Comparing Apples to Inches

Reality is digital and analog. The question is why.

While the original precept of modern physics is that quantum activity has both particle and wave behavior, there is an inclination to consider reality as fundamentally digital at the smallest scales, with every form of energy and effect, from light to inertia, as a particle, that manifests analog wave behavior.

While the history of how this view came to be is long and complex, the result is that increasingly fantastical concepts are accepted as legitimate descriptions of reality.

Entangled particles creating faster than light correlation between separate positions are considered “spooky action at a distance.” because the wave correlations are only considered statistical and not actual.

Multiworlds pop into existence with every superposition of a quantum particle, because dispersion of the wave isn’t considered a factor.

While it is frequently argued that physics is not intuitive, there is a limit to how many parallel worlds popping into existence one is required to consider before common sense does rebel and starts considering alternatives.

The main reason why particles won out over waves is because there is no suitable medium in which such quantum waves might propagate and this is a very valid concern. It raises the issue, though, given the problems arising in a particle based model, whether the concepts of particles and waves might not be sufficient to describe what is going on.

While physics likes to say it is not intuitive, the concepts of particles and waves are common features of our daily existence and ones which our minds are well adapted to recognize. It seems that since primary conceptual tools in the theoretical tool box are particles, waves, dimensions, fields, etc. that whenever an observational anomaly arises, the solution invariably is to use one of these tools in whatever way is most convenient and add another layer of complexity.

This process serves to extend the paradigm, but does it really solve deeper issues, or paper them over? When people thought of the cosmos as geocentric, the motions of celestial objects were explained as a function of epicycles. Like giant wheels turning against one another, similar to gears in a machine, since such mechanisms were high concept to the pre-medieval mind. When anomalies rose, the logical solution was to add another cycle, much like modern physics adds another particle to explain every phenomena. Currently a lot of effort is being put into finding the particle for inertia, with the search for the Higgs.

What if we were to dump the tool box and start over?

For starters, lets do away with the idea that physics is not intuitive. Our brains are divided into two hemispheres, left and right, with complementary functions. The left side is considered the rational brain, because it is a linear function of analyzing cause and effect sequences. The right brain is considered emotional, because it is a parallel processor of cumulative effects that are not organized in convenient linear fashion and occur at rates too rapid to consciously decipher. Together they mesh sequences and degrees of activity into a semi-coherent perspective.

Our thought and especially visual processes are fundamentally digital, since we cannot process information carrying energy without breaking it down into coherent units. Consider how a movie camera functions by taking a series of still pictures and recreating motion from them. Our minds function the same way, as series of thoughts race across them. If we tried to sample the energy directly, it would be like having the shutter open all the time and moving the film past it. The result would be just a constant blur of light and information.

Because we are individual beings in an extremely complex environment, there is a fundamental need to organize far more information than is actually possible, so the mind has to do two contradictory processes. It has to create a coherent understanding of reality, while also editing out as much, presumably, extraneous, but potentially important information as possible.

So while the right side of the brain weighs the cumulative mass of input, the left side has to navigate the best possible path through it. Sometimes the right, intuitive side recognizes things which the rational left side of the brain does not see and sometimes the intuitive side is obsessed by things which the rational side can see are not important.

What physics spends a great deal of time investigating are cumulative aspects which are not particularly amenable to rational linear concepts and the results, from string theory to multidimensional geometries, tend to get lost in their own complexities.

How do we edit out some of the detail, yet still maintain that coherent whole? We can no more give free rein to our intuition and expect coherence, then we can give free rein to our logic and not be bound up in multiple intertwined logical threads that all seem to go in different directions.

While my own interest in physics has been one of curious observer, rather than dedicated professional, one of my earliest readings on the subject, Fritjof Capra's The Tao of Physics, influenced my thinking at a young age about many aspects of life and reality in a fundamental way that was far more intuitively logical than this linearly driven and object obsessed culture in which I was being raised. In a later reading some of the

comparisons seem stretched, but as introduction to both physics and Eastern philosophy, it left its mark on my developing consciousness.

Yes, physics does acknowledge symmetries, but generally in an object oriented context, where particles are balanced by their anti-particles and matter by antimatter. In reality it seems that opposites serve to balance each other, rather than cancel out. They coexist as opposite sides of the same coin, rather than combine to eliminate the coin altogether.

Is it possible there is far more connectivity to what we see and less loose ends than physicists currently suppose?

So how would we model and explain reality?

The most basic observational phenomena would seem to be light traveling through space. How would we go about explaining it?

What is light? What is space?

