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Exploring Asymmetry to Detect Disruption

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Abstract

Asymmetry is explored for its ability to improve Futures practice by recognizing it as a potential precursor to disruption. Asymmetry is further developed by engaging patterns of discovery across disciplines, as well as current theories and practices in Futures. The analysis is enhanced and enriched by exploring ideas and potential applications by futurists who may use asymmetry.

Keywords: Asymmetry, Forecasting, Disruption, Neuroscience, Cognition, Futures, Scenarios, Irregularity, Complexity.

Introduction

In this paper, I will explore 1) the relevance to the audience; 2) define asymmetry; 3) explore how futurists can use asymmetry as a new tool for detection of change; 4) explore how to recognize asymmetry; 5) discover how to apply asymmetry; 6) connect the relevance of neuroscience to asymmetry; 7) discuss how asymmetry can challenge existing futures thinking; and 8) conclude with a summary of most relevant points that the reader may practically use.

Asymmetry, as I would define it, is a subtle and nascent fissure or rupture that creates a departure or deviation from the current cycle or status-quo. Asymmetry, in this paper, applies primarily to anticipation and as an additional process for dealing with emergence in Futures. It can also be used to challenge the status quo.

Methodology

This is an exploratory piece intended to ease the process of pollination between Futures and asymmetry as a potential technique. The methodology connects existing theory in Futures and Neuroscience and utilizes eclectic analysis which includes crowd sourcing and curated dialogues, and framing through utilizing multiple disciplines to gain insight (Inayatullah, 2012).

Asymmetry can also be understood through a range of disciplines, with each contributing through a different lens of understanding. Table 5 continues the examples of asymmetry from varying fields while including methodology, characteristics for recognition, and, more importantly, implications for Futures using some of the fields methodologies, characteristics, and implications where asymmetry can be characterized. It is meant to be illustrative rather than comprehensive. Many fields have approached asymmetry from their own

disciplinary perspectives. Perhaps physics and statistics have paved the way to queries based on energetic systems and data distributions.

Table 1. *Understanding Asymmetry*

Field	Methodology	Recognition Characteristics	How the Field Can Be applied to Futures
Mathematical: Statistics, Geometry, complex systems	Aesthetically through curves, shapes, and dimensions	Asymmetry appears as fractals in geometry and as "fat tails" on either side of the bell curve. Temporality can add complexity and skew data.	Detecting early signs of disorder, disruption,
Physics, Socio-Physics	Energetically through dispersion of energy or lack thereof	Asymmetry is characterized by entropic functions. Temporality can infuse friction in time series reversals.	Energetic systems and entropy can provide additional lens for asymmetry as a precursor to systemic change and exergetic release.
Neuroscience, cognition, and Psychology	Human behavior, cognition, perception, and observed changes in the brain	Asymmetry is characterized by cognition, perception, belief, heuristics and risk taking; temporality can be distorted by memory	Application of human influence and judgement individually or as a collective in asymmetry and disruption.
Business/Finance	Risk is measured energetically using entropic behavior in bell curves as applied to financial instruments.	Asymmetry and disruption are characterized by how financial instruments, acting in groups, function. Temporality is relevant to indexing of time series data.	Financial instruments are a characterization of human actions, behaviors and perceptions and provide an additional lens into potential future behavior.
Behavioral and Macro Economics	Econometric observation of behavioral manifestations	Asymmetry shown in overweighting and underweighting potential outcomes; Temporality can skew views of either the past or future based on mis-estimates of time.	Implications for asymmetry prior to disruption through group behavior.

Theoretical Framework

Theory is woven throughout this paper; however, it should be noted that the theoretical foundations reside outside of Futures Studies, which is largely silent on the subject. Asymmetry is part of a larger process within complex systems where observable irregularity may be manifested as precursors to more prolific disruption. For example, Asymmetry in economic systems can create negative disparities that disrupt systems. Asymmetry in income can have consequential negative

impacts of reduced demand for purchasing creating polarizing effects that act as energy in the system seeking exergy through consolidation or conflict (Volner, 2015; Wade, 2009). Asymmetry also occurs across the "hierarchy of needs", such as food, water, energy, employment, etc. (Maslow, 1943).

