Unequal Sameness Theory: Towards Precise Understanding of Contradictory Equivalence*

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> "...if an inch may be divided into an infinite number of parts the sum of those parts will be an inch; and if a foot may be divided into an infinite number of parts the sum of those parts must be a foot; and therefore, since all infinities are equal, those sums must be equal, that is, an inch equal to a foot." Sir Isaac Newton (see Figure 1) at Trinity College, January 17, 1692, anticipating *unequal sameness theory*, in a letter to Bentley at the Palace of Worcester. (accurately quoted out of context.)[10]

> "Men read maps better than women because only men can understand the concept of an inch equaling a hundred miles." Roseanne Barr. [1]

Unequal sameness theory (UST) addresses modeling of the sameness, or equivalence, of unequal quantities. Twins have the same parents, but are not equal to each other. All tofu tastes the same - but is acquired at different (unequal) costs. UST also considers the converse proposition. Two equal quantities may not be the same. Four quarters, for example, is equal to one dollar. Four quarters, though, are clearly not the same as a dollar bill. In terms of sameness, $4 \neq 1$. In terms of equality, $4 = 1$.[1]

*Visit the UST web site at <http://cialab.ee.washington.edu/Marks-Stuff/UST/index.html>. **Key Words:** Gleason's approximation, emergent truth, unequal sameness theory, integer derivatives, Ocum's derivative, Glossglossnovitch's lemma, the Orwell limit, Gray superposition, Damborg's temporal displacement engine, anticipatory causality, El-Sharkawi's proof, oxymoronic doubleshpeak, Arabshai diffraction, Bermuda's triangles, Bertrand's equivalent inequalities, the Pythagorean dilemma, Reynold's unbalanced wheel, far far field

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[1]See *the Orwell limit* later in this discourse.

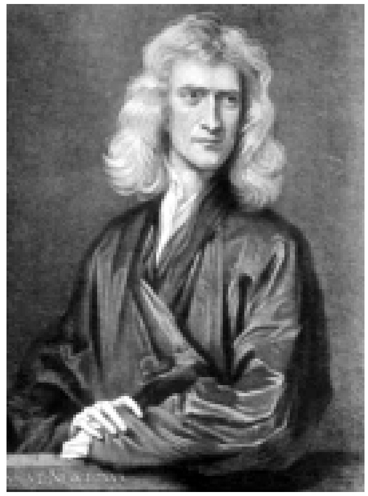

Figure 1: Sir Isaac Newton, UST pioneer.

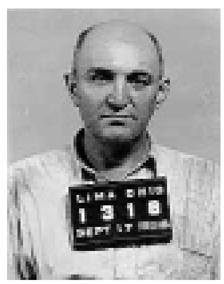

Figure 2: Cleveland Gleason: September 17, 2000.

The precise modeling of items that are unequal, though still the same, is the goal of UST.

1 Historical Development

UST is historically traced to *Gleason's approximation.* The relationship is named for Cleveland Gleason (not his real name -see Figure 2)[2] - a graduate student in Electrical Engineering at Stanford (not his real university) in the late 1970's.[3] The story is foundational in UST folklore. Gleason's approximation was popularized when Gleason, formerly a high tech investment councilor and dot com CFO, was given a take-home examination in advanced electromag-

[2]Because the theory is controversial, many contributors to what is now known as *unequal sameness theory* choose, under threat o law suit, not to reveal their names.

[3]Ironically, the story itself is an example of UST. It is simultaneously whimsical and historically serious.

Figure 3: Dr. M.A. El-Sharkawi.

netics. Professor Oliver Onemug (not his real name - see Fig 4), author of the exam, orally informed the class the answer to the last and most difficult problem was one erg when, in fact, it was two ergs. Gleason became frustrated. No matter how he worked the problem, the answer was two ergs. After two nearly sleepless nights, before handing in his work, Gleason, in frustration, scribbled at the bottom of his test paper the following. "The answer is 2 ergs $\approx$ 1 erg for small 2." Onemug gave Gleason full credit in the first historical substantiation of the celebrated *Gleason's approximation*.[4]

$$2 \approx 1 \text{ for small } 2. \tag{1}$$

2 Foundations of UST

Let H_0 denote an event with features $\{h_0[n]|1 \leq n \leq N_0\}$ and H_1 denote an event with features $\{h_1[n]|1 \leq n \leq N_1\}$. If there exists a p and a q such that

[4]**The El-Sharkawi** (see Figure 3) **Proof of Gleason's Approximation.** Take the equality version of (1) and multiply both sides by x. The result can be written

$$2x = x.$$

It follows that, if $z = x$ and arbitrary y,

$$2x(z - y) = x(x - y).$$

Expanding gives

$$\begin{aligned} 2xz - xy - x^2 &= x(2z - y - x) \\ &= 0 \end{aligned}$$

or, equivalently

$$2z - y - x = 0.$$

Substituting the special case $x = y$ gives

$$2z - 2x = 2(z - x) = 0.$$

Reimposing the equality $z = x$ gives the desired result

$$0 = 0$$

and the proof is complete.

Figure 4: Dr. Oliver Onemug, circa 1960.

