

## Potential Energy blue/red shift and Hubble Tension

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### Abstract:

Einstein's General Theory of Relativity proposes a blue/red frequency shift caused by differences in Potential Energy levels. Here we add this factor to the Hubble observations for Kinetic Energy redshift. A database of supernovae distances and velocities has been analyzed to give the present-day positions of the supernovae, allowing for photon transit delay times. The mathematical model has used AI pattern-recognition techniques to estimate the Earth's position in a symmetrical, expanding universe. The model adjusts the ratio of Kinetic Energy redshift to Potential Energy blue/red shift to achieve the most symmetrical pattern - where supernovae velocities are directly proportional to their distances from the center of the expansion. The model also indicates where we are in the "Kinetic Energy to Potential Energy" cycle of the universe. The preliminary results indicate a strong correlation to a SINGLE best-fit solution. *A detailed mathematical paper, with quantitative data, is being prepared for peer-review.*

### 1. Introduction:

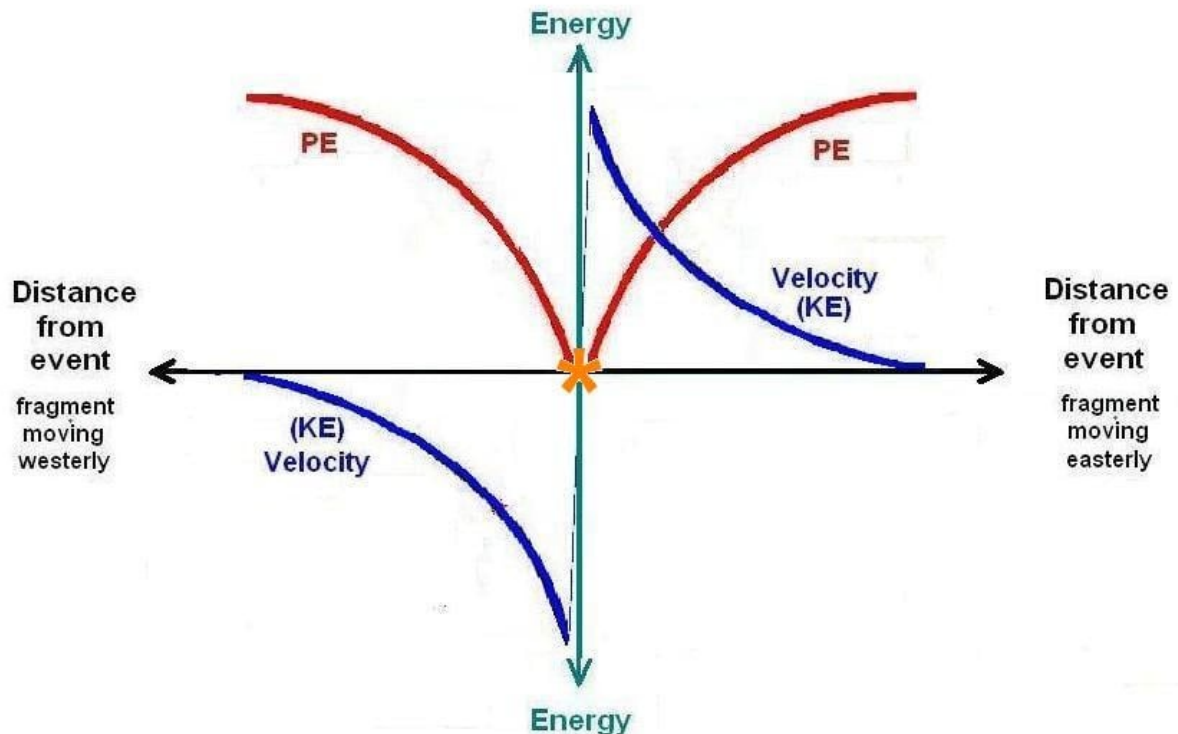
Potential Energy Wells have been analyzed in previous papers: The Mystery of Potential Energy Wells [1] and The Interactions of Potential Energy Wells [2].

Einstein's General Theory of Relativity proposes that the fabric of space is distorted by "matter", creating Potential Energy Wells. In this paper we discuss the characteristics of "objects and their Potential Energy Wells", and the implications for Hubble measurements.

If the "object and its Potential Energy Well" explodes, the fragments can be expected to spread out through 3-dimensional space with a spectrum of velocities. As the fragments move further away from the centre of the Potential Energy Well, the Potential Energy of each fragment increases and its velocity (Kinetic Energy) decreases. Figure 1 shows a 2-dimensional representation:

## Explosion - in a Potential Energy Well (in Space).

Chemical PE transformed into KE of fragments - then into PE of fragments.



