

## Complexity and the Phenomenological Structure of 'Surprise'

### Abstract

Surprising, unexpected events happen all the time which can be thought of and addressed in a variety of ways. On one hand, surprise can be something that is not desired, something suppressed or controlled for. Or, it can be something that is embraced, sought out or encouraged. Conceptually speaking, conceiving surprise in this fashion is not uncommon. Still, there seems to be an important piece missing from the many discourses on surprise. This paper offers some a possible framework to understand the *experience* of surprise in relation to a more complexified framing of the lived-experience. Specifically, by drawing upon principles from the complexity sciences, this paper considers the lived human experience of surprise as an emergent phenomenon that arises from a complex system.

The phenomenon of surprise is typically understood to be a special event that happens *to* people where the surprising event may be thought of as a good or a bad experience. Moreover, for many people who manage or direct the actions of others in an organization (like many workplaces), surprises are seen to be unwelcome moments that sometimes evoke a feeling of discomfort, prompting the need to know more, plan better, or design better systems to avoid the possibility of any unexpected surprises (McDaniel, Jordan, and Fleeman, 2003; Weick and Sutcliffe, 2001). Certainly, it is possible to attend to many different kinds of organizations to find examples of how human expectation and certainty, as well as, unexpectedness and surprise, affect and shape our knowledge and actions within those organizations (Stacey, 1992). It is not, however, the aim of this paper to explore organizational contexts for an understanding of surprise. Rather, it is the idea that surprise and unexpectedness are particular *kinds* of *experience*. In the complexity science literature, however, the *experience* of surprise is not, by and large, something that is discussed, but is taken up in slightly different ways—often, for instance, psychologised, framed by the notions of bounded rationality and a lack of information (Simon, 1991). Nevertheless, it is the aim of this paper to suggest some connections that can be made between the experience of surprise and a complexity science interpretation of surprise. As such, in this paper, I outline a view of “surprise” and “unexpectedness” framed by the philosophical branch of phenomenology, further interpreted through the lens of complexity and some of its attendant principles. In doing so, this paper seeks

to illuminate the notion of surprise by tending to the common ground of complexity and lived-experience.

### Phenomenological Research: Finding A Methodological “Middle Ground”

Phenomenological research might appear to be antithetical to the work of science. After all, whereas matters of methods and technique, which are quite antithetical to the spirit of phenomenological research, are not fitting in any purely prescriptive sense (van Manen, 1990), science requires some attention to methods of study and tools and techniques: scientific techniques can create a certain illusion of control and knowability, but then difficulties and tensions can arise. For example, as Barritt (1983: 4) and her colleagues write, “techniques of collecting information are more important than what the collection is all about—that is, the thing one is trying to understand. There is too much talk about things which matter very little—numbers, methods, contexts stripped of their meaning in the name of research—and too little about the important events—the real stuff of life...”. To suggest, however, that science is the same as methodological reductionism, in the derogatory sense of the word “reductionism”, is short-sighted. In fact, any sort of methodology—the scientific method, for example—in a prescriptive sense, as when one follows a recipe, is bound to fail to capture in any real sense the messiness of doing research, particularly research about lived-experience. Still, not only is a phenomenological “method” apparently paradoxical in that, traditionally speaking, it is not a prescriptive method of inquiry at all, but it often requires some attention to other forms of inquiry to understand

lived-experience.

To some, it may appear that the work presented here is not particularly phenomenological—perhaps I may even be “tainting” the field. To be sure, the work presented here is more in line with an evolved framing of the field of phenomenology. Thus, given the usual need to announce one’s allegiance to a particular conceptual framework, this particular inquiry draws upon a “naturalized phenomenological” approach to understanding surprise. Following the lead of researchers and scholars like Jean Petitot, Francisco Varela, Bernard Pachoud and Jean-Michel Roy (1999), my approach here is more in line with the shared intellectual space of contemporary phenomenology, the cognitive sciences, and complexity science (see Petitot et al., 1999; Thompson, 2007; Varela, 1999). As such, the apparent mixing up of theoretical frameworks here is actually not so unorthodox. In fact, phenomenological inquiry is one which actually attends to the *emergence of a phenomenon*, a notion very much associated with complexity science.

