

## The Asymmetry Between Matter and Antimatter

I refer to your article entitled “**The Asymmetry Between Matter and Antimatter**” by Helen R. Quinn (PHYSICS TODAY, February 2003, page 30).

According to the author, our universe is characterized by matter – antimatter asymmetry: If **CP** is **conserved**, the matter – antimatter asymmetry could only be accounted for by initial conditions. If, on the other hand, **CP** is **not conserved** the asymmetry could result from cosmic evolution.

The sad thing about the article is that the claim is made by **fiat**, as no scientific proof was provided – it was at best a mere **belief**, or **make believe**. Our intention here is to establish the following: All Newtonian and Einsteinian systems (i.e. **causal** systems - the subject of the **first** and **second revolutions** in science) are characterized by **matter – antimatter symmetry** and matter – antimatter asymmetry respectively. **Non – causal** systems (i.e. manifestly chaotic systems – the subject of the **third revolution** in science) on the other hand are characterized by **matter – antimatter asymmetry**. The symmetry or asymmetry is primordial having nothing to do with the cosmic evolution of the universe.

We first note that **C** is not fundamental. Imposing **CP** transformation leads to the unphysical situation that neutral and charged particles which are subject to the same statistics have **different** transformation properties. It is

enough to impose only the **P** transformation, subject to the requirement that all physical states in the universe be electrically neutral.

### **The Newtonian World**

We start with the Newtonian World whose **furniture** are **macro objects** and **infrastructure** is **gravitation**. The essence of Newton's work is that the **geometry** of the macroworld is euclidean and the geometrical structure of macrostates is given by<sup>1</sup>:

$$\mathbf{8} = (\mathbf{3} : \mathbf{3}; \mathbf{2}), \text{ for states of relative motion,} \quad (1)$$

$$\mathbf{8} = (\mathbf{3} : \bar{\mathbf{3}}; \mathbf{2}), \text{ for states of relative rest,}$$

The numbers  $a(\bar{a})$  representing world (antiworld) dimensions. The first of (1) is a geometrical description of classical dynamics and the second a geometrical description of statics; we call them classical geometrodynamics and geometrostatics respectively. Recall that for statics "**3**" and "**3̄**" stand for matter and "antimatter" forces respectively, which by Newton's law are equal and opposite. It follows that the macroworld admits both matter – antimatter symmetry and P invariance.

Because of P invariance the world and antiworld of macrosystems undergoing bounded motion are described by the same orbital angular momentum operator  $\bar{l}$ . When all motions have ceased (*i.e.*  $l = 0$ ), the geometrical description gives  $\mathbf{8} = (\underline{\mathbf{2}} : \bar{\mathbf{2}})$ . There is no contradiction here because the two dimensional time – energy "space" can be occupied by either neutral or charged spin  $\frac{1}{2}$  particles and antiparticles – recall that the 3 – dimensional space

of the macroworld is occupied by three – dimensional (space – like) objects. It follows that when  $\ell = 0$  the geometrical structure of the corresponding microstates is given by:

$$\mathbf{8} = (\mathbf{2} : \bar{\mathbf{2}}; \mathbf{2} : \bar{\mathbf{2}}), \text{ for fermion absolute state of rest.} \quad (2)$$

Here the first pair  $(\mathbf{2} : \bar{\mathbf{2}})$  represents charged and the second neutral fermions. Physically the first pair represents **electron – positron** pair, and the second **electron – neutrino – antineutrino** pair, or **proton – antiproton** pair and **neutron – antineutron** pair.

The Dirac theory gives only the charged states, that is the first pair  $(\mathbf{2} : \bar{\mathbf{2}})$ , the Dirac theory is therefore incomplete! It is obvious from the foregoing that the Dirac theory is an extension of the Newtonian World to its absolute state of rest. It is seen that the Newtonian world admits both P invariance and matter – antimatter symmetry. Our theory has been confirmed by the discovery of antiprotons, antineutrons, neutrinos, antineutrinos, and antihydrogen. In fact every chemical element has a corresponding antichemical element. Therein lies an untapped energy resource.

### **The Einsteinian World**

The furniture of Einstein's world are **micro objects** and the **infrastructure** include all of nature's **fundamental interactions**. The essence of Einstein's work is that the geometry of the microworld is pseudoeuclidean and the geometrical structure of **microstates** is given by<sup>1</sup>:

$$\mathbf{8} = (\mathbf{4} : \mathbf{4}), \text{ for relative states of motion} \quad (3)$$

(3) gives the formal structure of relativistic geometrodynamics.