Asymmetry does not always have to be quantifiable but can be accessible through our sensory system and perception. Intuition, where we have a "sense" that something is not right is explored in Futures (Bussey, 2015, 2017) and theorized by neuroscience (D'Argembeau, 2004; Khaneman, 2011; Kveraga, Ghuman, & Bar, 2007). For example, Native Americans could sense the change between summer and fall and the exact day where the "turn" occurred by changes in animal and plant behavior or by simply a "feeling" that change was on the horizon (Thompson, 2008). In the U.S. music world, social change, war, attitudes, and technology enabled the transition to rock and roll preceded by tonalities and rhythms giving way to a new genre (Geels, 2007).

Asymmetry also occurs across the spectrum of food production, healthcare, energy, and employment (Volner, 2015). Other disciplines like Economics, Neuroscience, Mathematics, and Art can be useful lenses for understanding asymmetry. Asymmetry is emerging as a byway between art, math, economics, science, and other disciplines by connecting disparate threads throughout (Nature, 2018). Threads of asymmetry can be found in other areas of economics. For example, Macro-economics observes that the reliability of irregular asymmetric pro-forma modeling is contingent upon time horizon, parameters, and units of measurement (Kilian & Vigfusson, 2011). Aversion to uncertainty can escalate tipping points (Lemoine & Traeger, 2016)

Asymmetry can also be readily observed in Physics where Newtonian theory assumes that moving particles are symmetric even when time is reversed, however, entropy occurs as the second law of thermodynamics where in systems that become unbalanced, show even further deterioration of equilibrium at a faster rate when measured under time reversed symmetry (Andrieux & P. Gaspard, 2007).

Similar asymmetric tendencies can be seen in the field of Socio-Physics where Galam argues that the rational agent and invisible hand theory still applies to markets and particularly bubbles like the 2000 and 2008 crashes. This may be the result of the lack of flexibility in "extreme" beliefs where collective beliefs become overly biased and inspire herd behavior. The argument continues that many overly optimistic people have only fractals of information, but no one has all the information, therefore, in an overly optimistic environment anticipation rules; however, when this turns pessimistic, the crowd sparks a "lemming run off the cliff" (Galam, 2011).

Math, statistics and geometry can also give us insight into asymmetry. Fractals better explain irregularity and asymmetry by inferring that irregularities exist in the individual parts that make up the sum of the whole. Geometrically measured, parts of a whole are irregular (unlike cones or spheres) and can be seen in nature like mountains, clouds, or a coastline forming the boundary between land and water and hence the geometric measurement of a coastline being the sum of its parts (Mandelbrot, 1983). Fractals explain irregularity of the whole through examining the individual parts (Peitgen, 2010).

Discovering Asymmetry

Asymmetry emerges as an imbalance or entropic feature wherever it appears. It may signal a shift in direction or another cycle. Asymmetry may also bring an balancing stability imposing appropriate shocking mechanisms to systems, that in effect, create resilience (Pendall, Foster, & Cowell, 2010). Anticipating and understanding its emergent point should be of keen interest to futurists because if we can understand where it begins, we may gain a better understanding of the future disruption to come. Table 3 was designed to show examples of the emergence of asymmetry from varying disciplines, like Data Science, and how to recognize it in patterns of emergence, such

as how data looks under computer visualization (Sarkar, 2008). Japanese Haiku poetry and origami art demonstrate the beauty of asymmetry (Schwarz, 1997) whereas accounting shows us asymmetry through that "snapshot in time" of a balance sheet changing with each frame giving us insight into behavior (Bartov & Bodnar, 1996).