The essence of such an event—an emergent event—is what makes, as Dastur (2000) describes, the “impossible possible”. Moreover, this notion of the “essence” of such an event or phenomenon is in line with what Merleau-Ponty (1962) describes as the meaning of phenomenology. In other words, any phenomenon is always and already an emergent phenomenon. It is a happening, an event—a playful moment when the possible emerges, comes out, or appears to us. As such, no amount of conceptualizing can tell us what the human experience of surprise might be. Of course, pure experience is not enough for an

understanding of how and why we are or are not surprised. That is, to be clear, other perspectives—in this case, complexity science—will be drawn upon here for further insight.

### Experiencing Surprise: A Phenomenology Of Unexpectedness

“Unexpectedness” as a lived human experience is not some phenomenon limited to one particular type of experience. What is it that one recognizes in a moment of unexpectedness? When one is shocked to hear news about the death of someone that one knows well, is that said to be an experience of unexpectedness? Is my work colleague who appears startled whenever I approach her with a question, who appears so completely unaware of my presence, experiencing unexpectedness? What about other experiences? Would it be like having guests suddenly show up at your door unannounced? Or what about a surprise birthday party? Is unexpectedness any of these things: what is the lived experience of unexpectedness?

In the realm of human experience, one might say that we are seldom surprised. But, why do we not experience surprise in every moment of life? Surely, the experience of surprise might be taken to be a rare event—perhaps even something special. Moreover, the experience of surprise seems to come unannounced, and, just as suddenly, it disappears. That is, it is unforeseen, where one could not have “seen it coming”. To be clear, however, it is the immediate *experience* of surprise that does not happen all of the time, and this should not be confused with a surprising event. What could be surprising for one

person may not be so for another.

Framed in this way, when we are surprised, it seems to sneak up on us. Interestingly, the etymology of the word surprise has something insightful to say to us about this notion of “sneaking up on” (“surprise, n”, 1989) . As van Manen (1990: 58) writes: “Being attentive to the etymological origins of words sometimes put us in touch with the original form of life where the term still had living ties to the lived experiences from which they originally sprang.” In this spirit, then, the word “surprise” is closely related to such notions as “a sudden unexpected attack”, “to come upon unexpectedly”, “to take unawares”, “the feeling or emotion excited by something unexpected, or for which one is unprepared” or something “akin to astonishment and wonder, caused by an unexpected occurrence or circumstance.” There is, as its French roots suggest, a sense of being “overtaken” (*sur + prendre*).

Etymologically, then, the idea of being surprised is, as the OED suggests, about being “taken over” or “attacked” all of a sudden. And, it is an unexpected event or happening for which we might be unprepared. Yet, this is paradoxical since we must be prepared, neurologically, to be surprised (Gazzaniga, 1998; Nørretranders, 1998)! Nonetheless, there is still a sense that surprise can be by design. That is, surprises can be deliberately planned events to catch *someone else* “off guard”. In this manner, certain aspects of the planned surprise must be kept away from the other. Hence, the surprise must remain hidden or invisible to the other, although, to be clear, it is the lived human experience of surprise that cannot be planned.

Certainly, it would appear that sometimes surprises are hidden from us, however, the unexpected need not be hidden at all. In fact, the unexpected happening can be there in front of us all the time (Merleau-Ponty, 1962). But why is it that we might not see it? The difference may be a distinction between seeing and looking. In looking, we are paying attention, and there is an act of intentionality. When we are merely seeing, the world fades into a background of over-familiarity (Berger, 1973).

### Embodying Surprise: An Illusion of Stability and Expectation

To the western mind, the idea that consciousness plays such a small role in our “experience of experiencing” may be hard to believe. Indeed, some may believe that consciousness is limited, but the idea that consciousness contains so little information may be a bit surprising. Since the mid-20<sup>th</sup> century, psychologists and communication theorists have known that large quantities of information as sensory inputs are discarded, prior to the conscious perceptions of human beings (Nørretranders, 1998). So, do human beings see the world as it is? Generally speaking, the answer is “no”.

To be sure, human beings are bathed in a sea of sensory possibilities, and research suggests that what human beings can be consciously aware of are several magnitudes of difference away from one another (see Nørretranders, 1998, for a full list of references). In fact, while the details may differ from one piece of research to another, the results are generally in the same order of magnitude with the number of sensorial possibilities being around ten-million bits

per second compared to the very narrow bandwidth of 40 bits per second of conscious perceptual possibilities. In spite of so much information being “filtered out,” the sensations that we do have still affect how human beings think and act at a non-conscious level (Davis *et al.*, 2000). This is, quite possibly, a feature for many different kinds of organizations of various scales, including the biological, but also the sociological, cultural and ecological. The difference between what is perceived and what is sensed cannot be overstated enough. But it does beg the question: If one is not and cannot be aware of every sight, sound and smell, then what is it that human beings see, hear and smell that happens on a non-conscious level?