$h_0[p] = h_1[q]$ for $h_0[p] \in H_0$ and $h_1[q] \in H_1$, the events H_0 and H_1 are said to be *the same*. If there exists an n such that $h_0[n] \neq h_1[n]$ for $h_0[n] \in H_0$ and $h_1[n] \in H_1$, the events H_0 and H_1 are said to be *unequal*. Using these definitions, it is other than unmeaningless not to speak simultaneously of events as not being *the same* and *unequal*.

As is the case for most insightful revelations, a flurry of theoretical contributions ensued building on the foundation laid by Gleason's approximation. Three most substantive are *Glossclossnovitch's lemma*, *the Orwell limit* and the introduction of the *fragility measure* on the logic of a UST proposition.

2.1 Glossclossnovich's Lemma

Trevor Q. Glossclossovitch (not his real name - see Figure 5) offered an important lemma motivated by Gleason's approximation. The celebrated *Glossclossnovitch's lemma* is[5]

$$\text{For any number } x \text{ and for small } 2, x \approx 1. \tag{2}$$

2.2 The Orwell Limit

French historian and ameteur logician Robert Bǫughb (not his real name - see Figure 6) proposed that, in the limit, as 2 becomes smaller and smaller

$$\lim_{2\to 1} 2 = 1. \tag{3}$$

This eloquently stated though self evident result brings one to the startling conclusion that all real numbers, although not the same, are equal. Indeed, they are all *real*. Bǫughb proposed naming his lemma after political novelist

[5] **Proof of Glossclossnovitch's Lemma.** Subracting one from both sides of (1)gives

$$1 \approx 0 \text{ for small } 2.$$

Multiply both sides by $x - 1$ and solving for x gives *Glossclossnovitch's Lemma* in (2).

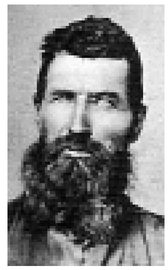

Figure 5: Trevor Q. Glossclossovitch.

Figure 6: Left to right: Robert Bǫughb, George Orwell and Dr. Nomar Hedging.

George Orwell (see Figure 6) who, in his classic book **Animal Farm** [16], had a communist pig proclaim that, although all animals in the new communist regime were equal, some were more equal than others.

2.3 The Fragility of a UST Proposition

In a classic proposition on unequal arbitrage sameness theory, University of Chicago economist Nomar Hedging (see Figure 6) recognized some UST propositions were more sound than others. She proposed a measure for this variation. The *fragility*, $F[p, q]$, of a UST proposition feature pair, $h_0[p] \in H_0$ and $h_1[q] \in H_1$, is a measure of the unsoundness - or $fragility$[6]- of the logic of a UST proposition.

3 Example Manifestations

There exist numerous fascinating manifestations of UST in science, law, finance, mathematics, sociology and even humor.

[6]We later show that fragility is the complement of *emergent truth.*

 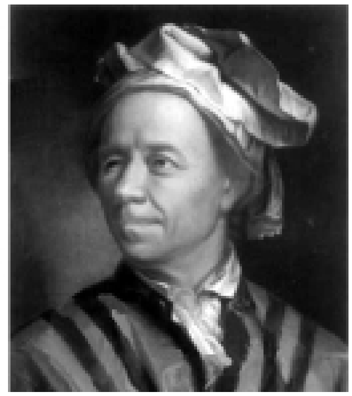

Figure 7: Left to right: Dr. Bawbby Bermuda and Leonhard Euler.

3.1 UST in Law

Men and women, legally, are equal. A cursory inspection reveals, however, they are not the same. On a constitutional level, *all men are created equal* although all are not the same.[7]

3.2 UST in Analysis and Geometry

3.2.1 Bermuda's Triangles

Italian geometrist Bawbby Bermuda (see Figure 7) proposed the triangles in Figure 8 which, with the *same* components, rearranges into *unequal* areas. Each of the shapes in the top and bottom triangles are congruent. The bottom triangle has more area. The extra square on the bottom is shown shaded black.

3.2.2 Euler's Log

A well known identity in complex variables following directly from Euler's (see Figure 7) equation is

$$\mathrm{e}^{j2\pi} = 1.$$

Taking the natural logarithm of both sides gives

$$j2\pi = 0.$$

We

- divide both sides by $j2\pi$ and
- add one to both sides.

In this example, Orwell's limit is achieved. The fragility of this UST example, however, is high.

[7]Contrast, for example, John Wayne and Pee Wee Herman.

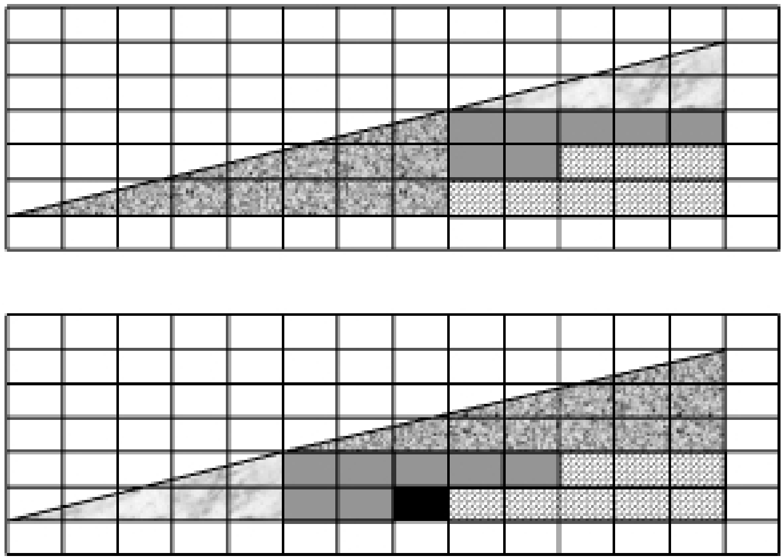

Figure 8: Bermuda's triangles with the same components yield unequal area. The bottom triangle has one extra unit of area. It is shown as a black square.