Table 2. *Discovering Asymmetry*

Discipline	Patterns of Emergence	Assumptions	Aesthetic Imagery
Data Science and statistics	Data visualization	Statistical distributions; shapeshift into irregular formation	Widening tail(s) of a statistical distribution Iceberg formation in data (Inayatullah, 2018)[1]
Art and Literature	Japanese Origami and Haiku	Asymmetric edges form art Hanging sentences form literature	Lop-sided formation becomes art Lop-sided poetry becomes literature
Accounting	Subtle changes between amounts owed, owned, and claimed	Changes in balance sheet between Assets, liabilities	Asset and liabilities look numerically more positive or negative.
Mathematics	Fractals in geometry	Irregular formations shapes, measurements	Precious stones, rubies, emeralds chipped off a larger rock
Molecular Biology	Asymmetry between DNA helixes	not perfectly matched; missing	Symmetry is broken on the right
Glaciology	Mesoscopic fracturing begins as nascent fissure.	Undetectable fractures form in ice	Moving ice layers become iceberg calving leading to birth of new iceberg formations

Like a balance sheet in accounting, asymmetry is a "snapshot in time" where things are out of balance. While it may be part of a cycle, it is the point in time where dysfunctionality occurs which may signal a shift.

How Futurists Describe Asymmetry

To gain further insights, I asked a number of futurists how they would describe asymmetry and how they might recognize it in Futures. Table 3 details how futurists describe asymmetry and aesthetic identification of its features in response to a crowdsourcing query/dialogue on Facebook, The Association of Professional Futurists (APF) list-serve, and curated email dialogues. More than twelve futurists responded, and Table 4 summarizes their collective responses.[2]

Table 3. *How Futurists Describe Asymmetry*

How Futurists Describe Asymmetry	Aesthetic Recognition
Uncomfortable, randomly fractal, a wilderness, untidiness	Avoided intentionally; freakishly unsettling and we look for; it takes an effort to overcome
Asymmetry is described between work and life standards as climate conservationists advertise their views at work but drive gas fueled vehicles instead of using alternatives	Asymmetry may manifest as hypocrisy allowing us to anticipate reactions through behavior.
Asymmetry between what we plan in the drawing phase and what we deliver	A change in strategic plans or architecture plans
Asymmetry is part of the cycle of moving between resilience and panarchy.	A dramatic spike or change in the panarchy process that changes the cycle
Part of the S curve cycle where there is rebellion, creative destruction	Could be the beginning growth of a bubble or a drying before a drought
A tipping point between balance	The unfamiliar, out of sorts
Unbalanced spaces, balls in the air	Juggling

Presumptions of asymmetry may provide additional complexities to futures methodologies and forecasting. Unlike Molitor's emerging issues (Molitor, 1999), asymmetry is the beginning of an emergence of disorder. Asymmetry may also be characterized by a state of behavior where subtle inflection points give way to gargantuan systemic shifts. Molitor observed some of these irregularities in their appearance as larger macro-trends and emergent issues prior to their appearance as S curves (Molitor, 1999, 2001). In the evolution of S-curves, representations of data may be irregular, icebergs to pre-V-formations before undergoing more major shifts. A Futures triangle would be represented by an irregular shape indicating a plethora of pulls at play within the environment. Asymmetry may appear in a system as gradual imbalance or as irregular relationships. In a statistical regime forecasting data, asymmetry can be observed by stochastic data residing on either side of the bell curve and most frequently dismissed as an outlier (O'Connor, Remus & Griggs, 2001). Early mathematicians like Bernoulli considered extreme data sets to be too far outside of the norm and subsequently deleted them (Beckman & Cook, 1983).

Understanding how irregular and non-sequential (observations that differ from a successive sequence, like A, B, C, D, etc.) contribute to asymmetry can be seen through combining statistics and neuroscience to understand the interplay between data and human behavior. We can observe that *frequency* matters in sample size when talking about probabilities and can substantially change interpretation of the data. Gigerenzer argues that the "over confidence in people's self-delusions" about a particular fact leads to natural frequencies (a physics term that characterizes oscillation) that allow people to make inferences". Gigerenzer also points out the fallacies of misrepresented data through using relative probabilities, such as the percentage of people cured from cancer as opposed to using absolute numbers which can provide more truthful representation of data (Gigerenzer, 2014). Smaller data sets can lead to better inferences equating to "less is more". Our human behavior also plays a role since the brain may have an underlying cognitive process for statistically estimating (Gigerenzer, 2006, 2009, 2011).

