Energy as a Relational Property: A Mass–Space Interpretation of Nature

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Abstract

This article presents a reality-based conceptual interpretation of energy intended to provide a unified understanding applicable across macro, micro and micro-micro physical domains. Energy is interpreted not as an independently existing substance, but as a relational property associated with matter through differential state conditions such as velocity, temperature, charge potential and gravitational level. Within this framework, the distinction between *energy* and *energy level* becomes fundamental, since the feasibility and direction of physical interactions depend primarily upon energy level rather than merely upon total energy content. Mechanical, thermal, electrical and radiative phenomena are examined to illustrate this distinction.

The article further explores conceptual issues associated with the conventional interpretation of photon energy. An alternative qualitative framework is proposed in which the relation

$$E = h\nu$$

may be interpreted as representing photon energy level rather than total photon energy alone. In this exploratory model, photons are considered possible physical particles of a finer micro-micro domain possessing extremely small but finite mass together with an intrinsic photonic charge state. Wave behaviour is interpreted as a mathematical representation of underlying particle interactions rather than an independent physical ontology.

The work also develops a mass-space framework in which charge, energy and interaction processes arise from non-equilibrium distributions of mass and space. Electrical, thermal and radiative phenomena are interpreted as manifestations of structurally similar processes occurring across different domains of matter organization.

The article does not reject the significance of mathematical physics; rather, it argues that qualitative realization of physical reality logically precedes quantitative formalization. The objective of the work is therefore to establish a conceptual foundation for future mathematical and electromagnetic development within a causality-oriented and physically interpretable framework of nature.

Keywords: *Relational Energy, Mass–Space Interaction, Energy Level, Photonic Charge, Charge Potential, Micro-Micro Domain, Reality-Based Physics.*

Mass–Energy Relation

Energy is commonly understood as the capacity of a system to produce change. In physical reality, however, energy is never observed as an independently existing entity detached from matter or physical structure. Every observable manifestation of energy is associated with a material system, field configuration or state condition of matter. From this perspective, energy may be interpreted as a relational property arising from the differential state of matter relative to its surroundings or to a chosen frame of reference [1].

A body situated on the Earth and possessing the same velocity, temperature, charge potential and gravitational level as its surroundings may be regarded as having no externally observable energy relative to that environment. Nevertheless, the body may still contain internal energy associated with microscopic structural non-equilibrium. When complete internal and external equilibrium is attained, no net exchange of momentum, heat or charge occurs with neighbouring matter. In such a condition, the system may be described as existing in a zero-energy-exchange state relative to that frame of reference.

If the reference frame changes, the same body may again exhibit energy because energy depends upon differential state relations rather than absolute existence. Transfer of matter between different reference environments naturally produces processes such as heat transfer, momentum exchange, and charge redistribution until a new equilibrium state is established.

This interpretation suggests that energy is fundamentally connected with both matter and state difference. While such a conception appears intuitive in the macro domain, conceptual difficulties emerge in the micro and micro-micro domains, particularly in the interpretation of photons and nuclear processes. In conventional physics, photon energy is treated independently of rest mass, whereas nuclear processes directly associate mass with energy transformation. These conceptual differences motivate the search for a more domain-independent understanding of energy.

An important distinction must therefore be made between *energy* and *energy level*. Energy determines the total capacity for interaction, whereas energy level determines the feasibility and direction of a specific process. Several familiar phenomena illustrate this distinction:

- A body containing a large quantity of heat energy at a lower temperature cannot transfer heat to another body at a higher temperature, whereas a smaller quantity of heat at higher temperature can do so.
- A body possessing lower kinetic energy but higher velocity may rise to a greater height against gravity than another body possessing greater total kinetic energy but lower velocity.
- Low-intensity high-frequency radiation can produce stronger photoelectric effects than high-intensity low-frequency radiation.

These examples indicate that physical interactions are governed not merely by total energy content, but also by the state parameter associated with energy level, such as temperature, velocity, frequency or potential.

In conventional quantum theory, photon energy is expressed by

$$E = h\nu$$

where (ν) represents frequency and (h) is Planck's constant. Within the present conceptual framework, this relation may alternatively be interpreted as representing photon energy level rather than total photon energy alone. The possibility is proposed that photons may possess extremely small but finite physical mass associated with a deeper micro-micro domain of matter organization. Such mass, if it exists, would be far below present experimental detectability.

In the conventional interpretation, frequency is regarded as a property of electromagnetic waves. In the present particle-oriented interpretation, however, wave behaviour is treated as a mathematical representation of underlying particle interactions rather than an independently existing physical entity. The state parameter associated with photon energy is proposed to arise from an intrinsic photonic charge state determined by the mass-space structure of the photon.

The present proposal remains exploratory and conceptual. Its physical validity and predictive capability would require substantial mathematical and electromagnetic development. The immediate objective is therefore to establish a qualitative conceptual foundation for a domain-independent understanding of energy extending from macro to micro-micro physical domains.

Understanding Energy Through Mass–Space Non-Equilibrium

Within the proposed framework, homogenization between mass and space does not occur through direct displacement because mass and space are considered mutually

integrated aspects of physical existence. Instead, homogenization proceeds through the interaction and redistribution of mass-rich and space-rich particles.

Every local space medium is characterized by a definite mass-space ratio determined by the organization of its constituent space-matter particles. A particle whose mass-space ratio differs from the equilibrium ratio of the surrounding medium behaves as an active entity capable of rearranging the local structure in the direction of a new equilibrium distribution. Similar considerations apply to both mass-rich and space-rich particles.