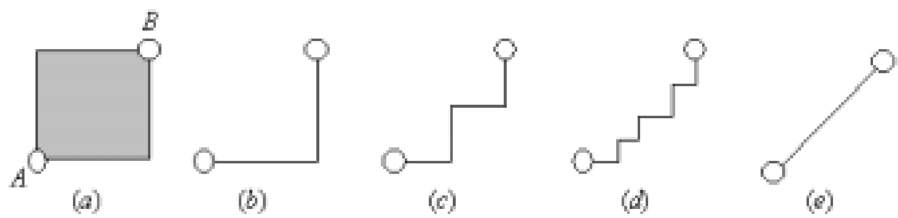

Figure 9: Illustration of the Pythagorean Dilemma.

3.2.3 The Pythagorean Dilemma

The *Pythagorean Dilemma* illustration of *the Orwell limit* is shown in Figure 9. A unit square is shown in Figure 9a. The distance from point A to point B is $\sqrt{2}$. In Figure 9b, we can get from point A to point B using the path shown. The length of the path is 2 units. An alternate path, shown in Figure 9c, also is of length 2. So is the path shown in Figure 9d. In the limit shown in Figure 9e, therefore, the distance from point A to point B is 2. Thus $2 = \sqrt{2}$. Squaring both sides and dividing by two gives *the Orwell limit* in Equation (3). The fragility of the Pythagorean dilemma is low.

Figure 10: Omar Ocum.

3.3 UST in Elementary Calculus

3.3.1 Ocum's Derivative

The most celebrated manifestation of UST is *Ocum's derivative* . We consider evaluation of

$$\frac{d}{dn}n^2 = 2n. \tag{4}$$

Note, however, that

$$\begin{aligned} \frac{d}{dn}n^2 &= \frac{d}{dn}(n \times n) \\ &= \frac{d}{dn}(n + n + n + ... + n) \\ &= (1 + 1 + 1 + ... + 1) \\ &= n. \end{aligned} \tag{5}$$

Equating (4) and (5), followed by dividing by n completes *Ocum's derivative* derivation of an equality form of Gleason's Approximation.

3.3.2 Painting Hollow Glass Flagpoles

The hollow glass flagpole problem is illustrated in Figure 11. A function, $f(x)$, is rotated around the z axis to form a flagpole. The problem is to determine the amount of paint needed to paint the flagpole. Since the flagpole is made of glass, this can be accomplished by filling the hollow flagpole with paint. The results, from the outside, are *the same* as painting the inside of the glass flagpole. The amount of paint required, however, is *unequal*. In some cases, an infinite amount of paint is required to paint the surface while a finite amount of paint is needed to fill the flag pole with paint.

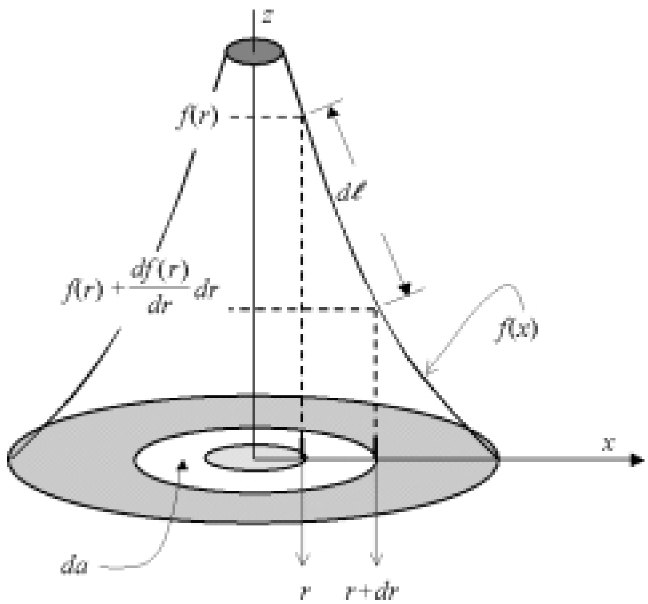

Figure 11: Geometry for the painted flag pole problem.

To find the surface area of the flagpole, we note, with reference to Figure 11, that

$$d\ell = \sqrt{\left(\frac{df(r)}{dr}\right)^2 + 1} \quad dr$$

The surface area for the annulus from r to $r + dr$ is then

$$\begin{aligned} ds &= 2\pi r d\ell \\ &= 2\pi r \sqrt{\left(\tfrac{df(r)}{dr}\right)^2 + 1} \quad dr. \end{aligned}$$

If the base of the flagpole has a unit radius of one, then the total surface area of the flagpole is

$$\begin{aligned} S &= \textstyle\int_{r=0}^{1} ds \\ &= 2\pi \textstyle\int_{r=0}^{1} r \sqrt{\left(\tfrac{df(r)}{dr}\right)^2 + 1} \quad dr. \end{aligned} \tag{6}$$

