Mathematical Physics: Singularities in physics using Energy, it's subsets and implications.

First Author: Paul Leslie Wood
First Author Details: Science Qualifications. Former lecturer in Stevenson College. Domiciled in Scotland, United Kingdom.
E-mail: mja_wood@hotmail.com

KEY WORDS
Infinities avoided. Minima of curves lifted away from Origin of x y z axes, Energy and it's subsets represented as Parabolas, Sensitivity analysis. Quasi Energy Dipoles constructed as 1 Dimensional, 2D and 3D Arrays. Implosion replaces Big Bang.

ABSTRACT:

Singularities are "undefined physics" with values rapidly escalating. This speculative article uses "Area" boundaries with Parabolic modeling and Complex numbers. Sensitivity Analysis (600% yields). Reinterpreting Inflation as Implosion. Inflation (post Big Bang): polynomial graph translated until "hover" coincides both with area boundary condition and with first zero. Quasi Energy Monopoles can describe Proto Big Bang et seq. Expanding Universe requires X4 input of Energy for doubling of "area" of a cube or sphere.

MAIN PAPER

Consider Energy E, composed of Mass M, Length L and Time T described by Dimensional Analysis:

$$E(M, L, T) = f(M,L,T) = E = [M][L]^2[T]^{-2}$$

Deconstructing [M] to be $[(M)^{-1/2}]^2$ (Always possible with complex numbers)

Then E is composed of Three parabolas (for M, L and T) which can be constructed as quadratics

orthogonal to each other (typically X, Y and Z axes) and permitting E itself to be a Parabola [NOTE 1].

For M,L,T and E the Minimum for each Parabola will be assigned an arbitrary value "k" which prevents the Parabola from "touching the Origin" by translation of the parabola to reside at "k".

E, M, L, T no longer conjure up infinities associated with Singularities including *Black Holes* and Proto (before)

Big Bang [NOTE 2]

RE*SULTS and DISCUSSION for MAIN PAPER and NOTE 1 and NOTE 2:*

1) Infinities at Singularities have been substituted by a mechanism proposed to provide some minimal finite area bounding a non zero "volume".

2) Translation of Parabolas away from Origin(s) - resulting in an absence of Real number solutions to parabolas.

3) Explored Real number qualities of "k". The use of Planck length squared for Real number minima is a convenient size yet infinitisimal in macro environment. The 10^{-70} notional value for "k" area is applicable to any parabola (Energy, Mass, Length, Time) within the quantum sized world as a substitute for infinitesimals without specifying units of Energy, Mass, Length and Time. Where roots for parabolas are required they can be located in the imaginary aspects of Complex numbers (in four dimensions).

======= *END OF RESULTS and DISCUSSION for MAIN PAPER*. ========

========(Notes, diagrams and Minority issues now follow).=======

[NOTE 1] *The parabolas of Energy E, Mass M, Length L, Time T:*

Energy $E = M L^2 T^{-2}$

Express M as a complex number and take Square roots - always possible for complex numbers.

$E = M^{1/2}M^{1/2} L \ L T^{-1}T^{-1}$ [Equation 1] has 6 terms.

Simplify L and T but retain the power identities for M gives $E = (M^{1/2})^2L^2T^{-2}$

==========

To show Energy is also a parabola:

Let $E = a^2.b^2.c^2$

Then $E = (abc)(abc) = (abc)^2$

where $a = M^{1/2}$, $b = L$, $c = T^{-1}$

SUMMARY for NOTE 1: Energy E is seen to be Three Parabolas (from Mass a^2, Length b^2, and Time c^2) and that Energy E is itself a Parabola $(abc)^2$

[NOTE 2]

Consideration of size "k" (treat as Dimensionless)

Conjecture: "k" is likely to be of the size order of an infinitesimal say Planck's length l_p such as the square of $lp = (lp)^2$ of the Order of 10^{-70}. "k" has attracted a 2 Dimension area interpretation from it's heritage

of length squared. Allowing "k" to be of the order of lp^2 can be construed as some minimal area bounding some "volume" of space (Hawking and others - demonstrated the area of a Black Hole Horizon to be correlated with the Energy of the Black Hole). Suppose the area feature can be generalised to other situations and other classes of Energy. Then use the "k area" to supply an area boundary to some finite volume for some situations.

It will be noted that the point like Singularity of a Black Hole or a Proto Big Bang can now be enlarged to a volume contained inside some finite area described as " k " (the difficulty of measurement is recognised).