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[Figure 1. Explosion of a Potential Energy Well in Space.](#)

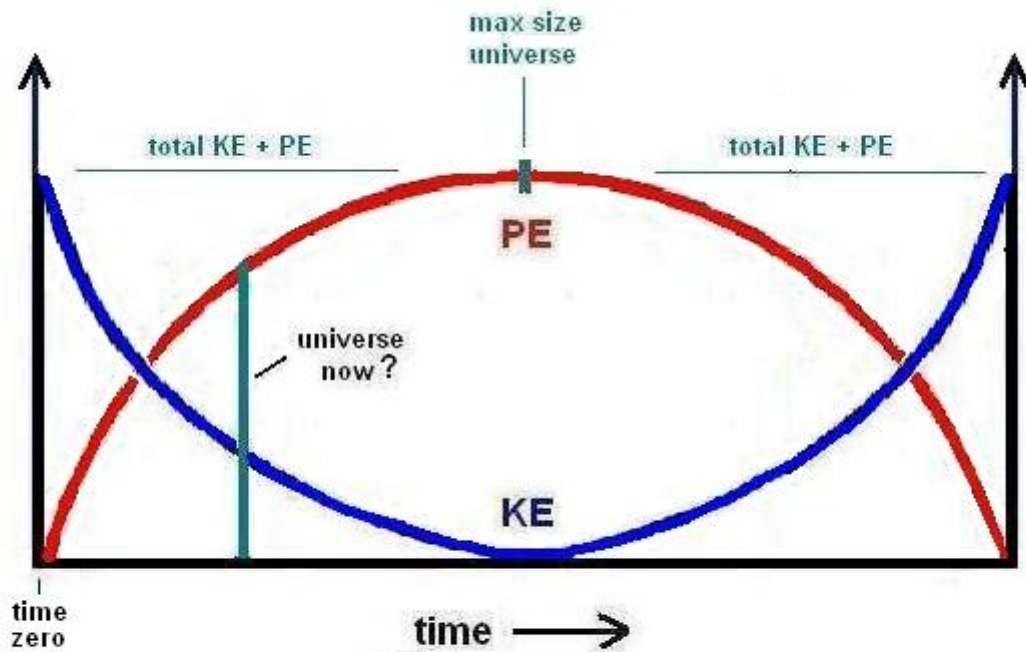
### 2. Movement within a Potential Energy Well:

If an object's initial velocity is less than the escape velocity, it will eventually fall back towards the centre of the Potential Energy Well. If the initial velocity exceeds the escape velocity of the Potential Energy Well, then the object can escape.

The object may move into an adjacent Potential Energy Well (as a spacecraft leaving Earth for the Moon), or it may move away into outer space until it collides with another object, or enters the Potential Energy Well of a distant galaxy etc (Voyager 1).

But if our whole universe is one gigantic Potential Energy Well, will all objects eventually fall back into a central point? See Figure 2:

Our vision is limited. We can only see a snapshot of how the galaxies WERE when photons left them. Our universe may already be collapsing. From our simplistic local observations and interpretations, we cannot be sure what is happening NOW.



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[Figure 2. The Expansion and Collapse of a Potential Energy Well.](#)

### [3. The blue/red frequency shift with changing Potential Energy levels:](#)

With acknowledgements to the work of Albert Einstein and Edwin Hubble:  
We can observe the deflection in light travelling past a large object, which leads us to believe there is a frequency shift when changing from one Potential Energy level to another.

If we apply this Potential Energy blue/red shift factor to the Hubble observations, can the Hubble parameter be calculated more precisely?