Particles existing in non-equilibrium states relative to a reference frame may therefore be interpreted as active or charge-bearing particles. In this framework:

- Micro-domain particles are associated with electric charge,
- Micro-micro-domain particles (photons) are associated with photonic charge,
- Sub-photonic particles are proposed to possess thermal charge.

Although the underlying concept of charge remains common across domains, the strength and range of interactions vary significantly with scale.

An analogy may be drawn with the behaviour of an electrical capacitor. A capacitor stores electric charge at different electric potentials, where the stored charge is proportional to voltage. Similarly, a thermal system stores thermal charge at different thermal potentials represented by temperature. From this viewpoint, electrical and thermal phenomena may be interpreted as structurally analogous manifestations of mass-space activity at different organizational levels of matter.

This interpretation also provides an alternative conceptual basis for understanding electric charge. Conventional theory attributes opposite charge types to protons and electrons. In the present framework, however, positive and negative charge are interpreted as relative manifestations of differing mass-space ratios rather than fundamentally different substances [2]. Neutralization therefore represents attainment of equilibrium between differing charge potentials rather than annihilation of opposite entities.

The charge potential of matter is proposed to arise from the ratio of mass content to space content. Matter possessing identical mass-space ratios remains mutually neutral because equilibrium already exists between them. Consequently, neutrality is interpreted as a relational state property rather than the absolute absence of charge.

The apparent positive and negative signs of charge emerge only within a relative scale, analogous to positive and negative temperature scales defined relative to a chosen reference state. The feasibility of charge interaction depends upon potential difference rather than upon the existence of fundamentally distinct charge substances.

This approach attempts to provide a unified conceptual basis for attraction, repulsion, and charge neutralization while preserving continuity with observable electrical and thermodynamic phenomena.

Different Forms of Energy

Different forms of energy such as thermal, kinetic, electrical, sound and light energy are experienced in the macro domain. Although mutually convertible, each form is conventionally defined through distinct physical manifestations and characteristic modes of interaction.

Thermal energy, for example, expresses the dynamical condition of the internal structure of matter through the organization and interaction of its constituents. Macroscopic temperature thus reflects microscopic structural dynamics.

If finer levels of matter organization exist within deeper domains of nature, then particles of the micro domain may likewise possess internal structural states analogous to the thermal states of macroscopic bodies. Extending this reasoning further, all forms of energy observed in the macro domain may potentially be interpreted as manifestations of structural and dynamical processes occurring within progressively finer levels of matter organization.

Within the proposed framework, particles of every domain possess structured mass-space organization consisting of nucleus-like and extra-nuclear regions [3]. Variations in local mass-space ratio generate differing charge potentials and interaction behaviours. Matter appearing neutral in one reference frame may exhibit charge behaviour in another frame characterized by a different equilibrium mass-space ratio.

This concept may be clarified through familiar examples. A body maintained inside a furnace at temperature (t_0) possesses no thermal energy relative to the furnace environment because equilibrium exists. However, when removed into a cooler environment, the same body exhibits heat energy and temperature relative to the new frame of reference.

Similarly, charge carriers confined within an electrical condenser at equilibrium potential possess no effective electrical energy relative to that system. When transferred

into another environment possessing different potential conditions, electrical energy becomes observable.

In this manner, energy and energy level emerge as complementary but distinct concepts. Energy determines the total capacity for work, whereas energy level determines the feasibility and direction of interaction.

The proposed framework further attempts to interpret all fundamental interactions in terms of basic mass-space relations involving:

- mass-space attraction,
- mass-mass repulsion,
- space-space repulsion.

Within this interpretation, the conventional distinction between two fundamentally different electric charges is replaced by a unified description based upon relative mass-space ratios [2].

Although exploratory in nature, the approach seeks to develop a broader and more causality-oriented interpretation of energy, charge and interaction processes. If successful, such a framework could contribute toward the development of a more unified understanding of physical reality across all domains of nature.

Conclusion

The present work has attempted to develop a qualitative and reality-based interpretation of energy applicable across macro, micro and micro-micro domains of nature. Energy has been interpreted not as an independently existing substance, but as a relational property arising from differential state conditions of matter relative to a chosen frame of reference. Within this framework, the distinction between *energy* and *energy level* becomes fundamentally important, since the feasibility and direction of physical interactions depend primarily upon energy level rather than merely upon total energy content.

The article further proposes that thermal, electrical, radiative, and mechanical phenomena may be understood through a generalized mass-space framework in which interaction processes arise from non-equilibrium distributions of mass and space. Charge is interpreted as a state property associated with mass-space ratio, while positive and negative charges are treated as relative manifestations of differing charge potentials rather than fundamentally different entities. This interpretation attempts to provide a unified conceptual basis for attraction, repulsion and charge neutralization phenomena.

The work also explores an alternative interpretation of photon energy in which the relation: $E = h\nu$, may represent photon energy level rather than total photon energy alone. Within this exploratory framework, photons are considered possible physical particles possessing extremely small but finite mass together with intrinsic photonic charge states. Wave behavior is interpreted as a mathematical representation of underlying particle interactions rather than an independently existing physical ontology.

The proposed framework remains conceptual and requires substantial mathematical, electromagnetic and experimental development before its physical validity can be evaluated rigorously. Nevertheless, the approach seeks to emphasize that qualitative realization of physical reality logically precedes quantitative formalization. By attempting to generalize the interpretation of energy, charge and interaction across different domains of matter organization, the work aims to contribute toward the development of a broader and more causality-oriented understanding of nature.

Reference

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