Island Universe Cosmology v1.0

An Open Source Model

The Island Universe Framework

- **Strong Relativity** – the vast cosmos we observe is not a singular, unified, coherent entity. Rather it is recognized as a vast collection of only partially overlapping matter-energy systems, inherently unknowable in extent, which does not comprise a unitary system in any physically meaningful sense. It follows that the cosmos cannot be successfully quantified as a unified system. Consequently, all reference frames are local and there does not and cannot exist a universal reference frame of any sort.
- **Complementary Reference Frames** – there are two distinct and complementary types of reference frame necessary when attempting to accurately model physical reality:

    1. The three spatial dimensions plus time (3D) frame of matter.
    2. The four spatial dimensions (4D) frame of electromagnetic radiation.

- **Galaxy Formation** – takes place in the manner suggested by the astronomer Halton Arp's observations of active galaxy/quasar associations.
- **The Speed Of Light** – varies with position in a gravitational field.

The Island Universe Model: Structure

I. Definitions: The Fundamental States

1. The cosmos has two fundamental states, matter, and energy.
2. Matter is 3-dimensionally localized and has rest mass.
3. Energy is 4-dimensionally non-local, electromagnetic radiation.
4. Energy is produced by matter.
5. Matter is formed of energy.

II. Gravity

1. Matter presents a 3-dimensional hole to the omnidirectionally-sourced, 4-dimensional energy background of the cosmos.
2. Energy is attracted by and drains into 3-dimensional matter in the manner observed.
3. The energy-density gradient surrounding a gravitating body constitutes the gravitational field of the body.
4. On the cosmological scale the only thing that separates material bodies is energy.
5. Two material bodies produce a gravitational-attraction effect by each locally draining the energy field separating them.

III. The Variable Speed Of Light

1. Mass (m) is the measure of the energy (E) constrained in a unit of matter (M), such that $E/M=(m/M)c^2$.*

2. c^2 is the omnidirectional speed of an expanding spherical wavefront of light.
3. According to The General Theory of Relativity*, c*, the speed of light *in vacuo*, varies with position in a gravitational field.**
4. As the speed of light diminishes in a collapsing gravitational well, the mass per unit matter is reduced by the release of energy, in accord with $E/M=(m/M)c^2$.
5. Gravitational collapse is self-limiting.
6. Quasars are the end-product of gravitational collapse.
7. Quasars are not at their redshift-inferred distance.

IV. Galaxies

1. Quasars are nascent galaxies ejected from fully-formed AGN galaxies.
2. Galaxies emit omnidirectionally expanding spherical wavefronts of light.
3. An expanding spherical wavefront of light is gravitationally redshifted by all the mass enclosed within its circumference at any given radius.
4. Galaxies absorb energy omnidirectionally from all the radiating galactic sources within range
5. Galaxies are both cosmological fountains and drains.

V. The Cosmos

1. The extent of the cosmos is unknown and almost certainly unknowable.
2. The cosmos is not simultaneously observable, neither by 3-dimensional observers, nor by itself.
3. The cosmos does not have a universal frame, a universal age, or a universally verifiable extent.
4. The cosmos is not a singular, unified, simultaneously existing entity.

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* This trivial reformulation of the standard equation $E/m=c^2$, serves only to make clear that any standard unit of matter, such as an electron, must have a variable mass in a gravitational field, where the speed of light varies with position.

** The following quote is from, *Relativity The Special And The General Theory*, 15th edition, 1952 (English translation 1954).

… our result shows that, according to the general theory of relativity, the law of the constancy of the velocity of light in vacuo, which constitutes one of the two fundamental assumptions in the special theory of relativity and to which we have already frequently referred, cannot claim any unlimited validity. A curvature of rays of light can only take place when the velocity of propagation of light varies with position. Now we might think that as a consequence of this, the special theory of relativity and with it the whole theory of relativity would be laid in the dust. But in reality this is not the case. We can only conclude that the special theory of relativity cannot claim an unlimited domain of validity: its results hold only so long as we are able to disregard the influences of gravitational fields on the phenomena (e.g. of light).

— Albert Einstein

The Island Universe Model: A Discussion

In criticizing the standard cosmological model, a common rejoinder of the model's defenders is to demand of the critic an alternative cosmological model. In a discussion of the standard model's shortcomings, of course, this is nothing but a transparent attempt to change the subject. As an argumentative technique it is a sign of desperation.

Setting aside the discussion of the standard model's failures however, it is fair to ask what an alternative model might look like. Herein then is an attempt to sketch an outline of such a cosmology in qualitative terms. The purpose of insisting on a qualitative model as a first approximation of this cosmology is simply to avoid the flights of mathematical fantasy that are one of the main causes of the current model's failures.