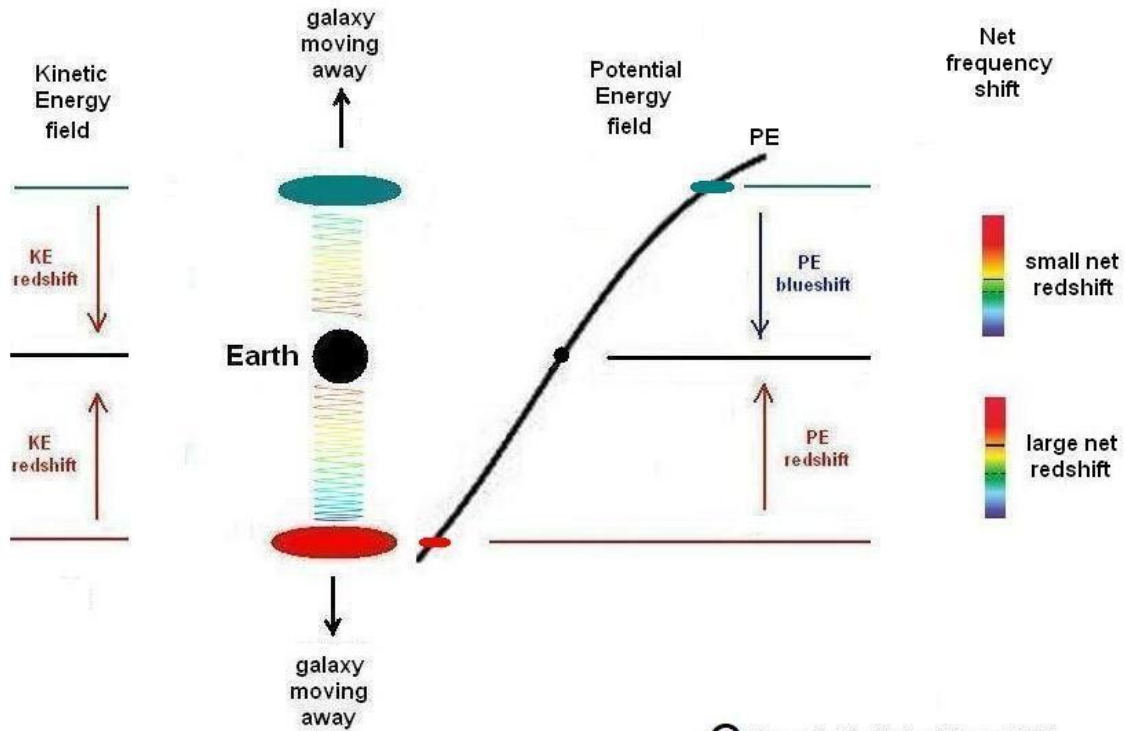
If both Kinetic Energy and Potential Energy red/blue shifts are applied to the Hubble observations, can we show that the Hubble "parameter" is really a Hubble "constant"? And could the Potential Energy blue/red shift help to resolve the "Hubble Tension" between the different measurement methodologies?

Local galaxies all appear to be moving away from the Earth, but some will be at a higher Potential Energy level than Earth, and some will be at a lower Potential Energy level than Earth.

Figure 3 shows a snapshot of local galaxies, viewed from Earth.

## Snapshot of local galaxies viewed from Earth

PE and KE redshifts and blueshifts.



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[Figure 3. Snapshot of local galaxies viewed from Earth.](#)

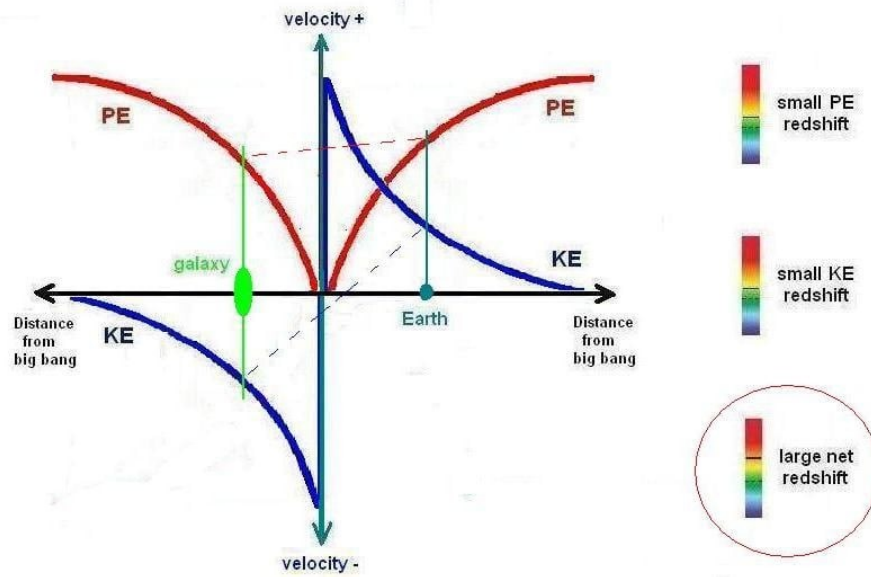
### 4. Snapshot of a distant galaxy:

Figure 4 shows a snapshot of a distant galaxy viewed from Earth. *It should be noted that the position and parameters of the galaxy will have changed since the observed photons left the galaxy.*

With the addition of Potential Energy blue/red shift to the Kinetic Energy redshift, can the Hubble parameter be calculated more precisely?

## Snapshot of distant galaxy viewed from Earth

PE and KE — redshifts and blueshifts.



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[Figure 4. Snapshot of a distant galaxy viewed from Earth.](#)

### [5. The Hubble parameter, and Hubble Tension:](#)

There are a number of theories about the expansion of the universe, and uncertainty whether the Hubble parameter is, in fact, a constant. But different methodologies for measuring the size and age of the universe yield different results. Hence the disagreement, and what has been called the “Hubble Tension”.

If we consider the Potential Energy blue/red shift in addition to the Kinetic Energy redshift, can we calculate a “best-fit” Hubble parameter?