The descriptions of "k" area and Event Horizon area have some similarities. "k" is unlikely to be applicable to every situation but this concept was postulated as a "work around" for singularities rapidly expanding off to "undefined physics" of infinity. The area "k" does not prevent entities from entering or leaving the "k" area Boundary. This may be the basis of "Inflation" smoothing outcomes that follow the Big Bang (Implosion).

Entry by entities might best be described as an IMPLOSION for the Big Bang Not explosion.

Postulate: Entities exiting the "k" area (having previously entered and then transited inside or within the area shell "k") will behave like post explosion/ IMPLOSION debris. The paths of entities (derived from or being Energy) transiting inside of the "k" boundary may remain speculative and or be described as" quantum tunneling". It can be postulated that entities meeting a "k" area boundary may "display" strategies which involve the "k" area such as: "Bouncing" (Elastic reflection without penetrating the "k" boundary). "Sliding" along it's surface - (on, within, or close to the surface).

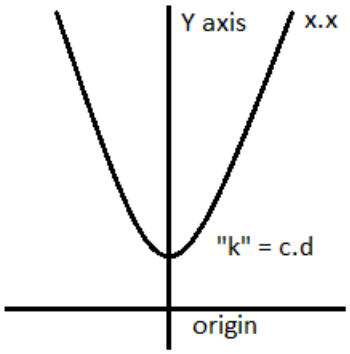
The entities leaving the boundary "k" may well display the attributes of "smoothing" of quantum fluctuations - if entity interactions are possible before, during and as the entities are leaving boundary "k". This may be the basis of "Inflation" smoothing outcomes that follow the Big Bang (implosion).

In the Macro world it would be surprising if a fragile brittle container enclosing a "vacuum" managed to IMPLODE without shards (fragments) passing near or through some focal point(s). It would superficially behave like an explosion to the Observer unless they possess a suitable measuring device (high speed camera). Computer modeling may support this viewpoint of Big Bang imploding and subsequent

"smoothing" of the exiting entities (Cosmic Microwave Background interpretation).

(DIAG 1) Diagram of a general quadratic

$Y = x^2 + cd$ = $Y = x^2 + k$



Origin is below the Minimum of the curve (labeled Y = k = c.d)

The general form of a quadratic is $Y = ax^2 + bx + c.d$ (where coefficients a = 1, b = 0, c = Non zero)

then $Y = x^2 + c.d$

And Y = c.d = k, when a = 0, b =0, and c and d are Non zero. ("k" is substituted for c.d).

That is Energy = "k" at some Non zero value (which we define as a minimum for the Parabolic curve).

Note that "k" operates as an "area" function.

Area "k" is postulated as Planck length squared but it could be some other value - including an infinitesimal - selected by the Physicist compatible with derivative of dy/dx to describe a "k" minimum for parabolas for Energy, Mass, Length and Time along the Y axis.

==========

Minority issue 1: Sensitivity Analysis of Energy expressed as the product of 6 terms [Equation 1] above.

Suppose each term was increased by 4% (from 1.00 to 1.04).

Then $(1.04)^6 = 1.26$ *or 26%* increase in Energy.

Or reducing each term by 5% (from 1.00 to 0.95) then $(0.95)^6$ = 26% reduction in energy.

Result: These calculations show a dramatic leverage of small numerical changes to become a greatly Magnified OUTPUT of the order of 600%. Even if the subcomponents are not involved there is still the

Quadratic parabolic behaviour of Energy itself to consider. It may be possible to interpret and correlate these sensitivity results with mechanisms for:

1) speedy "wave function collapse"

2) "spooky at a distance"

3) "de-coherence" of some quantum behaviour in a macro environment

4) "Entanglement scenarios"

5) Sensitivity Analysis may provide a viable model for "changes" that exceed the speed of light such as the expansion of the Universe. (Consensus view: is that size of the Universe exceeds the size predicted by the speed of Light.)

The use of "k" as a minimum for a parabola using Real numbers can be further nuanced by including imaginary aspects of Complex numbers and involving 4 dimensions.

==========

Energy is associated with area (Hawking and others concerning a Black Hole Event Horizon).

We generalise this to any energy. An expanding Universe requires a volume increase which has an associated area increase.

Area quadruples for every doubling of the measure of say side (or radius) of area.

Consider a model of some volume bounded by some cube of side L =1 and therefore has an area of $6L^2 = 6*1*1 = 6$ units

If the same structure achieves an increase to become a cube of side 2L it has an Area of $6*2^2 = 24$ units (X4 "area" increase). So that Hawking's relationship indirectly requires a X4 injection of energy.