As it turns out, figuratively and literally, we don’t see what we don’t see (Maturana & Varela, 1992). And, yet, human perception of the world appears so seamless. Human beings have blind spots and sensorial equivalents to our visual blind spot that remain outside of human consciousness unless certain deliberate “tests” are done to show these “limitations”. But why do human beings experience a seamless world as opposed to one filled with gaps? The answer is perceptual completion or apperception.

Perceptual completion is a subject-level phenomenon which presents a kind of “filling in” of information by the brain to make up for some kind of absence of information (Thompson *et al.*, 1999). Moreover, all of this happens before we know it, in a manner of speaking. That is, the brain seems to get things done before a person knows it (Gazzaniga, 1998). This kind of predictive perception offers up, from past experiences, a possible or to-be-expected perception. In

other words, through experience, human beings become primed or prepared to deal with life's unknowns. Paradoxically then, one must be prepared, in some sense, to be surprised. As such, the experience of surprise suggests a certain complicity. Thus, surprise is an emergent phenomenon that arises in the interactions between one's self and the world.

### Theorizing "Surprise" Using Complexity-Related Frames

What I aim to show here are two possibilities for thinking about the nature of surprise and unexpectedness through the conceptual frames of catastrophe theory and self-organized critical systems. It must be born in mind that these two "theoretical" frames—in as much as they could be coherent theories—are not the same because they are informed by different assumptions. The field of complexity is, after all, an interdisciplinary field that is shaped and guided by a diversified collection of tools and views. In this light, the idea of presenting a unified frame for thinking about the nature of surprise and unexpectedness is not troublesome. Certainly, the emerging field emphasizes a diversity of views anyway.

In *Reality Rules*, John Casti (1992: Vol.2, 259) notes: "One of the great challenges to both science and philosophy is to provide a rational account of the uncertainty we perceive in the events of daily life." He remarks, however, that although a variety of theories, including classical probability and fuzzy logic, have addressed this issue, these domains have made unsatisfactory progress in answering this challenge. Each of these domains, moreover, has suggested that

uncertainty is not associated with randomness. It is, rather:

that the uncertainty we feel over everyday events and situations cannot usually be attributed to the influence of a random mechanism, but appears to stem from an inherent vagueness, or lack of information, either in the linguistic description or other circumstances surrounding the situations we find ourselves in (Casti, 1992: Vol 2, 259).

As has already been suggested, it is not so much that there is some inherent vagueness or a lack of information in what is known that marks human experience. Rather, there is a great deal of re-interpretation or apperception that happens prior to human experience, especially in times when the brain itself remains uncertain when faced with something novel or unexpected (Austin, 1999). In fact, while a great deal of “information” may be filtered out while unconsciously assimilated as “exformation”, the perceptual completion of such a filtering of information draws upon a particular history of past events as particular expectations of the world (Thompson & Pessoa, 1999).

Returning to Casti (1992), one might consider the proposition that surprise is some result arising from some discrepancy between the behavior of some open system through its interactions within the larger context of that system (the “outside”) and the behavior of a closed system to those same interactions. In other words, the discrepancy arises through some difference between what is experienced and what could have been expected—even on an unconscious level. Last, Casti suggests that complexity arises from a potential of bifurcation which is

a notion that seems fitting for a catastrophic-inspired model of surprise. The question of surprise, as an emergent phenomenon, however, cannot be accounted for in such a model. That is, the “novelty” of a surprising moment of unexpectedness cannot be addressed. In this manner, surprise as an emergent phenomenon would be better addressed through the notion of self-organized criticality.

#### A Catastrophe Model

Phenomenologically, the quality of “suddenness” is a particular lived existential (van Manen, 1990). In this case, it is the temporality or “lived-time” aspect of surprise that proves to be a helpful category for reflecting on the nature or essence of unexpectedness. Certainly, one cannot separate this lived existential from the others (*i.e.*, corporality, spatiality and relationality). Still, it can be differentiated, and it is used here as one aspect that could inform a general shape for a catastrophic model for surprise and unexpectedness.