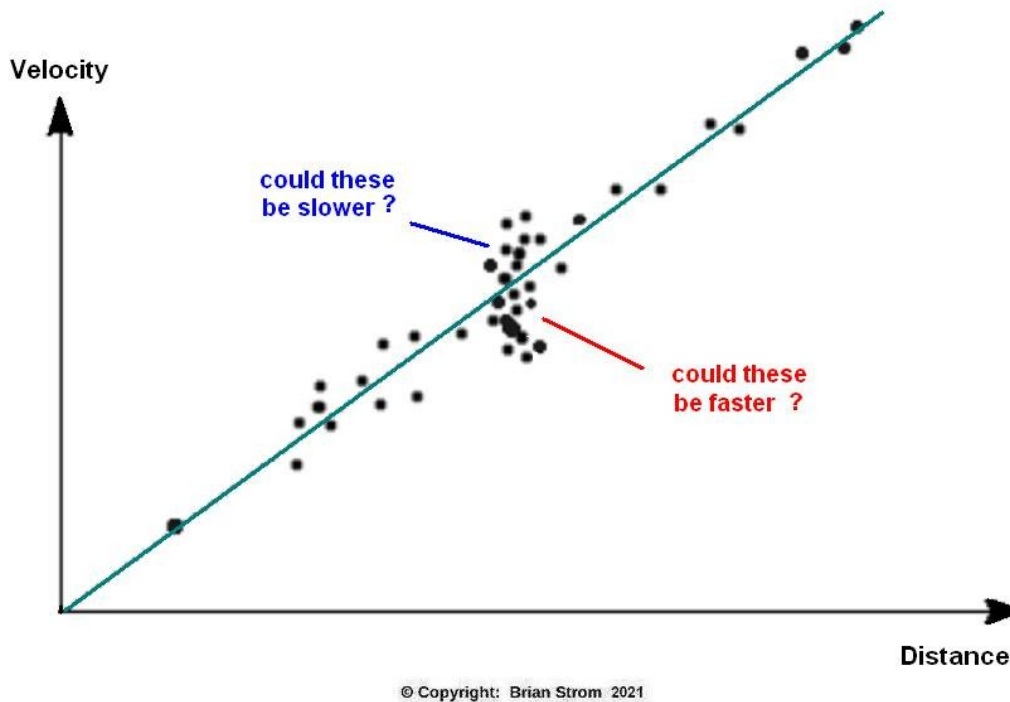
Could this parameter be shown to be a constant?

Could this parameter indicate where we are in the “Kinetic Energy to Potential Energy” cycle of the universe?

Figure 5 shows a simple Hubble plot to indicate the basic principle of our analysis:

## Measured Hubble shift corrected for PE redshift and PE blueshift.

Corrected KE redshift improves accuracy of Hubble constant.



[Figure 5. Can we “correct” the measured Hubble redshift?](#)

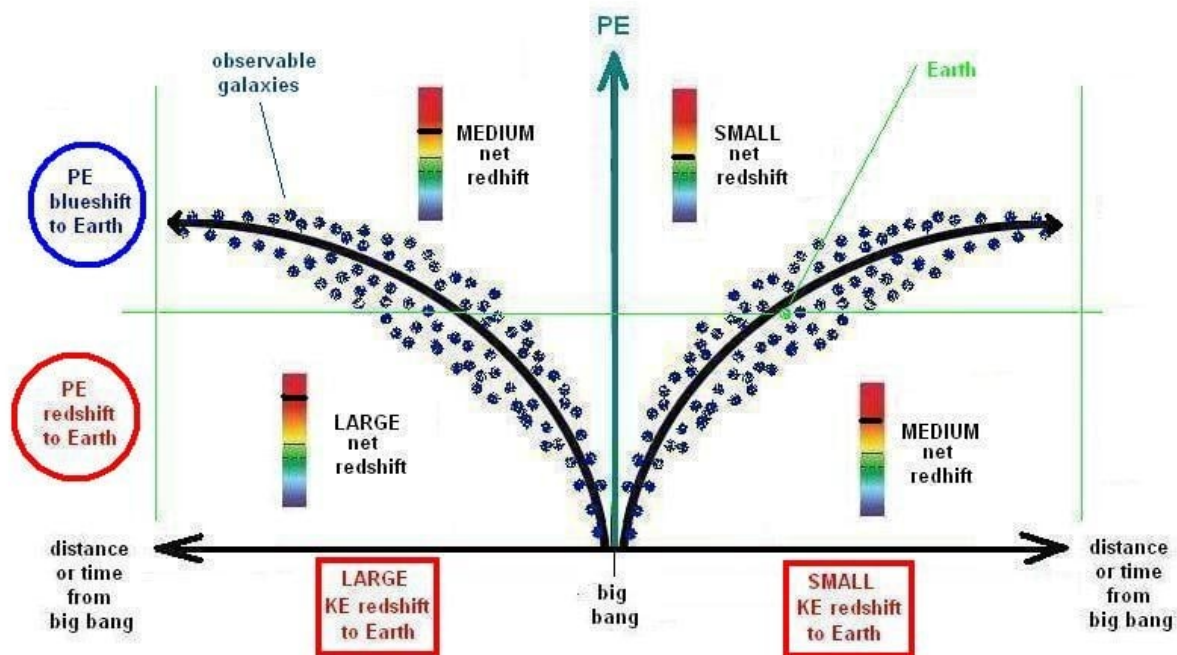
### 6. The effect of Potential Energy red/blue shift on Hubble measurements:

