

**'BIFURKASI' AND 'TURBULENSI' AS SCIENTIFIC METAPHORS  
IN DEE LESTARI'S *SUPERNOVA*: PUTRI, KSATRIA, DAN BINTANG  
JATUH**

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**Abstrak**

*Supernova* adalah novel karya Dee Lestari (2004) yang termasuk dalam genre fiksi sains. Ada beberapa metafor sains di dalam novel tersebut yang diambil dari fisika modern. Tulisan ini membahas penggunaan kata 'bifurkasi' dan 'turbulensi' dari teori kekacauan yang digunakan sebagai metafor. Lebih tepatnya, tulisan ini membahas bagaimana kedua istilah tersebut digunakan dalam dialog dan narasi dan pengaruhnya terhadap interpretasi penulis sebagai pembaca.

Kata Kunci: *Supernova*, metafor sains, dan teori kekacauan.

**Abstract**

*Supernova* is a novel penned by Dee Lestari in 2004 that appears to be science-fiction work. There are scientific metaphors especially derived from modern physics. The study is focused on the use of term *bifurkasi* and *turbulensi* as scientific metaphor and their connectedness to Order and Chaos theory. It discusses the way the scientific terms are used within the story and intertwined to its narrative, affecting the reader's interpretation of the story in general.

Keywords: *Supernova*, *scientific metaphor*, and *Order and Chaos theory*.

**Introduction**

The prominent language element we can find in literature is metaphor. Nevertheless, until quite recent time metaphor was seen by most linguists, philosophers, and other researchers of language as a linguistic oddity; metaphor was even regarded as a 'fancy language' used by poets, politicians, or people otherwise psychologically deranged. As a consequence

of its suspected strange status, metaphor was not deemed worthy of a place at the core of linguistics; its study was hence mainly left to the literary critics (Steen, 1994, p.3).

Researchers have started to acknowledge, however, that metaphor is more than just an ornament that decorates language. There has been a growing concern in humanities that metaphors used in language shows some basic pattern about the way human brain works; they operate at multiple levels of analysis to provide insight into how we understand an organizational life. By that reason, metaphors have gained prominent interest from researchers. Metaphor is now believed to be primarily conceptual, conventional, and part of the ordinary system of thought and language; “Upon investigation, it appears that many ordinary expressions and ways of representing the world rely on metaphorical mappings, even when most of us do not realize the fact.” (Stockwell, 2002, p.109)

The conceptual metaphors in linguistics field can be defined as conceptual packaging of reality understood in their own terms because they have evolved to facilitate our everyday functioning in the world. An actual example of the existence of conceptual metaphor in daily speech of English language, proposed by Lakoff and Johnson (2003, p.4-8) is the notion, ARGUMENT IS A WAR. “The argument is war” notion may reflect some possible interpretations such as: Your claims are *indefensible*. He *attacked every weak point* in my argument.

Scientific metaphor also has been used in the literary works. As its function in physics’ field study, the use of scientific metaphor in literature is to heighten our experience of the nature of being around us. This article use the work from Dewi Lestari entitled *Supernova: Ksatria, Putri, dan Bintang Jatuh* (henceforth, *Supernova I*) that brings many issues of human living in the vast universe. The issues mostly cover social norms and values, sciences, myth, knowledge, wisdom, philosophy and technology. They all wrapped in

an intricate love story amongst the main characters who are not even simple ones.

The use of scientific metaphors emerged in *Supernova 1* becomes the characteristic that defines it as science-fiction works. There are many metaphors used in the novel that drawn from many sciences, especially from modern physics (Quantum Theories), some of them are *bifurkasi* (bifurcation) and *turbulensi* (turbulence) concepts that classified into Order and Chaos theory. This article wants to discuss about the *bifurkasi* and *turbulensi* concepts as scientific metaphors that underlying the life events that are experienced by the novel's main characters: Ruben, Ferre, Rana and Diva.

### **Methodology**

The research design of this research is descriptive qualitative design since the data that emerge from qualitative study is descriptive; they are reported in words and images rather than in numbers (Creswell, 2009, p. 195). The reason of using descriptive qualitative design is to provide a rich description of the analysis and discussion. Furthermore, the design is applied to reach the aims of this research, which are to identify and describe the mapping of conceptual metaphors on the use of scientific languages found in the novel of *Supernova 1*. The data collection methods are reading and note taking.