Asymmetry arises out of systemic processes that are in a continual state of flux as systems move through cycles of balance and imbalance. States of entropy may provide opportunity through maximization instead of minimization in recognition of uncertainty and assuming the sum of the

parts move as a whole (Geman & Taleb, 2015). Taleb argues that entropy can be embraced instead of disparaged (Taleb, 2018). Financial markets contain many examples of entropic scenarios and analysis of probability distribution in characterizing "tails of the distribution". Tails of a statistical distribution, whatever, that data represents, can be very important to futurists as well, as systems become more connected the distribution tail could, in effect, be the proverbial "tail that wags the dog". For example, in financial markets, equities demand premiums because investors overweight negative tail events, which are considered least probable. These tail distributions could represent future crashes or a big windfall, like the next Google (Geman & Taleb, 2015).

People often negatively overvalue the probability of "tail events," such as the low deductible in insurance, by assuming they will have flooding or an automobile accident (Huisman, Koedijk, & Pownall, 1998; Taleb, 2015). It is also hard for people to anticipate negative events like market crashes, terrorism, or hurricanes since they cannot often recall them in recent memory. For those that have been in a negative event, they may overweight, contributing to both misguided underweighting and overweighting of probabilities. Some elements may be attributable to misbelief (Barberis, 2013). Sperber argues that societies also experience "culturally appropriated misbelief" in that people communicate through conversations and narrative. This often makes the untrue seem true and multiplies the error in successive generations, a bit like a giant fish story (Sperber, 2009).

How our brains interpret data is essential to understanding asymmetry and interpretation of events. Beliefs are important for motivating people as part of survival. "Adaptive Misbelief" also exists as an evolved falsehood or exaggerated truth that contributes to decision-making and how people may perceive the future (McKay & Dennett, 2009). In Futures Studies, inordinate amounts of data and its interpretation can be confounding. Gigerenzer argues that ecological rationality is a form of heuristics when one explanation is better than many; less data is better than more, and favors the "counter- intuitive", (Gigerenzer, 2006). Essentially, more data can become noisy and dilute relevant data. In Futures Studies, we are presented a two-fold challenge when observing futures: 1) our interpretation of events and data may be skewed, and 2) our cognitive perception of events may also be skewed, therefore, porting potential falsehoods between the past, present, and the future. Asymmetry in futures puts us on alert for the emerging element that we can vaguely observe from our peripheral vision that seems to be "slightly out of balance" (Rhemann, 2018).

Asymmetry and Neuroscience: Asymmetry May Start Within Us

Asymmetry can be observed in many systems, and even more so as systems become more connected, complex, and ultimately more susceptible to subtle forces that can successively impact the entire connected system (Gell-Mann, 2002).

Neuroscience has made significant strides in helping us understand the relationship between memory and futures projection, as well as raising the question of whether we can trust our memory of the past or our vision of the future[3]. Our brains are constantly trying to anticipate the future to sense what might be coming next, (Kahneman, 2011). There is also significant evidence that memory plays a large role in anticipating future events (D'Argembeou & Van Der Linden, 2004). However, people also engage in misappropriation when they assume that a past or current event will continue into the future (Gilbert & Wilson, 2007). The adage of "rose colored glasses" continues to be confirmed by neuroscience. These rose-colored glasses do not just apply to the future but also the past which should cause us to question whether we have an accurate picture of either past or future events. Our brains can also overwrite or suppress negative information, which may keep us from carrying the baggage of negative thoughts into the future. This suppression mechanism can cause image details within memory to be entirely lost (Benoit, Davies, & Anderson, 2016). If we are blind to the past, we may fall victim to transporting rewritten memories of the past into the future.