Figure 6 shows the basic analysis of Potential Energy red/blue shift - in addition to the usual Kinetic Energy red/blue shift and time factors.

It shows that one quadrant has both Potential Energy redshift and Kinetic Energy redshift. This would distort the Hubble analysis in this quadrant, and give a rate of expansion for the universe that is too low.

The possibilities are intriguing: for instance, in an expanding universe, could the maximum Kinetic Energy redshift - when Kinetic Energy is at its maximum – be an identical value to the maximum Potential Energy redshift - when the Potential Energy is at its maximum?

## Effect of PE red/blue shift on Hubble observations



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[Figure 6. The effect of PE red/blue shift on Hubble measurements.](#)

### [7. The effect of Potential Energy red/blue shift on observations:](#)

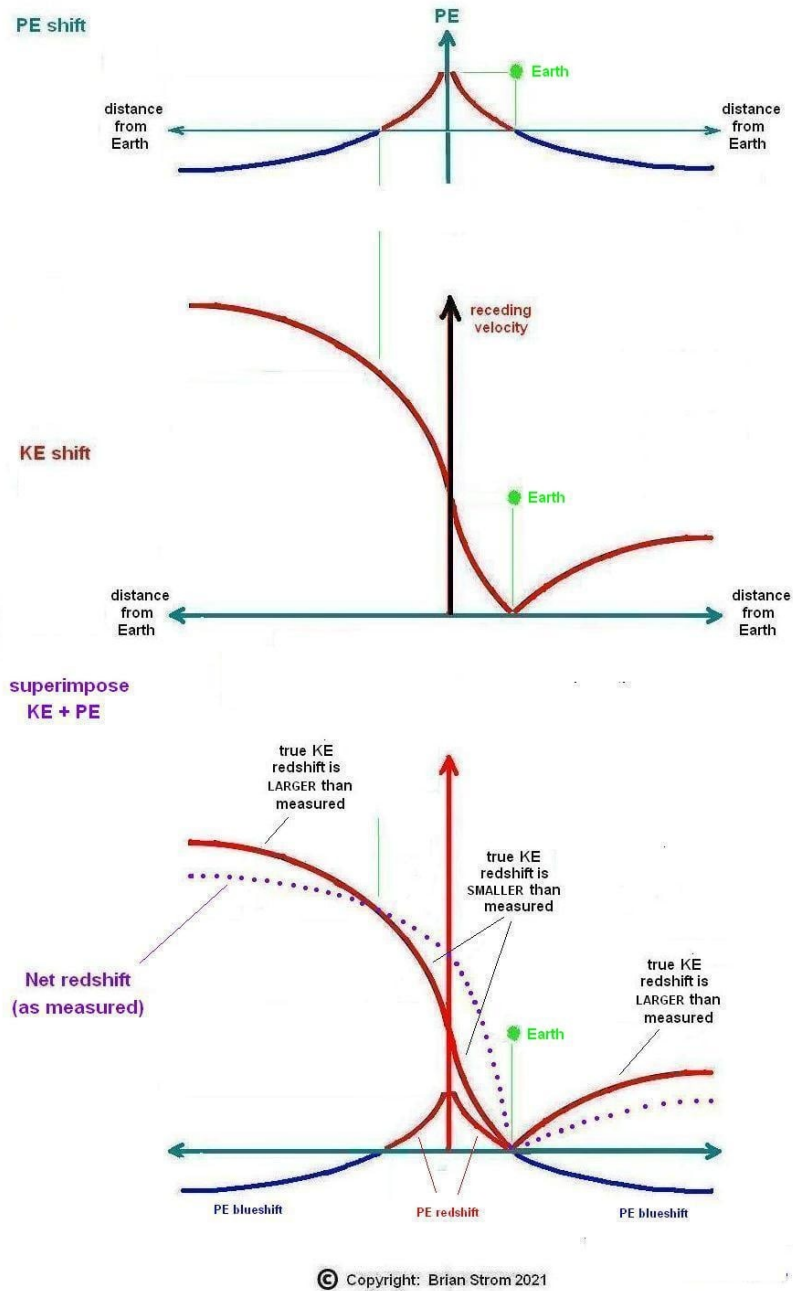
In the next stage of this analysis, we can see how the Potential Energy red/blue shift could affect the true Kinetic Energy redshift.