The fundamental requirement of this new cosmology, the Island Universe Model, is that all of its physical features and relationships must rest firmly on observations and measurements, which is to say that the physical structure implied by the model must be subject to empirical verification. The Island Universe Model is not so much a fixed model as an approach to modeling the cosmos that insists on the primacy of the scientific method. Empiricism is understood to lie at the heart of the scientific method.

At the core of the Island Universe Model is the Island Universe Framework which consists of:

1. an extension of Relativity Theory
2. the 4/3 dimensional ratio
3. the astronomer Halton Arp's extensive observations of high redshift quasars in close proximity to and apparent interaction with low redshift active galaxies
4. the observed fact that speed of light varies with position in a gravitational field.

In the Island Universe framework, galaxies are the fundamental unit of creation across the cosmos. Unlike the Big Bang, the singular creation event of the standard model, creation events are distributed widely and non-simultaneously in the IU framework. The cosmos of the IU framework consists of an ongoing process of multiple creation events. Quasars, in this model, are nascent galaxies born of fully-formed AGN galaxies.

The Island Universe Model of the cosmos requires a mechanism to account for the cosmological redshift. That mechanism is provided by employing standard light cone analysis to the light emitted by galaxies and augmenting that analysis with the well-known phenomena of entanglement and standard gravitational theory.

> This results in a redshift-distance relationship caused by a relativistic gravitational effect on an expanding spherical wavefront of light emitted by a galaxy. The term relativistic in this context refers to the fact that the gravitational effect on the wavefront is relative only to the particular expanding spherical wavefront under consideration.
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> In the IUM then, we consider an expanding spherical wavefront of emitted light surrounding a galaxy. At a point close to its origin we can calculate a gravitational redshift for that wavefront using the standard General Relativity equation. We can also consider that all of the photons that comprise this spherical wavefront are entangled via the same mechanism that underlies all entanglement phenomena – they share a common 4-dimensional origin. This means the wavefront essentially constitutes a simultaneity – all the photons are simultaneously connected to each other.

It follows then that any number of years after the original calculation, say one billion, another calculation can be made for the redshift of the same expanding spherical wavefront, now 1 billion light-years in radius and employing the mass density of the enclosed sphere to determine the total mass contribution. The result is a redshift correlated with distance.

At large distances the results so calculated will not agree with observation but not because the general methodology employed is wrong. It is rather that the GR equation being employed does not capture the nature of the underlying physical mechanism that produces the redshift on the scale at which it is being used.

What the GR formalism misses is that an expanding spherical wavefront becomes tattered in the expansion process. Parts of the wavefront are absorbed as it encounters intervening galaxies, producing holes that expand with the wavefront. This slow shredding of the wavefront can be interpreted as the main cause of the cosmological redshift. The total energy of the wavefront is being depleted by these encounters, as indicated by the redshift of the simultaneously interconnected photons of the wavefront.

At large cosmological distances however, the cumulative effect of this process diminishes as the expanding holes of the wavefront swallow subsequent galaxies without causing any direct energy depletion. The gravitational effect begins to tail off.

As in all large-scale systems beyond the solar-system, General Relativity has to be implemented in a more complex physical model than the GR math is designed for. For the purposes of this paper however we can set the GR problem aside and state that it has been established that the IUM using light cone analysis, entanglement and some corrected form of large scale gravity, can account for a cosmological redshift without invoking a universal expansion.

The same line of reasoning also leads directly to an explanation of the cosmic microwave background radiation. As each successive, expanding, spherical wavefront of light reaches its minimal energy state, they collectively form the equivalent of a blackbody shell around the source galaxy that re-radiates the absorbed energy at the observed 2.7K temperature. Since the primary source of this radiation for an observer would be the local galaxy, some galaxy aligned features would be expected.

In the IUM, the fundamental unit of the cosmos is the galaxy. All galaxies are at the center of their individual observable universes which is to say that every galaxy is possessed of its own individual reference frame. This is in keeping with a fundamental feature of basic relativity theory, the absence of a universal reference frame.

Upon careful reflection it is obvious that in the IUM, the extent of the field of galaxies is unknowable. Consider a distant galaxy at the edge of our observable universe. An observer on that distant galaxy would see our galaxy at the edge of its observable universe.

Here we make a simple but reasonable assumption that the observable universe of the distant observer is much like our own, meaning that the observer could turn its gaze 180° and find another galaxy at the opposite edge of its observable universe. That third galaxy would lie far beyond the outer edge of our observable universe and an observer there would have an even more distant view outward from our direction.

So the extent of the field of galaxies in the IUM is inherently unknowable as is the extent of the four dimensional sea of timeless electromagnetic radiation within which the galaxies play out their time-bound three dimensional lives.