In order to compensate for our potential past-blindness, an asymmetric approach may require us

to ask new questions. We must ask what weighting of the past we are willing to accept or find more unbiased approaches (which may be difficult). In effect, we are questioning the interpretation of others of the past (Romanowski, 1996) and ourselves.

Neuroscience tells us that we may not be able to accurately rely on memory (Zeidman & Maguire, 2016). The same brain regions are responsible for both past and future thinking (D'Argembeou & Van Der Linden, 2004), so we are reliant upon how we have filed data in our "filing cabinets". Further, when thinking about the future, we often transport the past into the future. Therefore, an asymmetric approach must address erroneous judgements we make about both the past and the future.

Discussion: Challenging the Future

Asymmetry can challenge our normal thinking by moving us into an asymmetrical world to observe from an asymmetrical bias rather than symmetrical. Applying Asymmetry in Futures is less dependent upon a method of interpretation, like mathematics, science, or art than changing how we restructure our thinking when it comes to symmetric projection into the future. An asymmetric approach embraces and seeks out the low probability high impact events as emergent in an approach to Futures (Ilmola, 2006), (Taleb, 2018). In forecasting, for example, we would assume asymmetry rather than only cycles based on symmetric models. Our assumptions in using asymmetry glasses to improve Futures would bring the unlikely models and the skewed data to the forefront rather than assuming them to be outliers or statistical tails. That would mean weighting would be prioritized in favor of earthquakes, volcanos, winning the lottery, and global cooling. In other words, we are challenging the crowd and short-circuiting what is believed to be the disrupting event by asking why it would not happen and assuming the asymmetric pathway.

Challenging the future within us

As we look to the past for potential reference points for the future, we are confronted by our own human limitations 1) by assessing whether our vision of the past is accurate or weighted by friction; and 2) how to remove our biased perspectives which can skew both the past and the future. Neuroscience, physics, and transdisciplinary analysis can useful in helping us understand these problems in creating new lenses. For example, thermodynamics assumes symmetrical particle movement backward and forward through time with entropy and imbalance occurring during temporal reversal (Andrieux & Gaspard, 2007).

Neuroscience infers that memories can be altered, replaced, and rewritten due to the brain's constant update of information between semantic and episodic memory functions (Benoit et al., 2016) In asymmetry, the Futures Triangle (Inayatullah, 2005, 2008) characterized by the "weight of the past" may be friction and entropy, which may occur as part of natural cycles where asymmetry precedes disruption prior to new cycles. If we are to engage in new Futures efforts that use asymmetry as a tool, we must attack it by challenging symmetry at every turn to anticipate what might change a given trajectory. Symmetry can appear "symmetric" in the respect that we expect the future to behave as the past or some component of the past that will make sense of the future. For example, growing and irrigating crops in the desert challenges traditional agriculture norms just as "fracking" has challenged traditional expectations of "peak oil".

Asymmetry may be an early tamer of wildcards: how futurists would use asymmetry in practice

I asked futurists five questions as part of a crowdsourcing query/dialogue on Facebook, The Association of Professional Futurists (APF) list-serve, and curated email dialogue[4]. These questions

were: 1) how would you apply asymmetry to futures; 2) How would asymmetry look in Macro History; 3) How would you apply asymmetry to environment scanning? 4) What would asymmetric treatment of scenarios look like; and 5) how would you apply asymmetry to strategy? More than twelve futurists responded, and Table 4 summarizes their collective responses. Almost all futurists recognized some level of asymmetry, its recognition, and its usefulness as an additional tool for Futures. Most futurists identified the necessity for earlier recognition of the "improbable" and the need for moving "improbable" scenarios to the forefront and including them in strategy. Essentially, asymmetry might become an early tamer of wild cards as it is implemented in practice.