The "strength" of the Potential Energy shift is unknown, but the search for the mathematical "best-fit" may provide some clues.

Figure 7 shows a possible graph for observations directly towards, and directly away from, the "centre of the universe". Red/blue shift would be at MAXIMUM in these directions.

In all other directions the red/blue shift would be smaller - as velocity differences and potential differences would be smaller.

Effect of PE red/blue shift on Hubble observations  
 showing possible net shift at 180 degrees across universe



**Figure 7. The effect of PE red/blue shift on observations.**



## 8. Close-up of the mathematical “best fit”:

The preliminary analysis of published cosmological data suggests that many high-red-shift measurements are in the central area of this diagram, where the true Kinetic Energy red-shift could be less than the observed value. See Figure 8:

This diagram shows the spread of possibilities for different Potential Energy shifts and different observational directions around the universe.

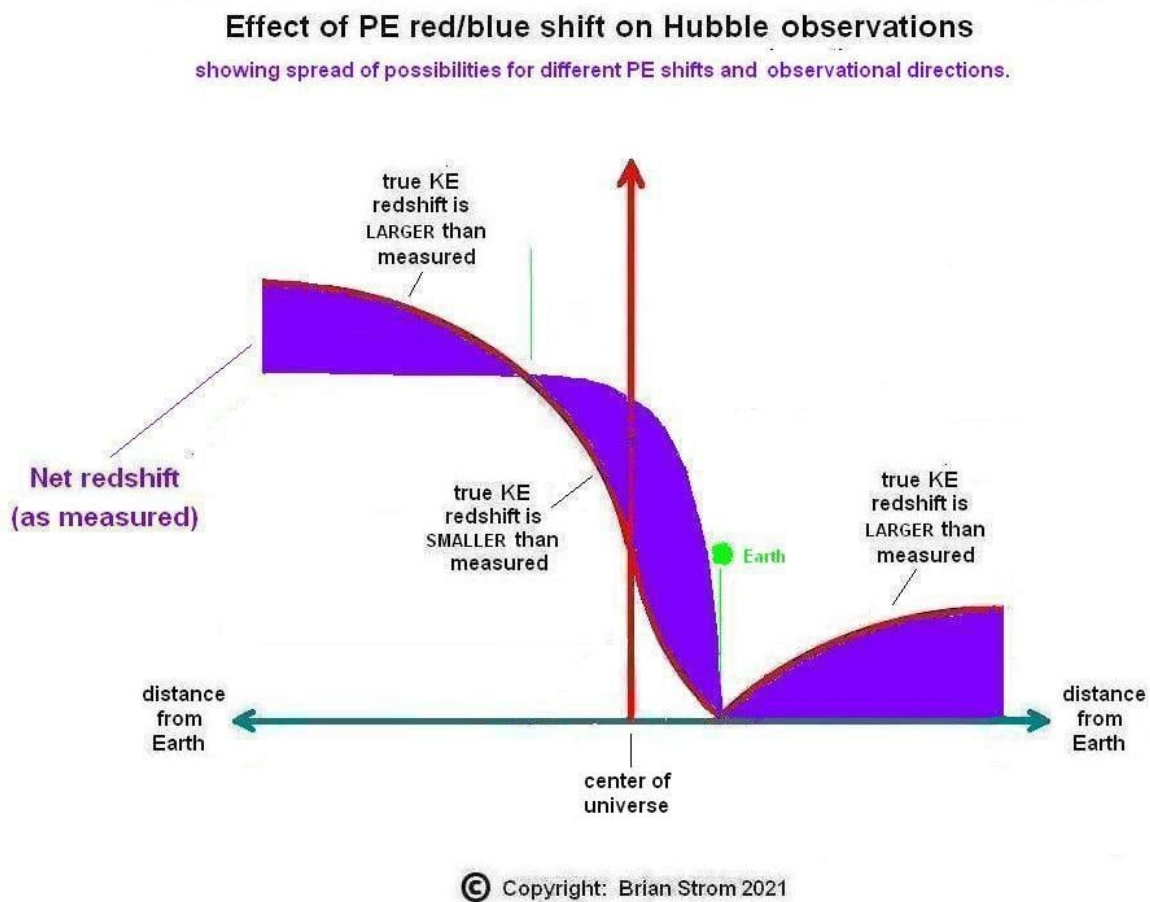


Figure 8. Close-up of PE red/blue shift possibilities.