The recognition of the 4/3 dimensional ratio is fundamental to the IUM. In the model, gravity is not a force but an effect of that 4/3 ratio. Three dimensional matter represents a hole in the four dimensional dis-continuum of the electromagnetic radiation (EMR) that permeates the cosmos everywhere there is no matter (mass).

Here, the term dis-continuum is used in recognition of the fact that EMR is discrete, not continuous, and to differentiate it from the mathematician's spacetime continuum. EMR in this conception falls into the dimensional hole presented by matter which consequently curves nearby light in the manner observed. This gravitational effect is local to the material object and short range. It is not a force field.

The apparent gravitational 'force" between two objects in relative proximity is simply the cumulative effect of their individual local absorption of the EMR that lies between them. The gravitational 'field' of a gravitating body is simply the energy-density gradient surrounding it.

The absence of 'space' in this analysis is simply in keeping with empirical reality. The existence of an empty 'space' container in which matter and energy exist has no empirical foundation and therefore has no place in scientific theory.

What separates material objects in the cosmos is at minimum, always and everywhere EMR. This is neither a hypothesis nor conjecture, but an assertion of observational fact.

In a similar vein it can be stated that there is no empirical evidence for the existence of a 'time' independent of the material processes by which we measure it. That is to say that 'time' is a characteristic of the sequential nature of material processes which are themselves a consequence of the three dimensional nature of matter.

'Time', as a free-standing entity, is a reified human concept, like physical 'space'. Since physical 'time' lacks any empirical evidence to support its existence, it also has no place in the IUM.

The cosmos of the ISM then consists of two fundamental entities, matter, and electromagnetic energy. Matter may be considered a distinct form of bound electromagnetic energy, and electromagnetic energy may be considered a distinct form of un-bound matter. Neither view is complete in itself; only both views, held equally, presents an accurate representation of empirical reality.

This leads to an awareness that our understanding of the fundamental physical processes of the cosmos is deficient. We have some knowledge of the matter to EMR transformation but no real grasp of the process by which matter is generated from EMR, except for the strained mathematical conceit that something came from nothing in a myth-like creation event, far back in an inaccessible and unobservable past.

The IUM presents fertile ground for observational research in this area. The quasar/active-galaxy relationship, discovered by the astronomer Halton Arp, needs to be fully investigated, with the blinders of big bang orthodoxy discarded in favor of a close study of all the available observational evidence.

There are other avenues for actual physical research suggested by the IUM. The tired, 19th century, laboratory-derived concept of entropy needs to be set aside in cosmology. There are no closed systems in the cosmos, and the cosmos itself is not a closed system.

What is needed is a robust theory of thermodynamic reciprocity in which systems alternately wind-up and wind-down. Entropy, as currently conceived, is a half-baked, half-loaf of reality resting precariously on the big bang creation myth. The quasar/active-galaxy relationship and the existence of living things suggests that the underlying dynamic may be scale-invariant and can possibly be generalized.

As already suggested, gravity must be re-conceived as a direct interaction between three-dimensional matter and four-dimensional EMR. Matter represents a hole or dimensional vacuum to the EMR that surrounds it and into which the EMR preferentially 'falls'. When all the EMR sources surrounding a material object are at great distances there is an omni-directional inflow of EMR into the matter 'hole' that is the source of a material object's inertia.

When two material objects are in proximity there is a shadow area between them. When EMR traverses that area as part of an expanding spherical wavefront, the section within the shadow area is truncated at both ends by direct absorption of the two masses and also shortened as parts of the wavefront, in close proximity to each mass, are drawn inward toward the respective centers of mass. Summed over all the incoming wavefronts within the shadow, this is what constitutes gravitational attraction – a shortening of the distance between the two masses, by attrition at either end of the separation.

For the most part EMR is thought of and studied as a linear phenomenon – as being composed of light rays or photons. The behavior of EMR as an omnidirectionally expanding wavefront is a neglected area of physics that is ripe for experimental and theoretical exploration.

The Island Universe Model then, can account for the cosmological redshift, the cosmic microwave background radiation, even gravity, without venturing beyond the realm of empirically verifiable entities and events. The IUM also provides a long-missing mechanism for the gravitational effect.

The Island Universe Model does, of course, need to be quantified. Trivially this is certainly doable because anything can be quantified if your quantitative model is not constrained by the limitations of physical reality. The Island Universe Model does have just such a requirement, however. Any proposed quantification cannot invoke events that cannot be observed or entities that cannot be detected. All proposed features of a quantitative rendering of the model must be empirically verifiable and consistent with the qualitative model.

An Open Source Cosmology