Table 4. *How Futurists Use Asymmetry: summary of responses*

How Futurists Think About Using Asymmetry in Practice				
Applying Asymmetry to Futures	Asymmetry might look in Macro History	Environmental Scanning	Asymmetric treatment of scenarios	Applying Asymmetry in Strategy
Looking for "seeds of change" unnoticed "margins"	Looking for facts as well as non-facts as extension of trends	Looking for what might put the company out of business	Wildcards and outliers would move to the front	Incorporating early warnings; Porter model
Asymmetry might be used to understand its sources, mapping metrics	Like the Wars in Vietnam or Iraq, more brutal, less overtly violent	Focusing on the diffused rather than the more obvious emergent	More challenges to extrapolation From straight [line] projection and the status quo	Developing paranoid strategies; leveraging multiple Asymmetries
Asymmetry could play a role in determining source of disruption	Recognition of smaller changes that lead to larger departures later	Breaks and fractures in assumed persistent trends, like volcanoes	Preparing for the wildcards and ridiculous might prepare us for actuality	Futureproof the wildcards
Recognizing unequal distribution in timing	London thought itself advanced and connected, but history reveals Mayan culture may have had more advancements for its day	Avoid tagging things instead of processes, rearrange value and how we apply STEEP	Change weighting on possible scenarios, avoid overweighting the favorable	Use back-casting in strategy as it would be used in other phases to seek and work with asymmetry
Applying asymmetry to our own existence such as collision of galaxies and search for new homes for human life	Remove the belief that we can shape our future	Removing dependencies on the past to forecast the future	Remove our bias toward symmetry; add depth to scenarios	Deploy scenarios that have included asymmetrical thinking to prepare for unexpected

Conclusion

Asymmetry has been of rising interest to the scientific community and should also be of mounting interest to futurists for its ability to signal change in an expanding interconnected maze of complex systems as noted in the Journal of Nature editorial (Nature, 2018).

An asymmetry identification process may help us with early detection. This identification process combines an interactive set of lenses for exchanging understanding between futurists and the subject being observed and incorporates lenses from other complex systems. For futurists asymmetry is an anticipatory sensor for interacting with futures. As shown in Table 5, "Seven Lenses in Asymmetry Detection", this might be done through using a multi-lens/tool process that involves: 1) Neuro-intuitive Cueing; 2) Mathematical Observation; 3) Morphological Observation; 4) Sensory Interaction; 5) Mesoscopic Rupturing; 6) Episodic Deconstruction, and 7) Asymmetric Scenario development.

Using the *Neuro-intuitive Cueing* lens, the futurist has a "gut instinct" or a "hunch". There is a neurological basis for this in theory (Rhemann, 2018). An intuitive process of the brain is inferred by Kveraga, Ghuman and Bar (2007) in their work on the brain's top down system where they argue that the brain does not simply work from environmental stimulus but is in a state of anticipating and attempting to predict the future (Segalowitz, 2007). Using the *Mathematical Observation* lens, the futurist can interact with the changing subject using observational data in the form of mathematical models or observing geometric shifts (Jiang, 2015). This might be a data set, a visualization, or statistical emergence or anomaly. Through the *Morphological Observation* lens, we can see physiological variations within the subject we are observing using techniques borrowed from biology and genetics (Hamada, 2002). With the *Neuro-Sensory Interaction* lens, we continue to inform our futures analysis with sensory inputs using optical, olfactory, acoustic, touch and human and computer based sensory systems (Kahneman, 2011). Using the *Mesoscopic Rupturing* lens, we can view the point prior to disruption using understanding gained from Bio physiology and Glaciology (Groot & Rabone 2001; Vassis, 2011). Through our *Episodic Deconstruction lens*, we challenge ourselves to find the truth of the past to avoid transporting tainted memories into the future (D'Argembeau, 2004). We need to ensure that we have not painted over our own episodic memories with rose colored glasses or in the opposite extreme presume more negativity than is attributable to the prior event. We might do this by checking our objectivity against factual data sources. The final step is *Asymmetric Scenario Development* where we bring our less probable scenarios to the forefront and not only confront them but generate secondary and tertiary effects.