## 9. The effect of Potential Energy red/blue shift on observations:

Many groups around the world are analyzing the publicly available data on supernovae from: <https://hsc.mtk.nao.ac.jp/ssp/data-release/>

For example, the Hubble Tension is discussed in the *Astrophysical Journal*. [3] and is summarized here: <https://scitechdaily.com/an-inconstant-hubble.../amp/>

Figure 9 shows the discrepancies in the Hubble methodologies by Freedman et al in the *Astrophysical Journal*:

Could the addition of the PE blue/red shift help to resolve this "Hubble Tension"?

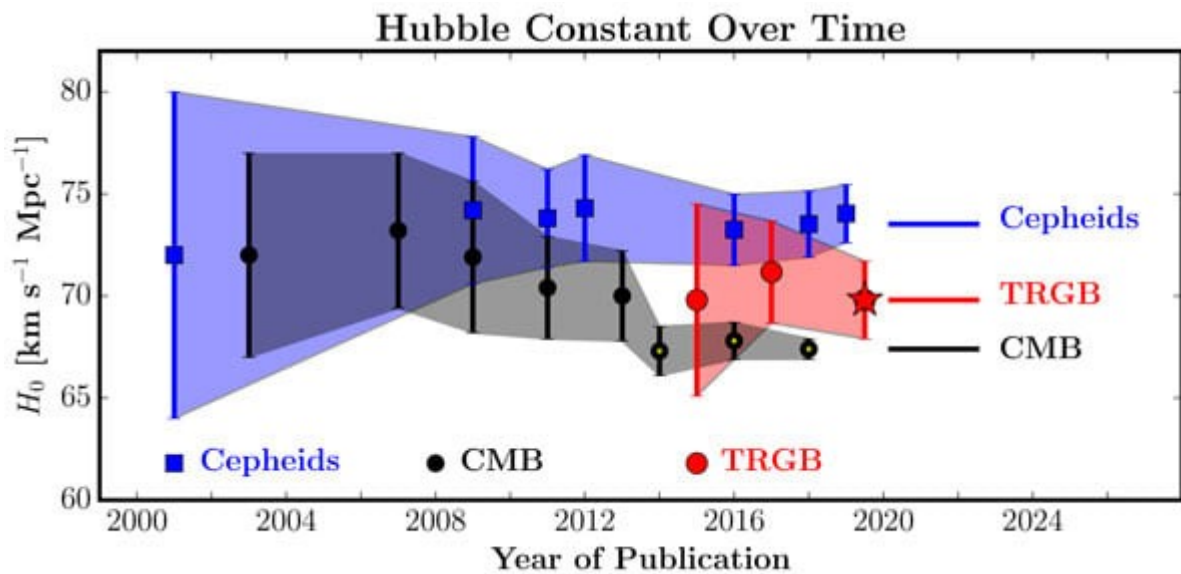


Figure 9. Different methodologies produce different Hubble Constants.

## 10. Mathematical Analysis:

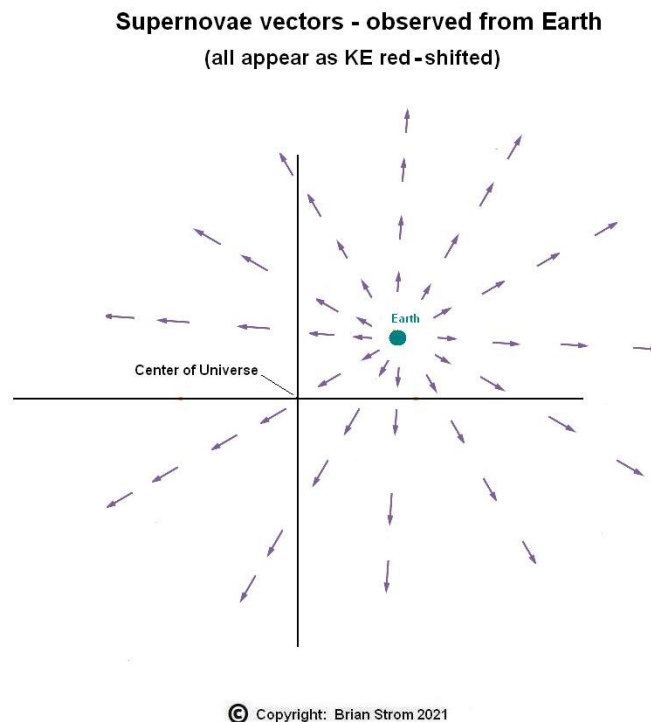
The mathematical model of the published supernovae data has been analyzed using AI techniques to identify patterns in the data. The variables have been flexed to find a best-fit solution, based upon the original Potential Energy Well assumptions.

