THE PHOTON--NONPHOTON UNIVERSE CONCEPT

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This note presents a brief description of a somewhat unconventional model of the universe. For additional detail, the reader is referred to two papers: A technical brief is given in our 20-page, June 2005 paper entitled "A Photon-Nonphoton Universe (Technical Brief)"; and, a detailed report on the model's construction and features is given in our 134-page, 19 November 2002 document entitled "A Photon-Nonphoton Universe".

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From various studies dating back to the late nineteen-forties, ideas emerged that suggested a particularly simple model of the universe. The model is infinite in both its extent and age. Hence it predicts that, as we become able to see farther, we will continue to find galaxies in the same stages of development as those thus far observed. An infinitely large and old universe, of course, avoids the need for an "inflationary" epoch and also the potentially reoccurring problems regarding conflicting estimates of the age of a "big bang" universe and the various objects therein. On the largest cosmological scale, the model envisions a uniform distribution of the various entities making up the universe exist at all times. On lesser scales, patches of the modeled universe may experience "mini-big-bang" events that yield the observed mix of the low-mass nuclei as these hot spots cool toward the nominal 2.73 Kelvin level of the observed microwave background photons.

A Two-Vector Formalism

In the modeled universe, the microwave photons and all things consist of point-like particles whose properties conform with special relativity and whose interactions conform with the conservation of inertial mass-energy and momentum. Particle properties are expressed in terms of two perpendicular formalism vectors. The normal to the plane of the two vectors parallels the direction of a particle's motion. A particle's inertial mass-energy is given by the sum of the squares of the two vector lengths in units of ε, a tiny unit of energy. In units of ε/c, where c is the speed of photons, the magnitude of a particle's momentum equals twice the product of its two vectors' lengths. Thus, in units of photon speed, a particle's speed equals twice the product of its vector lengths divided by the sum of the squares of these two lengths.

If a particle's vectors are of equal length, it moves at photon speed and we refer to it as a "photonic". If a particle's vector lengths are unequal, its speed is less than a photonic's and we refer to it as a "nonphoton". Photonics and nonphotons are the two basic particle species in the modeled universe to which we refer as the "photon-nonphoton universe".

Particle Fusion and Fission

Because of certain limited similarities of a particle's energy and momentum properties with those of electromagnetic fields, we will refer to one of a particle's two formalism vectors as its "electric" vector and to the other as its "magnetic" vector. Underlying the construction of the photon-nonphoton universe model is a postulate that governs allowed particle fusion and fission events as such would be viewed in a "preferred" inertial frame. An observer in the preferred frame would see isotropically-moving microwave background photons with a 2.73 Kelvin Planckian spectrum. As viewed in the preferred frame, the fusion of two particles may occur if their electric vectors be additive and their magnetic vectors be additive to form a composite particle with formalism vectors equal to those obtained by such vector addition. And, the converse fission process is also in accord with the cited fusion-fission postulate.

In other than the preferred frame, the above postulated "law" for fusion and fission is expressible in terms of the observable velocity of such a frame relative to the preferred frame. However, the preferred frame offers the simplest examination of the fusion-fission processes. For this reason, the following discusses such events as they would be observed in the preferred frame.

Photons and Nonphotons in Equilibrium

The fusion-fission postulate, together with the mass-energy and momentum conservation requirements, leads to a simple universe model where photons and nonphotons exist symbiotically. That is, a pair of photons may fuse to form a nonphoton which may later fission to return the same two photons to the universe. To establish the densities of photons and nonphotons that symbiotically come to equilibrium to form a 2.73 Kelvin universe, we follow the approach used by Bose to replicate Planck's black body photon spectrum. The energy of a particle is taken to equal an integer times ε, now a tiny quantum of energy that is much smaller than the average energy of microwave background photons. The figure shows how the family of nonphoton-spectrum curves tucks under Planck's curve for the photon spectrum.

The average energies of the two particle-species in the 2.73 Kelvin universe are comparable, being of the order of a thousandth of an electron volt. The average nonphoton speed is found to be about 81% of photon speed. However, the total densities of the two species differ by a very large factor—one of the order of the ratio of the average microwave photon energy to that of the tiny ε-quantum. On the basis of the nonphoton gravity concept later discussed, we estimate that ratio to be about 10^{77}.

The estimated "dark energy" density of the ethereal nonphotons is about 10^{74} times that of the observed average energy density of ponderable matter and radiation in the universe. This large dark energy density ratio falls in the wide (10^{55} to 10^{120}) range compatible with quantum-mechanic considerations of the vacuum's energy. It may also be noted that a divergent chain reaction, where photons induce fission of nonphotons into photon pairs, offers an explanation of mini-big-bangs in portions of the infinite modeled universe. The matter and radiation in a 10-billion light-year radius sphere, for example, has an estimated inertial mass-energy equal to that of the photons born from the fission of all the nonphotons in a 32-meter radius sphere.

Cosmological Photon Redshift

The observed redshift of light that has traveled cosmological-scale distances is generally attributed to special relativistic Doppler effects. Being based on special relativistic point-like particle dynamics, the photon-nonphoton universe model also recognizes this type of redshift. However, we do not require that the observable universe be expanding to explain redshift as does a "big bang" scenario. How could redshift occur in the modeled universe which is not only infinite but also static when viewed on the largest cosmological scale?