The data of this study are the utterances delivered by five main characters that conceive conceptual metaphor, more precisely, that show metaphor-like process in science. The five main characters are Ruben and Dimas as the pseudo-writer of the main story, and then Rana, Ferre, and Diva (as the *Supernova* itself). The scientific metaphors in the chosen dialogues and narratives that are put into analysis are the one that relates to Order and Chaos theory.

The steps of analysis are: Listing the directly expressed metaphors of '*bifurkasi*' and '*turbulensi*', mapping the metaphors using a complex

metaphoric schema, usually known as the Location Event Structure Metaphor (Location ESM), relating the conceptual metaphors found in the novel with Order and Chaos theory.

“Metaphoric mapping: a unidirectional relation between two conceptual domains (the source domain and the target domain) which sets up links (mappings) between specific elements of the two domains’ structures. A conceptual connection of this kind may be further reflected in metaphoric expressions, linguistic usages of source-domain forms to refer to corresponding aspects of the target domain.”

(Dancygier and Sweetser, 2014, p. 14)

Table 2: Location ESM Metaphoric Schema

Location	State
Motion (change of location)	Change of state
Self-propelled motion	Action
Destination	Purpose
Forward Motion	Progress in purposeful action
Inability to move	Inability to act
Impediments	Difficulties
Crossroads	Choices about action

## Discussions

The repetition of the word '*bifurkasi*' (bifurcation) and '*turbulensi*' (turbulence) in the dialogues within the novel somehow show a hint of conceptual metaphor that underlies the meaning of their use in the story. The term '*bifurkasi*' is derived from the Order and Chaos theory by Edward Lorenz in 1960, while '*turbulensi*' related to fractal is particularly drawn from Mandelbrot Set<sup>1</sup> (by Benoit Mandelbrot). Even though the theories come from the field of mathematic, the world view of particle physics also adopts a picture of chaos beneath order which teaches us that nature most often works in patterns, which are caused by the sum of many tiny pulses.

“Chaos Theory is a mathematical sub-discipline that studies complex systems. Examples of these complex systems that Chaos Theory helped fathom are earth's weather system, the behavior of water boiling on a stove, migratory patterns of birds, or the spread of vegetation across a continent. Chaos is everywhere, from nature's most intimate considerations to art of any kind. “

(Strickland, 2011, p. 38)

In its simplest form, Chaos theory is the science of surprises, the unpredictable, and the non-linear pattern that appears in the midst of order or conformity. Despite the fact that traditional science deals with hypothetically predictable phenomena such as gravity, electricity and chemical reaction, Chaos Theory deals with nonlinear things that are effectively impossible to predict or control, like turbulence, weather, the stock market, our brain states, etc. Hence, the term of '*turbulensi*' emerges as a force that causes the '*bifurkasi*' point to appear.

According to the author, bifurcation in its relation to the chaos theory itself is the system that depends on attractors “that continually regulating self-directed feedback, a process constantly moving backwards and forwards, creating an amplified system.” (Aveling trans., 2011, p. 14) After a certain

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<sup>1</sup> Mandelbrot Set has served as symbol of Chaos Theory ever since the field emerged. It is a graphic image that if we zoom in on any part of it, we are bound to come across the very same basic form, embedded in the texture of the mother image.

point of flux is reached, there is an opportunity for change. This means that the phase of uncertainty has reached its peak and therefore, something called bifurcation occurs.

Etymologically, bifurcation means branching point. According to Ilya Prigogine<sup>2</sup>, all systems contain subsystems which are continually “fluctuating”. At times, a single fluctuation or a combination of them may become so powerful, as a result of positive feedback, that it shatters the preexisting organization. At this revolutionary moment-the authors call it a “singular moment” or a “bifurcation point”. It is inherently impossible to determine in advance which direction change will take: whether the system will disintegrate into “chaos” or leap to a new, more differentiated, higher level of “order” or organization, which they call a “dissipative structure.”

Turbulence is a scientific term to describe certain complex and unpredictable motions of a fluid, is part of our daily experience and has been for a long time. No telescope or microscope is needed to contemplate the volutes of smoke from a cigarette, the elegant arabesques of cream poured into coffee and the vigorous eddies of a mountain stream. In an airplane we sometimes experience bursts of "clear air turbulence". Ultrasonography can reveal turbulent blood flow in our arteries; satellite pictures may show turbulent meteorological perturbations; computer simulations reveal turbulent fluctuations of mass in the Universe on scales of tens of mega parsecs. Without turbulence, urban pollution would linger around for centuries, the heat produced by nuclear reactions in the interior of stars would not be able to escape on an acceptable time scale and meteorological phenomena would be predictable almost forever.

