by an amount equivalent to the energy expended in the emission and kinetic processes. This accounts for the observed ~2.5 electron mass difference.*

## 6. Conclusion

*This article has proposed a speculative, philosophically grounded model for the emergence of electric charge. The model begins with a single assumption – prime matter – and derives the neutron as the first formed particle. The electron is then emitted from the neutron, transforming the neutron into a proton. Within this framework, electric charge is reinterpreted as a manifestation of internal energy deviation from a neutral equilibrium: the electron embodies an energy surplus (conventionally called negative), the proton embodies an energy deficit (conventionally called positive), and the neutron embodies the equilibrium state itself (neutrality).*

*While the model reverses the conventional sign assignments if taken literally, it does not demand an actual change in terminology. Rather, it offers a conceptual clarification: what we call "negative charge" is, in physical terms, an excess of internal energy, and what we call "positive charge" is a deficit. The neutron's neutrality is the baseline against which these deviations are measured.*

*The model is consistent with empirical mass relations and offers a parsimonious account of why atoms contain equal numbers of electrons and protons. As a speculative exercise in the philosophy of physics, it invites further reflection on the relationship between charge, energy, and the primordial origins of matter.*

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