Basically, as a photon emitted from a source travels to a detector, the tiny ε-quanta of the source photon are progressively lost via fusion with the quanta of the microwave background photons. Half of the mass-energy of the nonphoton debris thus formed equals that lost by the redshifted source photon. For small source-to-detector distances, this type of redshift is roughly proportional to distance. At large distances, the redshift tends to increase exponentially with distance. Thus a dark night sky is assured in an infinite static universe that is uniformly populated by photon sources. It is noted that if the near-exponential increase of redshift at large distances is used to compute a speed via the Doppler equation, the result might be interpreted as an acceleration of the rate of expansion of an expanding universe.

Nonphoton Gravity

The photon-nonphoton universe model assumes the bodies of solar-type systems present very thin targets to the ethereal nonphotons of 2.73 Kelvin space. On this basis, it is demonstrated that the Newtonian gravitational force between two bodies may be understood in terms of elastic collisions of nonphotons with the basic constituents (photonics) making up weighable (ponderable) matter. In essence, one body perturbs the isotrophy of the directional nonphoton flux that would otherwise exist to bombard a second body in its neighborhood. As a result of such anisotrophy, elastic impacts of nonphotons with a body's photonic constituents pushes each of the bodies toward the other.

Most of the mass of a solar system body is that of its nucleons. These particles are modeled by very thin rings of circulating photonics. Dynamic equilibrium requires that a ring's surface feels a pressure, P, that satisfies $PV = Mc^2$, where V and M represent the volume and the mass of a modeled nucleon. The model takes the ring surfaces to be impermeable to nonphotons, which hit and rebound from such surfaces to produce the pressure P. This, together with considerations of the uncertainty of the measured values of Newton's gravitational constant, permits the demonstration that gravitational force may be understood in terms of elastic impacts of nonphotons on the photonics in the thin-ring particles of ponderable matter. Because the constituent rings of ponderable matter bodies are so very thin, the bodies themselves present thin targets to the ethereal nonphotons. An estimate of the value of P sufficient to confine a thin ring's circulating photonics to its interior is $\sim 0.69 \times 10^{64}$ dynes/cm^2.

Using the PV = Mc^2 equation, multi-ring models of the electron, proton and neutron have been designed to conform with four of each particle's important properties: mass, charge, angular momentum and magnetic moment. According to these models, when seen in an inertial frame where an electron or a nucleon is at rest, the observer sees photonics moving in circular orbits, the system's mass-energy being that of the community of circulating photonics. We note that a nonphoton seen at rest may also be visualized as a system of photonics moving around a circle of a certain radius. As seen by an observer moving in the direction of the normal to the circle's plane, the photonics would move along helices on the cylinder generated by the moving circle. Thus nonphotons, like electrons and nucleons, may be visualized as a community of photonics moving along paths which look closed to observers in a nonphoton's rest frame.

It appears that all particle-types considered in constructing a photon-nonphoton universe model may be considered to be systems of constituents that are seen in all frames to move at the same speed—that of the speed of light. Since a system cannot move faster than its fastest constituent, we may understand why the speed limit of the particles of nature is c, the speed of light.

In contrast to Einstein's "warped space-time" approach to an understanding of gravity, the nonphoton gravity concept offers an explanation of Newtonian-level gravity in terms of elastic impacts of the copious and ethereal nonphotons on the photonics making up ponderable matter. Nonphoton Newtonian gravity necessarily assumes "thin targets" where only first collisions significantly contribute to gravitational force. To bring the nonphoton gravity concept into accord with the successes of Einstein's general relativity, consideration of bodies that present "thick targets" to nonphotons may be required.

The Multiplicity of Nonphoton Roles

The ethereal nonphotons appear capable of playing multiple roles in an infinitely large and old universe. As previously noted, they give the microwave background photons "something to be in equilibrium with". Also, they act to maintain the photon-like constituents of electrons and nucleons in dynamic equilibrium as they move inside thin annular regions. And, they collide elastically with these photonic constituents of weighable bodies to explain the Newtonian gravity acting between such bodies. Their high “dark energy” density serves to fuel “mini-big-bangs” and is also in accord with the high values required by the vacuum of quantum theory.

At least three other roles need to be added to this list. One is their ability to mimic the existence of a gravitating “dark matter”. The second is their ability to mimic—under certain conditions—the existence of a repulsive gravitational force between systems made up of photonic constituents. The third is their capability to be transmuted into high-energy photon beams, a feature that offers a candidate explanation of “gamma burst” observations.

Thus far, we have been able to bring into coarse focus some of our universe model’s features by noting the multiple roles nonphotons might play in explaining old and new observations. Future studies will attempt to sharpen the focus while exploring other candidate roles of nonphotons.