The volume of corresponding to the annulus from r to $r+dr$ is

$$\begin{aligned} dv &= f(r)da \\ &= 2\pi r f(r) dr. \end{aligned}$$

The total volume of the flagpole is therefore

$$\begin{aligned} V &= \int_{r=0}^{1} dv \\ &= 2\pi \int_{r=0}^{1} r f(r) dr. \end{aligned} \tag{7}$$

To illustrate the unequal sameness of the problem, let $f(r) = r^{-1}$. The volume of the flag pole, from (7), is

$$\begin{aligned} V &= 2\pi \int_{r=0}^{1} dr \\ &= 2\pi \end{aligned} \tag{8}$$

whereas, since $\frac{d}{dr} f(r) = -r^{-2}$, we have, from (6),

$$\begin{aligned} S &= 2\pi \int_{r=0}^{1} r \sqrt{1 + \frac{1}{r^4}} \; dr \\ &\geq 2\pi \int_{r=0}^{1} r \sqrt{\frac{1}{r^4}} \; dr \\ &= 2\pi \int_{r=0}^{1} \frac{1}{r} \; dr \\ &= \infty. \end{aligned} \tag{9}$$

Thus, as promised, the volume from (8) is finite and the flag pole can be filled with paint. The flag pole, though, from (9), has an infinite surface area and can therefore not be painted.

3.3.3 Integer Derivatives

Interesting unequal sameness insight is obtained from *integer derivatives*. To illustrate, consider a differentiable function, $y = f(t)$, such that $f(2) = 4$. It is therefore not unmeaningless to speak of derivatives of the type

$$\frac{d}{d2} 4 = \lim_{\Delta \to 0} \frac{4(2+\Delta) - 4(2)}{\Delta}.$$

- Since $4 = 2 + 2$, it follows that

$$\begin{aligned} \frac{d}{d2} 4 &= \frac{d}{d2} 2 + \frac{d}{d2} 2 \\ &= 1 + 1 \\ &= 2 \end{aligned} \tag{10}$$

- Consistent with this result is the case where $4 = 2 \times 2$. Since $\frac{d}{dx}2x = 2$ we have, for $x = 2$,

$$\frac{d}{d2}4 = 2, \tag{11}$$

a result consistent with (10).[8]

- Since $4 = 2^2$ and

$$\begin{aligned} \tfrac{d}{dx}x^x &= \tfrac{d}{dx}e^{x\ln(x)} \\ &= x^x \tfrac{d}{dx}\left(x\ln(x)\right) \\ &= x^x(\ln(x)+1) \end{aligned}$$

we have, for $x = 2$,

$$\begin{aligned} \tfrac{d}{d2}4 &= \tfrac{d}{d2}2^2 \\ &= (1+\ln(2))2^2 \\ &= 4 \times (1+\ln(2)) \\ &= 6.77258872... \end{aligned}$$

Although the integer derivative problems are the *same*, the result here is *unequal* to that in (10).

3.4 Set Theoretic UST

3.4.1 Cantor's Same but Unequal Squares

Using UST, the two squares illustrated in Figure 12 can be shown to be equal to each other. Each point in the 1×1 square has one and only one corresponding point in the $\frac{1}{2} \times \frac{1}{2}$ square on the left. To illustrate, visualize both squares oriented in the first quadrant with the lower left corner at the origin. Choose a point in the 1×1 square, say $(x_{1\times 1}, y_{1\times 1}) = (0.26414843410\ \cdots, 0.441288642684\ \cdots)$. The unique point in the $\frac{1}{2} \times \frac{1}{2}$ square are these numbers divided be two. In this case $(x_{\frac{1}{2}\times\frac{1}{2}}, y_{\frac{1}{2}\times\frac{1}{2}}) = (0.13207421705\ \cdots,\ 0.220644321342\ \cdots)$. The converse is also true. Any point in the $\frac{1}{2} \times \frac{1}{2}$ square has a single corresponding point in the 1×1 square. The x and y coordinates are simply doubled to find the point's location. This observation clearly demonstrates that the number of points in *any* pair of squares is exactly equal even though the squares are not the same.

3.4.2 Cantor's Manifestation

Georg Ferdinand Ludwig Philipp Cantor (his real name - see Figure 13) showed that some infinities are bigger than others. The smallest order of infinity, $\aleph_0$, corresponds to any infinity that is countable. Cantor showed there is a one to

[8]In the parlance of UST, the *same* results were obtained in (10) and (11) although the approaches are drastically *unequal*.

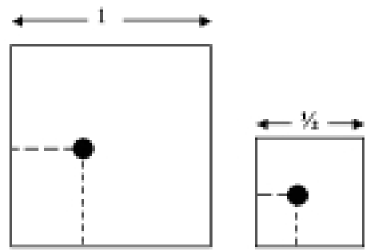

Figure 12: Illustration of Cantor's same but unequal squares.

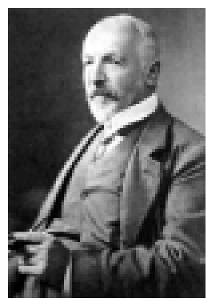

Figure 13: Georg Ferdinand Ludwig Philipp Cantor.

one correspondence between the elements of the set of all integers and the set of all even numbers. Both are countable, or $\aleph_0$, infinities. Thus

$$\aleph_0 = 2 \times \aleph_0.$$

Dividing both sides by $\aleph_0$ yields Orwell's limit.[9]

3.5 Probabilistic UST

3.5.1 Bertrand's Equivalent Inequalities

An inspired application of UST applied to probability is credited to Bertrand [8]. The fragility of the proposition is extremely low.