Brian Schmidt [3]: Supplied evidence (Mapping conclusion) from 221,000 galaxies: of 5X multiples of Energy exceeding that needed from atoms in the Universe. This is observational evidence of Energy size order, whilst the theoretical prediction is 4X - as outlined in this paper. Conjecture: 5X of Energy excess will be enough for one "COMPLETE" doubling of the area of the existing Universe. The surplus energy after this expansion may contribute towards a further partial expansion or some other source(s) of energy may need to be accessed to complete more area doublings of the Universe in the future.

Sphere: having X4 area increase:

Suppose some pre- existing size of Universe be described as contained inside a sphere of radius R = 1 having an area of 4 (pi) R^2 = 4(pi) *1*1 =4 pi

When the sphere is increased to radius R=2 it will have an area of 4(pi) 2^2 = 16 pi = X4 area increase.

The X4 increase in area (and by association Energy) is more than existed for radius R=1.

==========

Shape of surface area of a sphere

might be reconfigured to be a single sided rectangle of length 2(pi)R and height 2R (whose area product is 4(pi)R^2 = area of a sphere).

The rectangle might be a flat 2 dimension or rolled into a cylinder (a striking similarity to a wormhole?)

Alternatively 4(pi)R^2 for a sphere can be deconstructed into 4 one sided "filter papers" each of area (pi)R^2 .

Or, two double sided filter papers, each of area 2(pi)R^2. The "filter papers" might be stacked or arranged in some other way. The increase in energy related to increasing area boundaries requires explanations

1) Could additional Big Bangs have supplied the extra energy?

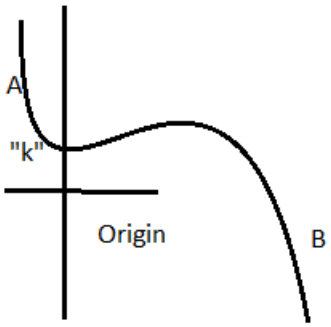
2) Some other alternative source(s) of energy employed?

3) Perhaps Hawkings relationship cannot be used in this way?

4) Alternative explanations for Universe "expanding" are needed. B Schmidt [3] offers Dark Matter.

==========

Minority issue 2: Polynomial representation of inflation Post Big Bang



(Diag 2) Polynomial view of transition from Big Bang event to Inflation

One existing view is that Energy displays a phase change as it passes from the Big Bang event to the Inflationary stage (which permits smoothing of quantum fluctuations and provides a mechanism for the current smoothed out Cosmic Microwave Background). One existing model reports the Energy "hovering" ABOVE the first minimum of the polynomial say at locus "A" before quantum tunneling through the energy barrier to continue to point "B". Suppose that the graph is translated (moved) so that the first minimum is relocated to some Y value labeled "A". Both "A" and "k" now represent the same value which lies at the first minimum of the curve. Then Energy located at "k" = "A" - can then transit to position "B" as described by the existing consensus view above.

The novelty [in this paper] lies in the use of "k" and translation of the graph (before reinstating the existing already proposed and established "same" transit result as before.

This reinterpretation (in this paper) allows Point "A" to not having to "hover" and the Energy does not experience zero energy (which "zero" would be implied if the first minimum lies at the Origin).

==========

Minority issue 3: Quasi (as if) Energy Monopoles [Acknowledgments] and [1]

1) Suppose Energy Dipoles can represent vector qualities associated with Energy. The vector basis may Relate to their Complex numbers origins.

2) Let one end of an Energy dipole be described as (+) and the other "end" as (-). In some random arrangement of dipoles the Net Total sums to zero (the scalar value is "canceled" or effectively sums to a NULL net Total).

3) Link a series of Energy Dipoles (end to end) into a very very long chain: (+) next to (-). Each (extreme) end of the One Dimensional chain acts as a *Quasi Energy Monopole.*

4) Place a collection of One Dimensional Energy Dipole chains parallel to the original 1D chain. Allow them to cross link across the 2D plane in any way possible. The total net Energy will be zero unless local disruptions show up as isolated (+) or (-) Quasi Energy Monopoles (that is the local disturbances act as if they are Energy Monopoles).

The disturbances are assumed to be temporary and random [walk] both in their manifestation (appearance) and their resolution (= disappearance).

Even with the multiple randomly located Quasi Energy Monopoles the net sum (+) added to (-) will still approximate some value(s) very close to zero if the 2D sheet extends to "infinity".