Stage 1: Build a database of supernovae distances and velocities from published data. All observed shifts are redshifts. See Figure 10a:

Stage 2: The model corrects the data to give the present-day positions of the supernovae, allowing for photon transit delay times. The numbers are then analyzed to calculate the Earth's position in a symmetrical, expanding universe. See Figure 10b:

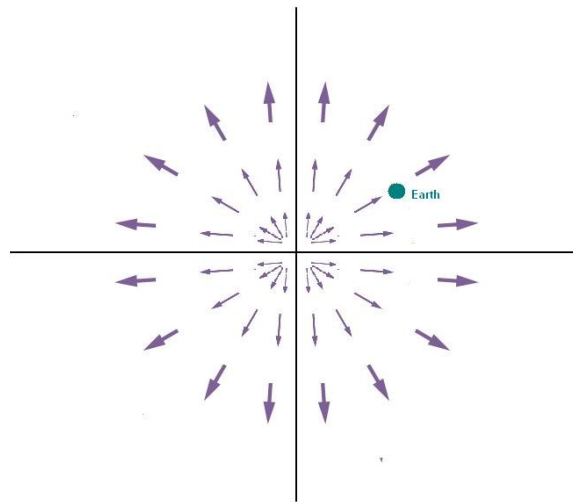
Stage 3: The model adjusts the ratio of Kinetic Energy redshift to Potential Energy blueshift/redshift to achieve the most symmetrical pattern - where supernovae velocities are directly proportional to their distances from the Center of the Universe. See Figure 10c:

The preliminary results indicate a strong correlation to a SINGLE best-fit solution. A detailed mathematical paper, with quantitative data, is being prepared for peer-review.



[Figure 10a. Supernovae vectors observed from Earth.](#)

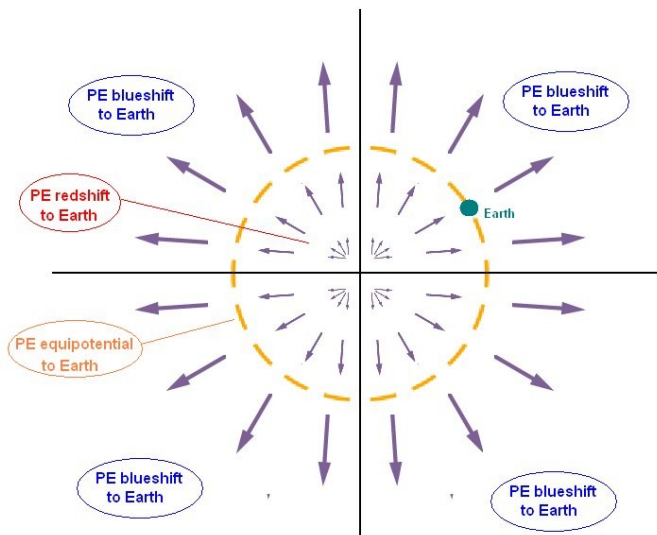
**Supernovae vectors**  
 adjusted for Earth's movement and photon transit time.  
 Earth moving away from Center of Universe



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[Figure 10b. Supernovae vectors adjusted for Earth's movement.](#)

**Supernovae vectors adjusted for PE red/blue shift**  
 and for Earth's movement away from Center of Universe and photon transit time.  
 (Optimum symmetry is when velocity is proportional to distance from Center of Universe)



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[Figure 10c. Optimum symmetry when velocity is proportional to distance.](#)

## 11. Summary and Conclusions:

Using Einstein's General Theory of Relativity, the blue/red frequency shift caused by differences in Potential Energy levels has been added to the Hubble observations for Kinetic Energy redshift.

A database of supernovae distances and velocities has been analyzed to give the present-day positions of the supernovae, allowing for photon transit delay times. From this data, the mathematical model has used AI pattern-recognition techniques to calculate the Earth's position in a symmetrical, expanding universe.

The "strength" of the Potential Energy shift is unknown, so the model adjusts the ratio of Kinetic Energy redshift to Potential Energy blue/red shift to achieve the most symmetrical pattern - where supernovae velocities are directly proportional to their distances from the Center of the Universe.

The model also indicates where we are in the "Kinetic Energy to Potential Energy" cycle of the universe.

The preliminary results indicate a strong correlation to a SINGLE best-fit solution.

*A detailed mathematical paper, with quantitative data, is being prepared for peer-review.*

## 12. References:

[1] **The Mystery of Potential Energy Wells:** <https://vixra.org/abs/2109.0046>

[2] **The Interactions of Potential Energy Wells:** <https://vixra.org/abs/2110.0170>

[3] **"On the Hubble Constant Tension in the SNe Ia Pantheon Sample"** by M. G. Dainotti, B. De Simone, T. Schiavone, G. Montani, E. Rinaldi and G. Lambiase, 17 May 2021, *Astrophysical Journal*. DOI: [10.3847/1538-4357/abeb73](https://doi.org/10.3847/1538-4357/abeb73)

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