Consider the circle in the NW corner of Figure 14. Inscribed is an equalateral triangle. Inscribed in the triangle is a smaller shaded circle. If the circle has radius r, then each side of the triangle is $\sqrt{3}r$ and the diameter of the small

[9] Conservative mathameticians, resistant to the paradigm shift offered by UST, often point out that division by ∞ is not allowed. We can formalize Cantor's manifestation, however, with finite values by noting that

$$\aleph_0 = \lim_{n\to\infty} n = \lim_{n\to\infty}(2n)$$

which, for any intermediate value, or in the limit, establishes Orwell's limit.

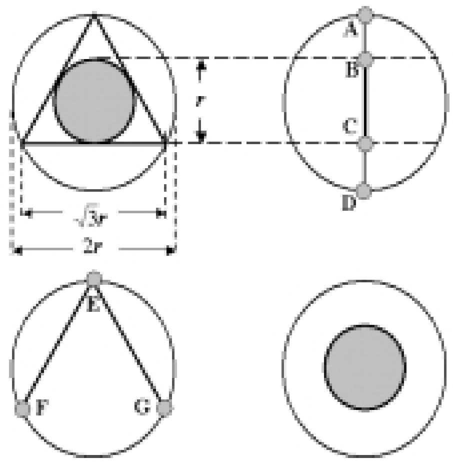

Figure 14: Illustration of Bertrand's UST applied to probability.

shaded circle is r. Choose a chord to randomly intersect the circle. Let the length of the chord be ℓ. What is the probability, p that a $\ell \geq \sqrt{3}r$? In other words, find

$$p = \text{Prob}[\ell \geq \sqrt{3}r].$$

Bertrand, in a UST trifecta, shows that

$$\frac{1}{2} = p = \frac{1}{3} = p = \frac{1}{4} \tag{12}$$

Northeast Solution With no loss of generality, we can, after the random chord is chosen, rotate the circle to view the chord horizontally. Consider, then, the circle shown in the NE corner of Figure 14. The probability the chord, thus oriented, exceeds $\sqrt{3}r$, is equal to the probability the chord has a midpoint on the line segment joining points B and C. Thus

$$\begin{aligned} p &= \frac{\text{length of } \overline{\text{BC}}}{\text{length of } \overline{\text{AD}}} \\ &= \tfrac{1}{2} \end{aligned} \tag{13}$$

Southwest Solution Let, as shown in the SW corner of Figure 14, the chord enter the circle at point E. The probability the chord exceeding $\sqrt{3}r$ is then equal to the probability the other end of the chord exits the circle in the arc $\overline{\text{FG}}$. This is given by the arc length of $\overline{\text{FG}}$ divided by the circle's circumference.

Then

$$p = \frac{\text{arc length of } \overline{\text{FG}}}{2\pi r} = \frac{1}{3} \tag{14}$$

Southeast Solution Lastly, we note, in order for the chord length to exceed $\sqrt{3}r$, the midpoint of the chord must lie within the shaded circle. This is illustrated in the SE corner of Figure 14. Thus

$$p = \frac{\text{area of shaded circle}}{\text{area of large circle}} = \frac{\pi\left(\frac{r}{2}\right)^2}{\pi r^2} = \frac{1}{4} \tag{15}$$

Equation (12) follows immediately from (13), (14) and (15).

3.6 Engineering Applications of UST

3.6.1 Gray Superposition

During his short but turbulent tenure at the Jet Propulsion Lab in Pasadena California, Andrew Gray (see Figure 15) applied UST to increase antenna efficiency. The impact of the contribution to NASA is incalculable. The fundamental of Gray's proposition, dubbed *Gray superposition*, is illustrated in Figure 16. In System #1, two identical antennas are fed a current of $A\cos(\omega t)$. Each antenna therefore generates power $\frac{A^2}{2}$ for a total power of

$$P_1 = 2 \times \frac{A^2}{2} = A^2$$

delivered by antennas X and Y. System #2 combines the currents before being input into antenna. The current delivered to antenna Z in Figure 16 is $(2A)\cos(\omega t)$ and the corresponding power is

$$P_2 = \frac{(2A)^2}{2} = 2A^2 = 2P_1.$$

Therefore, even though the same current is used, System #2 generates twice the power as System #1.

3.6.2 Anticipatory Causality: Damborg's Temporal Displacement Engine

All temporal systems are causal (or nonanticipatory) in that a response cannot occur prior to an input stimulation. The simple (temporally causal) circuit illustrated in Figure 18 demonstrates anticipatory causality: a positive delay in

Figure 15: Dr. Andrew A. Gray.

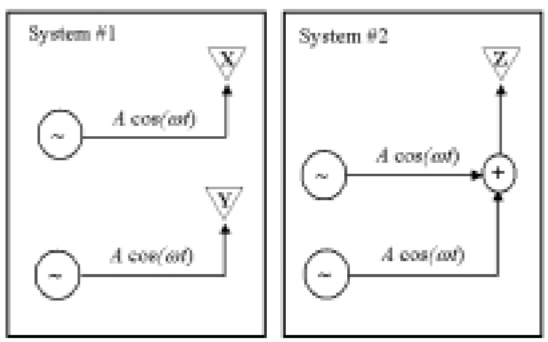

Figure 16: Illustration of Gray superposition applied to an elementary system of antennas.