Is light really quantum particles acting in wavelike patterns and is space simply an effect of measurement?

The basic assumption here is that measurement is the basis of both light and space.

While this is conceptually convenient, is it valid? Is it even conceptually valid, given that our intellectual preconceptions cannot be objectively isolated? One way to consider the problem is whether the assumptions are internally coherent.

Photons are considered irreducible quanta/particles of light, with no internal structure. This raises a question as to whether its possible to have an apparent external quantity, that doesn't require some internal dynamic. As we understand the processes which form quantities and units, there is usually some interaction between the internal and external.

It is essentially an external effect, that of bouncing the electron of an atom to a higher energy level, which defines a quanta of light. Is this actually an irreducible quantity, or simply the smallest amount which can be measured? This would be a moot point if there are no complicating factors, but there are.

For one thing, en mass, these photons exhibit wave like behavior which cannot be explained by the existence of a verifiable medium for the wave to travel through. So if we are to consider photons as actual point particles, it would seem there is a state of connectivity causing them to act in a form of unison.

The logical implication here would be that light is a form of medium that is expanding out from its source and the various description and effects, from the wave/particle behavior to the various frequencies and spectrum are the aspects which our rational thought processes can describe and measure. On the other hand, that much maligned

intuitive process might not have as much trouble accepting light as an expanding analog field of energy.

One of the consequences of understanding light as an irreducible point like quanta is the effect it has on our understanding of cosmology. We measure the light from distant galaxies as being redshifted down the spectrum of light, such that the wave length of that emitted on the blue end of the spectrum gets longer and redder the further the source is away from us. If photons are these irreducible point particles of light, the only way for that redshift to occur is for the source to be actually moving away at a very high rate of speed, such that each photon is emitted from a greater distance. Obviously these galaxies must be moving away at a very high rate for that to occur and it is determined those at the furtherest visible range are moving away at close to the speed of light. Of course, exceeding the speed of light would create a natural horizon line, beyond which we wouldn't be able to see any of the sources of light, though it would continue to travel in the infrared and black body spectrums. Which we coincidentally do measure, but it is assumed to be residue from the Big Bang.

What if there is some other way for light to be redshifted, proportional to distance? For one thing, it would make a far less complicated cosmology. There would be no need for Inflation to explain why background radiation is so smooth. Which might in fact be equally explainable as a phase transition of some sort.

There would be no need for dark energy, since the presumed expansion and thus otherwise unexplained(by Big Bang Theory) portion of it, would actually be an optical effect of the distance traveled causing the redshift.

It should be noted that when the path of light is bent around gravitational effects, there is no insistence the actual source of this light is being moved, just that the light reaching the observer has followed the path of least resistance. Since expansion and gravitational contraction are observed to be basically balanced, such that in larger scales, space appears flat, this expansion could be an effect directly associated with all the relatively empty space which the light traverses, while the curvature into gravity fields provides the balance for an overall equilibrium that means the sources are not actually moving away and needing the additional dark energy to match observations of redshift.

Another question about the issue of an expanding universe is what determines the otherwise stable speed of light, if the very fabric of the space is it crossing is expanding? When redshift of distant galaxies was first observed, it was assumed these sources were simply moving away in an otherwise stable space, but as it became clear this redshift was closely proportional to distance and there was no observable lateral motion of the speeds implied by redshift, the realization was that this meant our position was at the center of the universe. Since this was just a little too coincidental, the theory was changed to say that space itself is being stretched by the expansion of the universe. The conclusion being that every point appears to be at the center of its own perspective of the universe.

How does space, which has no physical existence, get stretched? The presumption being that since it is simply a measurement in the first place, if the points being measured are moving apart, then the measurement is being stretched. The problem is that the speed of light provides another method of measurement and if it was being stretched, then the speed of light would have to effectively increase to match the expansion. Say two sources are x lightyears apart. If the space between them, as measured by lightspeed, is actually being stretched, they would always be x lightyears apart. It would be like having an elastic ruler. No matter how far you stretch it, it will always be one foot long.

This would invalidate the Doppler effect being used to explain redshift though. The Doppler effect requires movement in a stable measure of space. The train is not actually stretching the space, as it moves away, but simply putting space that was in front of it, behind it.

So we know we have a stable field of space, as measured by lightspeed and those distant galaxies are redshifted. Either we are at the exact center of the universe, or there is another explanation for redshift.

What if light is not irreducible particles of light that travel in wave patterns, but is an analog emission of energy, of which the smallest measurable quantity is what is required to trip an electron to a higher energy level and conversely, the smallest amount an atom will shed?