For a bounded motion, the system is described by a time dependent angular momentum which is odd under P. We see that here the time is an operator and not an absolute parameter as in the Newtonian World. When all motions have ceased ( $\bar{p} = 0$ ), the geometrical structure of the microstates, consistent with the requirement of pseudoeuclidean and P asymmetry, is given by<sup>1</sup>:

$$\mathbf{8} = (\mathbf{1} : \bar{\mathbf{3}}; \mathbf{3} : \bar{\mathbf{1}}), \text{ for boson absolute state of rest} \quad (4)$$

The corresponding physical states are occupied by spin zero particles which are not antiparticles of each other (monopoles) and a spin 1 particle and its antiparticle. The charged state of (4) is occupied by the SWG particles  $(\gamma, w^+, w^-, z^0)$ , while the neutral state admits the particles  $\gamma, w^0, \bar{w}^0$ ; and  $z^0$ ; the  $w^0(\bar{w}^0)$  being the elusive Higgs particles.

We see from the foregoing that the SWG theory is merely an extension of the Einsteinian world to its absolute state of rest. We conclude from (4) (or from the charged and neutral partners) that the Einsteinian world is P asymmetric and matter – antimatter asymmetric as well.

## The World of Chaotic Systems

There exist systems in nature to which causality does not apply – they occur with or without human intervention. Such systems are said to be manifestly chaotic. Examples include weather, natural disasters like earthquakes, hurricanes, tornadoes, etc., the dynamics of stars, etc.

Professor Edward Norton Lorenz of M.I.T., a meteorologist, was the first scientist to undertake a serious (model based) study of classical chaotic systems. His work on chaos laid the foundation for the third revolution in science. The distinguishing feature of chaotic systems is that its background is not, unlike the Newtonian and Einsteinian systems, endowed with any discernable geometry, and hence there do not exist associated dynamical variables and equations of motion<sup>3</sup>. The microstates of such a system are described geometrically by<sup>1</sup>:

$$\mathbf{8} = (\mathbf{2} + \mathbf{3} : \bar{\mathbf{3}}), \text{ or } (\mathbf{3} : \bar{\mathbf{3}} + \bar{\mathbf{2}}) \quad (5)$$

Here the “+” stands for strong or weak nuclear interaction. The states are thus purely interacting particle – particle states, called interacting fermion – boson states. The particles that feature here (physically) are the fermions, and the bosons  $w^+, w^-, w^0, \bar{w}^0$ , showing that the w’s mediate weak and strong nuclear interactions. These states are therefore characterized by matter – antimatter asymmetry.

The state (5) is clearly distinct from those described by Dirac (i.e. (2)) and SWG (i.e. (4)); it gives the basic structure of chaotic systems. The furniture of the chaotic world are therefore fermions, and charged and neutral vector bosons. (5) is the basic structure of the **third revolution** in science.

### **Concluding Remarks**

The three structures (2), (4), and (5) are primordial, and are the cosmic basic structures of the universe in that all of the universe can be constructed from them: our world (macroworld), described by (1) evolved from (2), with the leptons and nucleons as the “building blocks”; the radiation dominated world described by (3) evolved from (4); and (4) itself describes the primordial state where the four fundamental interactions are fused into one electroweak-graviweak force. Electrical neutrality of the universe requires that the three charged physical nuclear states of (2), (4), and (5) have corresponding three distinct lepton states. The solutions of the contemporary global energy challenge, global warming, natural disasters etc are all derivable from (5).

Finally, we have created here three parameter-independent elementary absolute geometrical entities described by (2), (4), and (5) with which the universe is constructed. These entities are the nature’s basic designs for the universe akin to engineer’s or architect’s designs for structures. The building blocks are the fermions (leptons and nucleons) and bosons that nature has chosen and the building materials are the familiar five parameters, namely, **e**, **c**, and the three force constants, **h**, **h’** and **h’’**. The universe began with **5** primordial nuclear states, three charged and two neutral and three neutrino oscillations –

free lepton states, characterized by minimum entropy. The macroworld evolved from (2) into (1) via fusion reactions in the stars that created the fermions and bosons<sup>3</sup>, and the radiation-dominated world (3) evolved from (4) via the fragmentation of the electroweak – graviweak force.

Lastly we note that the powerful and influential competition has a **machine-driven** approach. There is a **parameter – driven** method that has resulted in a parameter glut and plethora of particles whose source is not known. Their model theory is anchored on **6** quarks as elementary confined objects whose existence can only be inferred! According to them the universe began as a blazing hot quark – lepton soup, characterized by maximum entropy, which metamorphosed into the present world via a cataclysmic explosion called (hot and cold!) big bang.

## References

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