Figure 17: Dr. Mark Damborg.

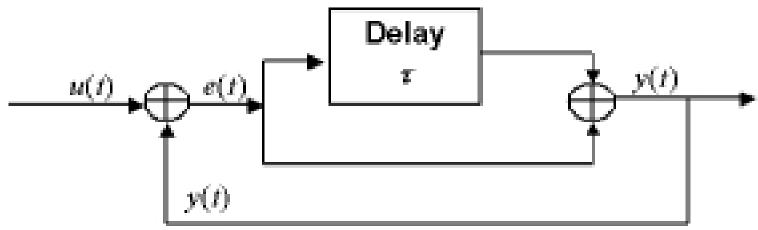

Figure 18: *Damborg's temporal displacement engine, e.g.* time machine.

time can result in a negative overall temporal shift at the system level into the future. The circuit was first proposed by Mark Damborg (see Figure 17). The input to the system in Figure 18 is $u(t)$. The signal, $e(t)$, if fed to a short and a time delay of τ the results of which are summed to give the output signal

$$y(t) = e(t) + e(t - \tau). \tag{16}$$

The system output is fed to the input resulting in

$$e(t) = u(t) + y(t).$$

Substiting (16) gives

$$e(t) = u(t) + [e(t) + e(t - \tau)]$$

from which we conclude

$$u(t) = -e(t - \tau).$$

The input to the system is therefore anticipatory of the system state, $e(t)$, by τ seconds into the future, thereby demonstrating the UST princpal of anticipatory causality.

Damborg showed that demonstration of his anticipatory causality system in the lab was futile. The circuitry, when stimulated, would simply disappear into thin air τ seconds before it was activated. Since the important UST operational aspects of the system occur during its nonexistence, experimental verification of anticipatory causality is not possible.

3.6.3 Arabshahi Transpositional Far Far Field Diffraction

Let an two dimensional aperture, (*e.g.* a phased array) be a single wavelength (*i.e.* monochromatic) source with field amplitude $f(x, y)$. In both electromagnetics and acoustics, if $f(x, y)$ is coherent and sufficiently localized, the far field (a.k.a. Fraunhofer - see Figure 19) diffraction patten is proportional to the two dimensional Fourier transform

$$F(\omega_x, \omega_y) = \int_{-\infty}^{\infty}\int_{-\infty}^{\infty} f(x, y)\mathrm{e}^{-j(\omega_x x + \omega_y y)} dx dy. \tag{17}$$

Figure 19: Left to right: Jean Baptiste Joseph Fourier, Joseph von Fraunhofer and Payman Arabshahi.

The coordinates, for wavelength λ, of the far field are

$$(\omega_x, \omega_y) = \left(\frac{2\pi x}{\lambda z}, \frac{2\pi y}{\lambda z} \right).$$

The far field occurs when $z >> \lambda$ so that each component point of the source maps approximately into a plane wave [3].

We denote the Fourier (see Figure 19) transform relationship in (17) by

$$f(x, y) \leftrightarrow F(\omega_x, \omega_y).$$

The duality theorem of Fourier theory states that the Fourier transform of a Fourier transform is the transposition of the original signal [5]. That is

$$F(x, y) \leftrightarrow (2\pi)^2 f(-x, -y).$$

Payman Arabshahi (see Figure 19), the famous office mate of the junior Andrew Gray (see Gray superposition and Figure 15), noted that, if one went to the far far field, one simultaneously had (a) the *really* far field and (b) the far field of the far field (a.k.a. Arabshahi diffraction). Suppose, for example, the far field occurs at a distance of z from the source. The far far field would occur at some $z_2 >> z$. For the *really* far field manifistation of the far far field, the field amplitude is proportional to

$$\text{far far field} \propto F\left(\frac{2\pi x}{\lambda z_2}, \frac{2\pi y}{\lambda z_2} \right). \tag{18}$$

For the far field of the far field manifistation of the far far field, the field amplitude is proportional to the Fourier transform of the far field. Let C be a constant of proportionality. Then

$$\begin{array}{l} \text{far field} = F\left(\frac{2\pi x}{\lambda z}, \frac{2\pi y}{\lambda z}\right) \\ \leftrightarrow \text{far far field} = Cf\left(\frac{-zx}{z_2 - z}, \frac{-zy}{z_2 - z}\right). \end{array} \tag{19}$$

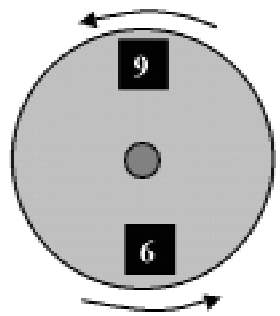

Figure 20: Reynold's unbalanced wheel.

The far far field here is the transposition of the original diffracting aperture. Equations (18) and (19) are *the same* far far field and they are clearly *unequal.*[10]

3.6.4 Reynold's Unbalanced Wheel

Reynolds [9] has applied UST to the taboo field of perpetual motion. Consider the wheel pictured in Figure 20. The wheel, initially turning counterclockwise, has, at its top, a 9kg mass. At the bottom is a 6kg mass. As the wheel turns, the masses will invert. The 6kg mass, when it nears the top, will become 9kg. Conversely, the 9kg mass at the top will invert to 6kg as it nears the bottom of the wheel.[11] The process will continue giving, remarkably, perpetual motion. In Reynold's unbalanced wheel, are 6kg and 9kg are simultaneously the same but not equal and not the same but equal.