Actually the word "turbulence" (Latin: *turbulentia*) originally refers to the disorderly motion of a crowd (*turba*). In the Middle Ages it was

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<sup>2</sup> Ilya Prigogine is the most famous name in Chaos theory and Complexity theory, was a Belgian physical chemist who won the Nobel Prize for investigating the irreversibility of processes in complex physical systems that are far from equilibrium conditions.

frequently used to mean just "trouble", a word which derives from it. Even today "turbulent" may refer to social or personal behaviour. Its scientific usage refers to irregular and seemingly random motion of a fluid. This definition, which is far from exhaustive, tries to express in a synthetic way one of the most complex and fascinating phenomenon of natural science, from Antiquity to present days Benzi and Frisch, 2010).

From the data taken based on the word use of bifurcation and turbulence, the writer draws a conclusion that BIFURCATION IS LIFE'S INTERSECTION (CROSSING/FORK/BRANCH) (Table 3.1) and that TURBULENCE IS LIFE'S PROBLEM (CONFLICT/TROUBLE) (Table 3.2). From the table 3.1, we can draw an inference that the use of the word '*bifurkasi*' (bifurcation) in every sentence it appears in the novel, the pseudo-authors refer it to the moment of crucial decision making in life that change a person's life. The state of bifurcation is on the focal point of a system, while in life, it is the moment when someone has to make a life-changing decision from the several options lie before him/her. Similar with the characteristic of quantum particles, the purpose of this bifurcation is unexpected. Meanwhile, in life, the destination is relative to every person in order to reach the best one for them. The change of state of bifurcation is branching out, whereas in life, the motion is facing/making the decision. The choices about action for bifurcation is full of probabilities, it is the same with crossroads in life that are filled with chances.

In addition to the characteristic of the conceptual mapping, for bifurcation there are turbulences that become the trigger of its appearance. While in life, there are forces that usually come from person's background like family, society, duties, or dreams. In the inability to reverse the decision: in bifurcation system, once it goes to one of many possibilities, the point is crystalized there. The same thing happens to life decision that has been made; people cannot go backward and retake or change they made.

Source: Life's Crossing (Inherits from Location/Motion)	Target: Bifurcation (Inherits from Event Structure)
Location (life's moment)	State (focal point) <sup>3.1.a</sup>
Destination (good places)	Unexpected <sup>3.1.b</sup>
Motion (making crucial decision)	Change of state (branching out) <sup>3.1.c</sup>
Crossroads	Choices about action <sup>3.1.d</sup>
<b>Forces</b>	<b>Turbulences</b> <sup>3.1.e</sup>
<b>Inability to retake</b>	<b>Crystalized</b> <sup>3.1.f</sup>

Table 3.1.: BIFURCATION IS LIFE'S INTERSECTION

From the table 3.2, we can conclude that turbulence happens in our brain or mind, while in life it happens in our life. The change of state of turbulence is fluid which is kind of abstract. While in life, the motion of problems is unrecognized but it does not mean that they do not exist. The action of turbulence happens several times, little by little. The same thing happens to life, the life's problems also do not happen all at once. Meanwhile, the purpose of turbulence is reaching the bifurcation point. In life, the problems lead us to making choices. In the part of its progress in purposeful action, turbulence is shaking stability. While in life, problems come unexpected and causing instability in life's aspect. For the last characteristic, fractals appear in turbulences. Fractal is the same patterns that occur again and again when we try to zoom it in on any part of it, we will encounter the very same basic form, embedded in the texture of the mother image. In life, the pattern of life's problems is repeated; it never ends until the end of our lives.



Source: Life's Trouble (Inherits from Location/Motion)	Target: Turbulence (Inherits from Event Structure)
Location (certain moment in life)	State (brain/mind) <sup>3.2.a</sup>
Motion (instability)	Change of state (fluid) <sup>3.2.b</sup>
Self-propelled motion	Action (unstable) <sup>3.2.c</sup>
Destination (life's choice)	Purpose → bifurcation point 3.2.d
Forward motion	Progress in purposeful action (repeated) <sup>3.2.e</sup>
<b>Trigger</b>	<b>Fractals</b> <sup>3.2.f</sup>

Table 3.2: BIFURCATION IS A LIFE'S TROUBLE

- 3.1.a.