Looking Back and Looking Forward

Looking back to times before the discovery of the 2.73 Kelvin microwave background photons, we note that Newton considered bodies to translate or rotate relative to an “absolute space” which appears to correspond to the “preferred inertial frame” of the photon-nonphoton universe model. And, Einstein conjectured that “The general theory of relativity renders it likely that the electrical masses of an electron are held together by gravitational forces”.The same nonphotons that cause gravitational forces in a photon-nonphoton universe also act to confine the electrically charged photonics of an electron within a small toroidal region. Thus, the emerging universe model is in accord with Newton’s concept of an absolute space and also with Einstein’s conjecture on gravitational-force confinement of a fundamental particle’s contents.

Looking forward in time, a few possible experiments to test aspects of the photon-nonphoton universe model come to mind. First, redshift observations should yield a constant when the distance to the photon emitter is divided by the natural logarithm of λ_d divided by λ_e. Here, λ_d and λ_e are the wavelengths of the detected and emitted photons, both emitter and detector being at rest in the preferred frame. Second, the average nonphoton, bearing news that a strong gravitational event had occurred, should be found to travel at about 81 percent of photon speed in the preferred frame. Third, if nonphoton bombardment of the photonics of the photonic-ring models of electrons and nucleons is a valid representation of their response to a gravitational field, then the weight of a magnet may be found to vary with its orientation in the gravitational field. Fourth, possible experiments related to the feasibility of a controlled nonphoton-fission reactor should be identified.

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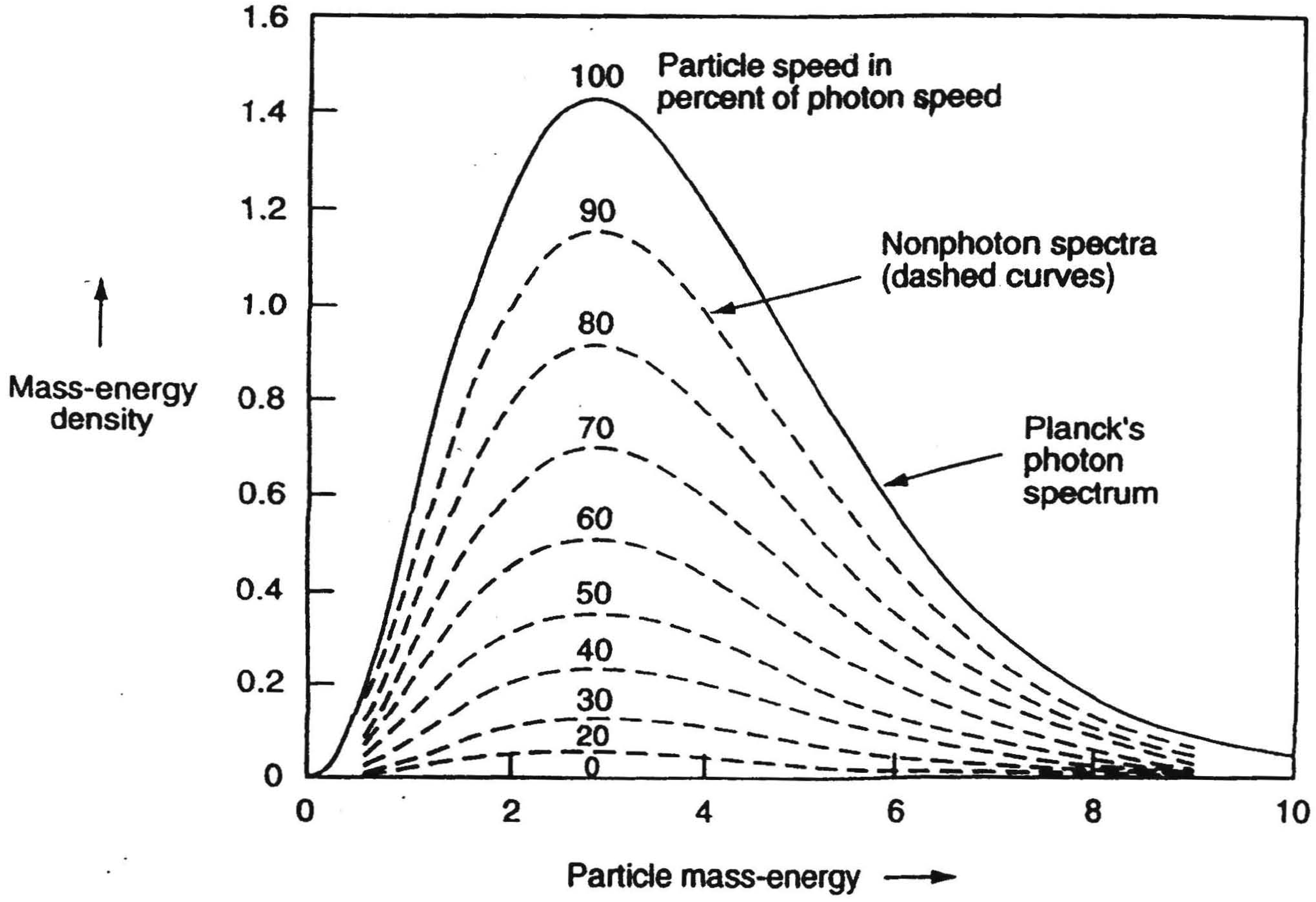

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