At a 1987 public demonstration of his unbalanced wheel in Bellevue, Washington, the experiment failed. After in depth analysis, Reynolds determined the machine would not work within the borders of the United States due to nonuse of the metric system.[12]

There remains open questions concerning Reynold's unbalanced wheel. Specifically, could he have used 6 lb and 9 lb masses? Opponents of the technology claim Reynold's unbalanced wheel is ill-conditioned. Specifically, if. instead of 6kg, the mass was 6.01kg and the 9kg mass was 9.001kg, the inversions would be 10.9 and 100.6kgs respectively. The fragility of Reynold's unbalanced wheel is dangerously high.

[10]An urban myth has been widely circulated that, at the discovery of Arabshahi diffraction, Arabshahi quoted Dickens' **Tale of Two Cities** [2]: "*It is a far far better thing I do, than I have ever done.*" Arabshahi denies saying this - but admits he wishes he had.

[11]It is straightforward to show that the inversion of the 6kg mass is 9kg and not 9kg^{-1}.

[12]The 6kg mass is 13.2lb and 9kg is 19.8lb. The values 13.2 and 19.8, unlike 6 and 9, are not invertable. Unfortunately for UST, Reynolds was unable to raise capital to support a trip to Paris to repeat his experiment in a country where the metric system is in common use. Because of the inability to demonstrate, his application to the United States Patent Office was subsequently rejected.

Figure 21: Left to right: Mohamed, Izzy, Bob, Stella Nixon and Mani.

3.7 UST in Finance

3.7.1 Mani's missing $10

The following true story illustrates UST in finance. Mohamed, Izzy and Bob (see Figure 21) attended the 2000 summer meeting of the IEEE Power Engineering Society in Seattle. They paid $100 cash each for their three rooms at the Seattle Sheraton. Payment was made to Stella Nixon (see Figure 21.) at the hotel's reception desk in the lobby. A bell hop named Mani (see Figure 21) escorted the three to their room but was given no tip. Mani had been stiffed - and didn't like it. Meanwhile, Stella remembered the conference special: three rooms for $250. She gave Mani fifty dollars in ten dollar bills and asked he return the money to Mohamed, Izzy and Bob. Mani, though, was

1. bad at math, and
2. still mad at being stiffed.

Mani therefore pocketed $20 and returned $10 each to Mohamed, Izzy and Bob. Consider the following flawless UST logic.

- After their refund Mohamed, Izzy and Bob paid a total of $90 each for their rooms.
- Mani kept the other $20.
- Thus, the total accounting is $3 \times \$90 = \$270$ plus the $20 Mani kept totals $290.
- Since a total of $300 was initially spent, we have lost $10.

The fragility of this proposition is high. The process can be explained with more conventional results using standard logic. This does not diminsh the impact and power of the UST logic of the above reasoning sequence.

Figure 22: VC.

3.8 UST in Linguistics

3.8.1 Same Sounding Antonyms

Same sounding antonyms are words that are their own antonyms. In English, the term *cleave*, as is the case with any object, is equal to itself. *Cleave* means to join, *e.g.* a child *cleaving* to its mother. *Cleave* also means to separate as is done with a *cleaver*. Both *cleaves* are the same, but are unequal. Indeed, since *cleave* means both to separate and to join, they are opposites. Similarly, a *citation* is negative if received from a police officer - positive if received from a professional society.

3.8.2 Clever Converses

Clever converses are second order puns of the first type where reversal of the *same* words results in *unequal* meanings. For clever converses, the *emergent truth* of the phrase is the complement of its fragility.[13] There are two types of clever converses: word reveral and auto context. Word reversal converses with low fragility include [1]

- "*If you fail to plan then you plan to fail.*"
- "*Some eat to live while others live to eat.*",
- "*The more unpredictable the world becomes, the more we rely on predictions,*" Steve Rivkin.
- "*When a man brings his wife flowers for no reason - there's a reason,*" Molly McGee.
- "*In theory, theory and reality are the same. In reality, they are not.*"
- "*Why do we drive on the parkway and park on the driveway?*" Gallagher.
- "*You have to live life to love life, and you have to love life to live life. It's a vicious circle.*" (see Figure 22).

Typical reaction to a clever converse is a slight smile with simultaneous small amplitude head bobbing and mono-hand chin rubbing. A phrase of the sort "*Babies who mind being changed occasionally do not occasionally change their minds*" is an example of a converse that, as a result of having little or no emerging truth, has high fragility.

[13]For example, if the emergent truth is 0.75, the fragility is 1.0-0.75=0.25.

Figure 23: Yogi Berra.

Auto-context clever converses, although still reversing word meanings, use the same words in doing so. An example with high fragility is "*I hate to feel pain*". The statement can be from a masochist who joyfully suffers when displaying extreme emotions - or a patient conveying concern to his dentist. Lower fragility statements with high emergent truth include [1]

- "*Life! Can't live with it, can't live without it.*" Cynthia Nelms.
- "*An empty taxi stopped and Bill Clinton got out*".
- "*Too many pieces of music finish too long after the end,*" Igor Stravinsky.
- "*The purpose of a life is a purpose,*" Robert Bryne.
- "*You can make a killing as a playwright in America, but you can't make a living,*" Sherwood Anderson.