“Malam itu, terjadi fluks hebat yang mengocok-ngocok solar plexus Reuben. Ia dapat merasakannya. Ia berada di titik **bifurkasi**.” (Lestari, 2014, p. 7)

“That night a hurricane shook Reuben’s solar plexus. He could feel something seething in the sympathetic network around his heart and within his being. He had reached his point of bifurcation.” (Aveling trans., 2011, p. 14)

- 3.1.b, 3.2.a, 3.2.c

“Otak manusia hampir setiap saat berada pada di percabangan menuju **bifurkasi**. Satu... saja **turbulensi** kecil berasal dari akumulasi keresahan, akan membawa tokoh kita ke titik kritis yang bisa menjadikannya apa saja.” (p. 50)

“The human mind continually hovers at a spot prior to point of bifurcation. With one brief moment of turbulence □ the consequence of one unstable act after another □ our character can find herself at that critical moment where absolutely anything can happen.” (Aveling trans., 2011, p. 42)

- 3.1.c, 3.1.d.

“*Reuben langsung tertarik. Ia tahu persis, sebuah sistem yang overloaded akan mencapai titik **bifurkasi** di mana cabang baru akan terbuka.*” (p. 20)

“Ruben was immediately attracted to the idea. He knew that when a system was overloaded, it reached a point of bifurcation before beginning to move in a new and different direction.” (Aveling trans., 2011, p. 22)

- 3.1.e, 3.2.e

“...*Gerbang **bifurkasi**-mu sudah dekat. Tentu saja dengan tambahan beberapa **turbulensi** lagi.*” (p. 203)

“...We’ve almost reached your point of bifurcation. All it requires is a little more turbulence.” (Aveling trans., 2011, p. 142)

- 3.1.f.

“***Bifurkasi** itu adalah momen yang mengkristal. Kamu nggak bisa kembali ke sana, tapi ia selamanya ada dalam kekekalan.*” (p. 305)

“At the point of bifurcation, everything crystallizes. You can never return to that moment, but it will stay with you forever.” (Aveling trans., 2011, p. 211)

- 3.2.b

“*Dia adalah **turbulensi** yang bisa diakses kapan saja, di mana saja. Dia akan mengamplifikasi system pemahaman orang-orang tanpa hierarki, tanpa bayang-bayang institusi atau dogma agama apa pun. Benar-benar non-linear.*” (p. 213)

“Supernova is a form of turbulence people can access whenever and wherever they want; one capable of amplifying their understanding in a non-hierarchical manner, beyond all institution and dogmas; completely and totally non-linear” (Aveling trans., 2011, p. 150)

- 3.2.f

“*Di mana ada sistem non-linear, chaos, ataupun **turbulensi**, di sana pasti ada fraktal.*” (p. 66)

“Wherever chaos, turbulence and disorder are found, fractal geometry is at play.” (Aveling trans., 2011, p. 52)

Below are the extended explanations of how the conceptual metaphors found about ‘*bifurkasi*’ and ‘*turbulensi*’ make sense to the characters’ life story. As it has been mentioned previously that there were for characters that had used the words within their dialogues; they were Reuben, Ferre, Rana, and Diva.

### **Reuben**

From the narrative excerpt (3.1.a), it is portrayed that character Reuben is on the point of bifurcation. Bifurcation is the moment that can lead either to order or chaos. But in Reuben’s case, it is the one that leads him into order since he comes to a point in which he understands all the confusing theories that he learned before;

“*Inspirasi halus yang hinggap di sukmanya telah mengamplifikasi seluruh sistem pemahaman yang ia miliki, menjadikan keeping-keeping teori yang selama ini terpecah-pecah tiba-tiba terekat menjadi satu. Dan, di tengah ruang tamu itu, sekelumit rahasia semesta terungkap di depan matanya.*” (Lestari, 2014, p. 7).

“*Saya melihat kejernihan. Clarity. Semua sekat dan kerangkeng pikiran terbuka.*”

(Lestari, 2014, p. 9).

“A subtle insight settled in his soul and amplified his understanding. What had previously been scattered fragments of an intellectual system suddenly came together. And in the middle of this living room, the universe revealed some of its secrets before his very eyes.

(Aveling, 2011, p. 14)

“I can see everything so clearly. It is so pure. I understand it all. Everything is interrelated but nothing belongs to anyone else.”