5) Vertically stack a pile of 2D sheets (from stage 4) above to create a 3D Energy Dipole object. Allow the Energy dipoles to cross link with adjacent sheets. When Quasi Energy Monopoles appear they will be embedded in a 3D network of Energy Dipoles. Quasi Energy Monopoles can "appear" then "disapear" probably spontaneously and probably subject to some probability outcome. Again the total net sum of energy for the 3D Dipole object will likely (be close) to zero for the "Field". Examples may be:

5.1)Vacuum Energy which is extraordinarily close to zero value over any infinite volume. It is many orders lower (10^{-21}) than calculations suggest. [2]

5.2) Quantum Energy Fluctuations (such as particle + antiparticle) appear and recombine (usually).

5.3) Black Hole - extreme Quasi Energy Monopole behaving in active dynamic manner) say (-)

5.4) White Hole - extremely dense Dynamic Quasi Energy Monopole say (+)

5.5) Big Bang event: Here the required precondition was probably a very large local collection of Quasi Energy Monopoles of say (+) and nearby a similarly also large collection of (-) Quasi Energy Monopoles. (Need not be equal - as for example the Macro example of "lightning" discharge pre - experiences a huge Energy Potential - in it's environment - before the local discharge). Here the Big Bang may have been the outcome for resolving some extraordinary extreme Energy potential (proto Big Bang).

The composition of probabilities needed to arrive at the Proto Big Bang may have been close to vanishingly small (probability) and therefore challenging to being described mathematically. Big Bang may have been a larger Potential Energy event than combining 5.3 and 5.4 - other prerequisite conditions may also be needed to obtain a Big Bang. Reports exist (in the literature) where multiple Big bangs are conjectured as being possible.

*Three Dimensional Energy Dipole arrays may be capable of "Crystal Diffraction" d*ue to having a repeating

structure seen in a crystal (Chemistry version). Then 3Dimensional dipoles are capable of demonstrating "crystal" diffraction if some suitable source of probing energy can be identified that is smaller in wavelength than the 3 Dimensional network intervals. Calculations may be able to provide likely wavelength candidates - perhaps gravitational waves from colliding paired dense objects such as 2 Neutron stars, or Black Hole and Neutron Star (each having a high energy density). LIGO detectors are capable of detecting gravitational waves making them prime candidates for the technology needed to detect 3D diffraction effects. Dark Matter may display diffraction effects if it has a regular repeating structure.

Hawkings Event Horizon (of Black Hole) area correlation with Energy suggests the next postulate in *this paper:* That the Universe's Total Energy is associated with the area bounding the volume of the Universe. Also *that* Energy may be supplied by energy dipoles. We postulate that 3D space is created and maintained by energy. The Energy size is correlated to the area which bounds that space volume. This close inter relationship has echoes of space time inter dependency.

==========

Conclusion: Expressing the subcomponents of Energy as Parabolas allowed the translation of the curves away from the Origin by "k" and so avoided "undefined physics" when using Real numbers. Using Imaginary content of Complex numbers in a 4 dimensional space may be wanted.

The polynomial "hover" pre "inflation stage translation provided a rich source of consequences and indicated additional areas of research.

Energy changes displayed high sensitivity for outputs over inputs.

Big Bang more likely to be IMPLOSION.

"k area" was originally conceived as a quantum construct. The Event Horizon "area" of a Black Hole had striking similarities to the "k area".

Quasi Energy Monopoles could pre represent Quantum Fluctuations and the extreme instability leading to Proto Big Bang and may describe Black Holes and White Holes as extreme examples of ongoing dynamic Quasi Energy Monopoles and or Energy Dipoles may be possible dark matter candidates [3].

Potentially they might be detected by diffraction effects.

----------END OF CONCLUSION----------

[Acknowledgments]

The author wishes to thank Russel Aitken for his conversations during the nascent forms of these ideas and his many encouraging words.

We acknowledge the inspirational insights for Magnetic Monopoles articulated by Felix Flicker (in his Lecture) as they were capable of being readily reinterpreted for Energy dipoles.

References

[1] *Felix Flicker* (Lecture) YouTube, dated May 2020. "The Physics of Magnetic Monopoles. How to pull North Pole of a Magnet") Youtube. Royal Institution, London, UK.

[2] *Mainland and Mulligan* (Arxiv 2005, Mathematical Physics subsection).

[3] *Brian P Schmidt* (Nobel Laureate) https://www.youtube.com/watch?V=55pcpTjd3BY ("Accelerating Universe" (Lecture) YouTube", dated 2013. Australian National University).

==========

This work was self financed by the Sole Author

=======END ==========