A rich source of auto-context clever converses is Yogi Berra (see Figure 23). These include

- "*It isn't over until it's over*".
- "*Toots Shor's restaurant is so crowded nobody goes there anymore.*"
- "*If the world were perfect, it wouldn't be.*"
- "*The future ain't what it used to be.*"
- "*It gets late early out here.*"

3.8.3 Oxymoronic Doublespeak

UST is foundational in the theory of oxymoronic doublepeak popularized in George Orwell's (see Figure 6) book, **1984** [6]. Citizen's were taught such phrases as "*slavery is freedom*". Here, antonyms are linked into a UST oxymoronic truth. Other examples include [1]

- "*Truth is the safest lie*".
- "*We're all in this alone,*" Lilly Tomlin.
- "*I am a deeply superficial person,*" Andy Warhol.
- "*Nothing fails like success,*" Gerald Nachman.
- "*Microsoft Works*".

3.9 UST in Theology

3.9.1 UST and Atheistic Apologetics

Paradigm shifts are often used to see atheistic apologetics in a new light.[14] Although Sir Isaac Newton anticipated UST[15], he was unenlightened by the use of UST by proponents of atheism. Newton reveals his position in the following quote.

"*Atheism is so senseless and odious to mankind that it never had many professors*" [10].

Irish-German UST enthusiast and atheist, M.M. O'Hairy (see Figure 24), conversely declares,

"*The cruelty and injustice in the world is incontrovertible proof of the non-existence of God.*"

O'Hairy asks how a just and loving God could allow the unspeakable horror and suffering imposed by the ebola virus, war, mass murderers and accordion music. The statement assumes "cruelty" and "injustice" have meaning.[16] An analysis of Herr O'Hairy's statements reveals UST-rich self-contradiction. British Professor, C.S. Lewis (see Figure 24), explains it this way.

> "*If the universe has no meaning, we should never have found out that it has no meaning: just as, if there were no light in the universe and therefore no creature with eyes, we should never know it was dark.* Dark *would be without meaning.*" [4]

Modern UST, as is the case with applied situational ethics, allows suspension of such contradictory arguments to justify continuity of logic thereby giving proponents of atheism new favor.

3.9.2 A Theological Clever Converse

"*God is dead!*", Friedrich Nietzsche.[17]
"*Friedrich Nietzsche is dead!*" , God.

3.10 Other Work

"*Logic is in the eye of the logician*", Gloria Steinem.

1. The business school at Evergreen State College has presented preliminary results in application of UST to balancing

[14] "*We had seen the light at the end of the tunnel, and it was out*", John C. Clancy.
[15] See the quote by Newton at the beginning of this paper.
[16] If you chuckled inside when you read "accordion music" in the previous line, you have evidence that, along with "unspeakable horror" and "suffering", 'cruelty" and "injustice" do, indeed, have meaning.
[17] See Figure 24.

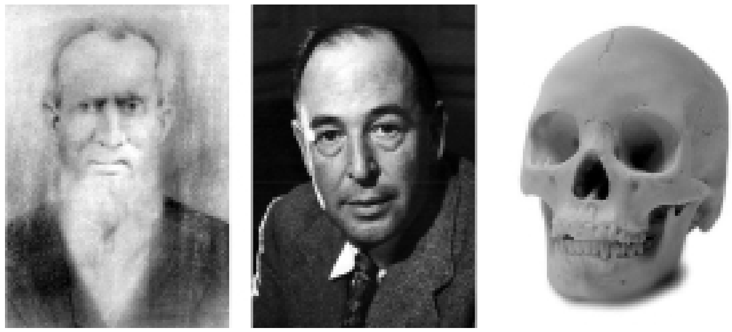

Figure 24: Left to right: M.M. O'Hairy, C.S. Lewis and Friedrich Nietzsche.

   (a) personal check books.
   (b) the national debt.

2. The political science department at Washington State University is applying UST to explain the logic used by nay voting members of the United States Senate when they failed to convict an impeached Bill Clinton.

3.11 UST in Humor

We end this tutorial discourse with a truism exemplifying UST in humor. Although humorous, the statement's emergent truth is remarkable high.

"*There are three types of people in the world: those who can count and those who can't.*"

4 References

1. Robert Bryne, Editor, **The 2548 Best Things Ever Said**, Galahad Books, 1996.
2. Charles Dickens, **A Tale of Two Cities**,Trident Press International, 2000.
3. Joseph W. Goodman, **Introduction to Fourier Optics**, Second Edition, McGraw Hill, 1996.
4. C.S. Lewis, **Mere Christianity**, Harper.
5. R.J. Marks II, **Introduction to Shannon Sampling and Interpolation Theory**, Springer-Verlag, 1999.
6. George Orwell, **1984**, New American Library Classics.
7. George Orwell, **Animal Farm**, Signet Classics.
8. Athanasios Papoulis, **Probability, Random Variables, and Stochastic Processes**, Third Edition, McGraw Hill, 1991.
9. Don Reynolds, **Harnessed Greed**, unpublished.
10. H.S. Thayer, **Newton's Philosophy of Nature: Selections from His Writings**, Hafner Press, 1953.