Table 5. *7-Steps in Asymmetry Detection*

	The Lens or Toolset	The Futurist	The Subject
1	Neuro-Intuitive Cueing	"I've got a hunch" The brain begins with an anticipatory process in producing "feelings" about the future. Identification: something is off, but there may be no physical or informational data this is apparent.	
2	Mathematical (statistical, geometrical)	Observes physical mathematical attributes or interacts with data surrogates	Stochastic data begins to separate, visualization shows data changing shape. Statistical data shows imbalances. Geometric proportional shifts become detectible and measurable.
3	Morphological Observation	Observes morphological changes.	Physiological changes at the atomic level occur Reorganization or changes can be observed between the object's anatomical structure or at the cellular level
4	Sensory Interaction	Changes can be perceived using our sensory systems, such as aesthetical, acoustic, olfactory, and physiologically stimulated systems which can interact and detect subtle systemic	Subject gives off cues that can be read by human sensory system and processed.
5	Mesoscopic Rupturing	Observes mesoscopic changes	Mesoscopic rupture or reorganizations are apparent as asymmetry begins to reshape the subject.
6	Episodic Deconstruction	This is like data preparation and "scrubbing" for "big data" applications. The futurist must find methods to verify facts about the past to avoid transporting faux memories or elements of rewritten pasts into the future.	
7	Asymmetric Scenario Development	Bring asymmetric scenarios to the forefront, confront and generate secondary and tertiary effects.	

For futurists asymmetry may offer new perspectives and insight:

1) *Asymmetry may be an early identifier for disruption*. It appears as an early fissure or fracture (part of an entropic process) and is apparent across disciplines and systems including mathematics, biology, physics, geology, economics, art, literature, etc., as it appears to be part of a greater cycle or shift.

2) *Asymmetry is neurologically, within us as we inject our own view of reality*. Recent neuroscience findings indicate that we may not only rewrite the past in our minds, but also transport our tainted view of the past into the future. The result may be generating faux futures and avoiding confrontation with more difficult scenarios.
3) *Glaciology scientifically and metaphorically embodies the asymmetry*. Asymmetry shows up in statistical data as a tail distribution that may morph into an iceberg shape. Icebergs, in nature, are presumed to be formed by mesoscopic fracturing that takes place in a moving ice sheet, resulting in iceberg calving. Icebergs also maintain the metaphor as more than 80% of their mass may be obscured beneath glacial waters. The metaphor continues in unforeseen danger, as with the Titanic. Further, architecture, built upon moving ice sheets, such as the McMurdo Station in Antarctica require footings that move with the ice, epitomizing the need for not only recognition of asymmetry, signals of disruption (and even danger), but treating asymmetry with resiliency and sustainability.
4) *Recognition of asymmetry by futurists needs work*. Futurists tend to sense asymmetry more than recognizing asymmetry. Characterization and qualification as an accepted methodology should be incorporated into the Futures methods and toolkit.
5) *Asymmetry may be a useful tool for treatment of scenarios and taming wildcards*. In a globally connected world where disorder can be magnified, accepting asymmetry would allow us to expand the number and the depth of wildcard scenarios and entering the zone of confrontation with discomfort. Our continued research and understanding of the relationship between asymmetry and its role in disruption is crucial to anticipating more realistic scenarios by challenging how our brain views the future and by moving dismissed scenarios to the forefront.
6) *Asymmetry can be beautiful*. As in Japanese art, literature, nature, the unusual, beautiful flower that emerged out of your garden, or the precious child that emerged from asymmetry in chromosomes, we should never miss the opportunity to find and explore the beauty in asymmetry and be vigilant in seeking it out.

As a final thought, in a world of increasing complexity, *we should assume entropy as the norm and embrace it*. As systems complexity and connectivity continue to increase, entropy becomes a normative behavior of 'Post-Normal" (Sardar, 2010) times, which should be adequately reflected and continually challenged with new methodologies and techniques in Futures.

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Notes

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Joanne Wilcocks, Dr. Verne Wheelwright, Cherie Miniecon, Dr. Victor Vahidi Motti, Dr. Timothy Dolan, Dr. Daniel Pesut, Ruben Nelson, and Dr. Cindy Frewen.

3. Neuroscience often expresses the word "future" as singular implying thought about a future event.
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