(Aveling, 2011, p. 15)

### **Rana (The Princess)**

Rana’s bifurcation happens after several turbulences that she had since her childhood. The chapter 4 in the novel entitled *The Princess* depicts her life’s journey into several subchapters that portrays how one brief moment of turbulence that emerges from Rana’s unstable act after another, she finds herself at the critical moment where absolutely anything can happen. Rana used to be obedient child who realized that God spoke in many ways, through many people, in many different places. But growing up as teenager and busied by her life and the tedious responsibility of school, tutoring classes, and studying Quran, she began to devour her faith. Going to college in prestigious university with a major she disliked (technical science) but in which she managed to excel her studies, Rana thought she had fulfilled her devoted obligations and had met her parent’s expectation. She then turned to journalism to become a reporter but still found herself unhappy. Still, after being graduated she married a man with a seemingly perfect background and admirable trait as a husband, a decision she made out of people’s fuss. Until one day, in the midst of her boredom she met Ferre, to whom she had interviewed for her magazine column. She got into affair with

him, and it marks her bifurcation point in her life. It signifies that Rana's bifurcation point leads her life to chaotic life:

*"Semua order yang tertata rapi sekarang tinggal seujung kuku dari keruntuhan."*

(Lestari, 2014, p. 62)

"All the order she has worked to maintain all this time is only a hairsbreadth away from total collapse!"

(Aveling trans., 2011, p. 50)

### **Ferre (The Knight)**

Ferre is the CEO of Multinational Corporation in Jakarta who spent his youth studying in San Fransisco. He had lost his parents when he was still eleven and was raised then by his grandmother, and later on by his grandfather's friend. Ferre has the soul of poet and as a kid he used to love the tale of a knight and a princess, wishing that someday he could be the knight who reunited with his princess, unlike what had happened in the story he read: "...But when the point of bifurcation happened during his childhood, the Knight wanted to rewrite the whole story anyway" (Aveling, 2011, p. 57).) His disappointment after reading his favorite tale separated him from his natural ability to express himself. He becomes a robot and growing up as a successful man with an empty soul:

*"Tidakkah ada yang melihat? Betapa ketulusan bisa menjadi teramat konyol. Hasrat yang berlebih tanpa persiapan bisa berakibat fatal. Percaya membabi buta pada pihak asing bisa jadi senjata makan tuan. Strategi. Kemandirian. Itulah kuncinya."*

(Lestari, 2014, p. 42)

"Couldn't anybody else see it that honesty had been taken for stupidity? That grand desires could have fatal consequences if one hadn't properly prepared oneself? That blind trust in another

could be turned against the innocent? Plan everything thoroughly. Trust nobody but yourself. These were the lessons he had learned early in life.”

(Aveling, 2011, p. 35-36)

It all changes however, when he meets Rana and falls in love with her. He began to questioning the whole nature of love and he gained his poetic soul back. However, in that point of bifurcation; he is led into chaotic life:

*“Dan, Re sanggup menghabiskan berjam-jam hanya untuk kembali mengenang. Pertemuan itu. Merunuti satu demi satu rantai waktu yang membelitnya hingga kini.”*

(Lestari, 2011, p. 28)

“And now, hour after hour, Ferré remembered that particular day, striving to commit it to memory, studying the chains of events that led them to today.”

(Aveling trans., 2011, p. 27)

### **Diva (Supernova)**

Diva is a highly-paid supermodel with bitter and cold characteristic. There was a cruel edge to her tongue, which she made no attempt to conceal. Her appearances were reserved for the best shows and the most exclusive magazines. She is very professional in her job, never complains and always on time. She is exceedingly independent and intelligent woman who has broad view in life issues of all matters from social, science, economy, psychology, etc. Her bifurcation that led her into her present life appeared when she was still a child living in an orphanage. She had been tall for her age and very thin. She had unusual body shape for a girl her age, her legs were so long and her feet so narrow, her thin face suggested that she never ate well. Her indifference caused her peers to bully her, but she believed in herself. This leads her to become a tough woman when she grows up. While in virtual world, Diva acts as Supernova, who helps people’s life problem with her philosophical and intriguing view of the world (See 3.2.b).

## **Conclusion**

In the novel, the subject of order and chaos creates a never-ending movement that results in delicate pattern, known as fractal patterns (Benoit Mandelbrot). These fractal patterns are the plot twist in the novel. Within the fractal patterns, there lies the conflict or problems (turbulences) that lead to the resolution (bifurcation) of each character. However, this happens not in a straight line but in a cycle, which leaves the story ends in open-plot manner. The writer found that the repetition of word-use of '*bifurkasi*' and '*turbulensi*' in the novel show that there is an underlying concept of metaphor that makes the realization process of reading works for the reader in understanding the metaphor in context.

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