With this idea of suddenness in mind, it is fitting to consider a theory that examines phenomena that unfold discontinuously (although not necessarily continuously discontinuous). In this manner, catastrophe theory, as a theory about discontinuous change governed by local interactions, may prove helpful. In fact, many physical events display discontinuous change: cell differentiation, turbulence, and buckling in iron structures of buildings, although models involving the behaviors of living systems have also been studied, *e.g.*, Thom and Zeeman (Casti, 1992). In this case, it is a lived-experience—a human emotion—that is the subject for this model: while modeling physical systems may be easier,

attempting to model surprise as a complex phenomenon could open up other possibilities for thinking about and understanding this deeply-felt human experience.

### Self-Organized Criticality

Of course, the world is always changing: this may be an obvious statement to make. Nonetheless, human beings sometimes seem to forget this, and thoughts and phrases like “I was caught off guard” and “Why is this happening?” point to a rather mystifying thought. That is, we seem to *forget* that the world is continually changing—as are we. This is a rather puzzling paradox. Still, what complexity scientists believe about how the human brain emerges can illuminate the tension in this apparent paradox.

If the world is continually changing, then why are there times when we do not seem to notice change? How are we affected by imperceptible change? Is there something significant or special concerning those changes that we can perceive as opposed to those that are imperceptible to us? I argue that there is nothing special or privileged about change that is perceptible to human beings, as opposed to imperceptible change. That is, all perceptual change arises from the same dynamics: yes, in some cases, dramatic effects can happen. But more times than not, mostly smaller and more frequent imperceptible change happens.

Conceived as a phenomenon that emerges at times of critical transformation, surprise could be patterned in the same fashion as two canonical examples of self-organized criticality: sand piles and earthquakes. Moreover, I shall refer to the experience of “surprise” as a particular moment of

unexpectedness that happens at some critical moment of transformation to distinguish it from other experiences of unexpectedness. To do so, aligns such a conceptual framework for surprise with the complexity sciences as a particular perceptual discrepancy between expectation and experience. This allows me to make the claim that every moment is a moment of surprise. This shift in meaning is important for framing a theory of surprise in the light of the complexity sciences.; however, it most certainly does not hold up to any phenomenological study of surprise.

With this in mind, it can be said that the world is full of surprises. Every moment is a surprising moment. Now. Now. And, now, again. Did you notice anything surprising? Naturally, to use a cliché, I wouldn't be surprised if you said "no". But, again, why are we not surprised (in every moment)? Surprises happen *for* us, and not necessarily *to* us. In this manner, to be surprised means attending to, and responding through, our current lived embodied experiences in the world, rather than reacting to some apparently large, significant human event.

As such, the world cannot necessarily *cause* us to be surprised without our partial collusion—particularly when we are inattentive to it and the world fades into a background of over-familiarity. Thus, if the world is full of surprises, some are filtered out: in fact, the human mind must necessarily forget some things and the brain must *learn* to forget (Davis, Sumara, & Luce-Kapler, 2000). The brain has developed in such a way as to bring forth a mind that functions in the world with particular expectations. This allows human beings to constantly adapt to a changing world. Otherwise, to use a computer metaphor, the human

brain would “overload”.

At this point, I still wish to hold onto Casti’s notion of surprise. That is, surprise is some result arising from some discrepancy between the behavior of some open system through its interactions within the larger context of that system and the behavior of a closed system to those same interactions. The measure of such a discrepancy will be important for describing further this self-organized critical model of surprise, although I will not—or rather cannot—say what such a thing would be. That is, as Einstein suggested, some things that matter cannot be measured, while other things that can be measured do not matter. Moreover, although the measures of such discrepancies have been useful and used in classical probability studies of surprise, I will refer to such measures in more of a conceptual manner. That is, I will use a particular conceptual *idea* for a measure of a surprise by suggesting that surprise could be conceived as a particular geometrical structure: a fractal.

Readers familiar with the concept of a fractal structure will recall that such structures have a quality of *scale invariance* on a number of different scales, temporal and/or spatial (Bar-Yam, 1997). This means that the appearance of some structure of the fractal will resemble other larger or smaller parts. Indeed, it may resemble the whole fractal itself. Sometimes fractals are described as being self-similar objects; however, it should be born in mind that only mathematical fractals can be self-similar, in a sense that a part of a fractal can be *identical* to the whole. Fractal-like structures in nature are best described as scale-invariant structures where, for example, the branch of a tree may *resemble* the larger tree

itself in all of its detail, although the two are not identical. But the two different scales do arise from the same underlying principles of dynamics for complex phenomena.