Rather than just viewing light through the prism of distance, consider also how volume is a factor. Our entire perception of reality revolves around these relationships. Think how an object grows smaller as it recedes into the distance. Why is that? It's function of perception. The object occupies a smaller proportion of our field of vision, as our field of vision increases with distance. One of the original arguments against an infinite universe, that an infinite number of stars would blanket the entire sky, overlooks this factor. There is far more empty space than that occupied by stars and so the relative portion of our vision occupied by empty space stays the same.

As the light from a star expands out to fill the volume around it, it necessarily grows more diffuse, as the same amount of energy must cover ever more volume. The further away that star is, the smaller it appears and the fainter its light gets. Since the smallest measurable quantity of light we can detect is what will trip that electron, eventually it reaches the point that barely enough is reaching our detectors to even trip one atom on the detector. Beyond that and the duration between the detections start getting further apart, so that the resulting wave pattern created by the continuing process of measuring these photons will have longer wavelengths.

A possible analogy would be a running faucet. When it is fully open, the water runs in a constant stream and as we start to close it, the stream is reduced and becomes smaller in diameter. Eventually we reach the point there isn't enough water to maintain the

stream and the faucet is just dripping water. Since it is the surface tension of water, vs. the force of gravity that determines the size of water droplets, these drops remain the same size and diameter, as we continue to tighten the faucet, but the reduction in the flow rate causes the time between each drip to grow longer. If we were to construct a wave pattern from this process, it would get progressively longer.

So how does this compare to redshift? Up to a certain distance, the light is like the constant running water and while it doesn't start to redshift, the amount is less and diameter gets smaller. Eventually it reaches that point where only the minimum amount of light can be detected and after that, redshift starts to set in. Which is basically what we see in the universe, as up through the closer galaxies, there is no measurable redshift, but outside this local group, it gets proportionally greater with distance.

As an effect of ever increasing volume with radius, the redshift curves upward with distance. The theory of dark energy isn't based on this expansion increasing at the closer distances, but rather that it did not decrease as completely as predicted from a steady fall off from an initial singularity.

In fact, Einstein originally proposed the Cosmological Constant as a way to balance gravity and maintain a stable universe, so it is interesting that now, with the most accurate measures of redshift showing it matches what a Cosmological Constant would be, there is no discussion of the original reason it was proposed.

This explanation for redshift doesn't require the entire universe to have originally been in a dimensionless point of the singularity. It doesn't require the extremely superluminal effect of the inflation stage. Since the universe would be infinite, as a unitary state and not a singular unit, there would be no multiverses floating around in some additional variety of space. There would be no need for dark energy to explain the observed characteristics of redshift and why they don't correlate to what Big Bang theory proposes.

In fact, if light is an expanding radiant energy in an infinite universe, which could not further expand, it might also go toward explaining the effect ascribed to dark matter. Rather than some additional force of attraction within galaxies, it would be a source of external pressure on them. Given it is the rate at which the outer bands of these galaxies move that is in question, this external solution would be fitting.

There is also the issue of ever more distant and apparently mature galaxies and galaxy structures being discovered and how to explain this within the age limit of Big Bang theory. One way has been to say these are all very young galaxies, as only the light from the lightest elements is detected, but that overlooks the fact that light from heavier elements would have been shifted completely off the visible scale anyway. I suspect the problem will only get more obvious, if the James Webb infrared telescope overcomes its currently budgetary problems and is successfully launched to further examine these extremes of light and perception.

This is just a few of the issues raised by questioning the analog, vs. digital nature of light. Many pages could go into debating the analog vs. digital nature of everything else, from space to time, but I would like to close with a few more conceptual points.

We need both concepts to manifest and comprehend reality. If everything was purely analog, there would be no features to interact and record. Digital is all about these separate actions and entities. Analog ties it all together. If everything was truly separate, there would be no basis for interaction and perception. Every point would be its own universe, not just the center of it own point of reference.

We treat these two concepts very differently. The left side of our brain counts the digital and the right side measures the analog. When we count something, it's the entity in question, but when we measure something, it's the space between the marks. A foot isn't the one foot mark, but the space between one such mark and the next.

Now when we are counting something, say people in a room, we wouldn't line them up and count the spaces in between and add one.

It seems to me, that when those early physicists were deciding what a photon was, they were counting when they should have been measuring. They counted the clicks of the detector, when they should have been measuring the spaces in between.

Not an irreducible little particle, but the smallest measurable quantity.

An inch, not an apple.

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