The emerging thinking behind self-organized critical phenomena has shown that many phenomena evolve and emerge at some “critical state” where change in the phenomenon, brought about by some disturbance, can lead to an event of any size (Jensen, 1998). Earthquakes and avalanches tend to be the canonical examples for such phenomena. And, for ages, human beings have thought that major events involving phenomena like earthquakes and avalanches were special events. In fact, it is the same evolution to such a state that gives rise to a large avalanche that brings about smaller ones. The dynamical interactions create a self-organizing system capable of change at any time. The size of such changes, however, will vary in a distribution referred to as a power law.

Phrased mathematically, the power law represents a way of stating a law of distribution of particular events through the observation of statistical measures (Schroeder, 1991). Of course, what can be observable depends upon our capacity to perceive. For instance, earth tremors happen constantly, but so many remain of them lie below our own thresholds of perception. Thus, when a tremor is felt, it is perceived to be a special event. Similarly, I claim that we are surprised more often than we realize according to the same kind of dynamical fractal pattern except that our own physiology is complicit in removing or filtering out surprising possibilities through mechanisms such as perceptual completion,

for example, which renders the world a bit more stable.

The point, here, is that surprises happen constantly and come in a variety of “measures”—in many sizes, small and large. More specifically, the number of times for and the measure of a particular measure of surprise are related and expressed as a power law. Graphically, such distributions looks like straight lines on a double-log coordinate scale: as the size of the measure increases, the fewer of such measures there will be, and, thus, the collection of data points resembles a straight with a negative slope. If, for example, one counts all of the animals on the planet, size is an indicator of number—the bigger the animal, the fewer there will be. Analogically, we experience more surprises which, if they could be measured, are small in nature compared to surprises that “stand out more” or, in a more common sense manner, that seem like surprises that are a lived emergent experiences.

Certainly, the notion of emergence is a popular one in the complexity literature (Bar-Yam, 1997). A variety of definitions abound involving concepts such as interactions, parts of a system, and something new. As a working definition here, *emergence* is about a novel phenomenon that arises from the interactions of parts of a system and is not found in the parts themselves. Emergent phenomena, thus, are inherently unpredictable. Moreover, emergence cannot be understood by attending to the parts of a larger system nor their interactions. Emergence is something more. That is, emergence is not readily *understood* from the self-organizing interacting parts of a system that give rise to a new phenomenon. In other words, the level of observation is important to

understanding emergence.

A self-organized critical view of surprise then has this to say: “surprise” is an emergent phenomenon that manifests itself at a level different from the interactions of (at least two) different systems, as well as the systems themselves. Through the interactions, the possibility of surprise is brought forth through some “push” into novelty. At some perceptual threshold, the experience of “unexpectedness” is felt: below that threshold, surprises of “all sizes” or ‘measures” continue to happen, although they remain outside of the narrow bandwidth of human consciousness. Such sub-liminal surprises, nevertheless, become a part of who we are as we are a product of our historically-situated experiences. In this manner, human beings become prepared for further surprises. In other words, surprise is possible because of our embodied history, and, when prompted, a surprising moment happens for us, and not to us, because of who we are.

### Concluding Thoughts

While many types of organizations attempt to remove the possibility of being surprise, surprise is actually something that will happen in spite of our efforts to eliminate it. Becoming rigid and stable, in fact, is no way to adapt to change; however, encouraging diversity and possibility through interactions in dynamic ways and in dynamic spaces suggests a more promising way to deal with a constantly changing world.

To be sure, surprising, unexpected events happen all the time. Depending upon the particular view that a person or organization may have,

these surprising moments can be thought of and addressed in a variety of ways. On one hand, surprise can be something that is not desired, something suppressed or controlled for. Or, it can be something that is embraced, sought out or encouraged. Such a conceptual view of surprise can have some profound effects upon an organization. Those effects, however, are quite different depending upon the “nature” of the organization.

Conceptually speaking, conceiving surprise in this fashion is not uncommon. Still, there seems to be an important piece missing from the many discourses on surprise. This paper, however, offers some speculation for framing the *experience* of surprise in relation to a more complexified framing of the lived-experience. And, it is hoped that some greater attention might be made for considering phenomenological aspects as an important, if not necessary, attempt to understand the notion of surprise through the science of surprise itself.

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