Chapter I

Postmodernism, Complexity and Emergentism:

A Historical Perspective
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The twenty first century world’s vision incorporates the ideals of holism, pluralism and universalism. We are experiencing the major societal transformation from the industrial machine age to the post-industrial information knowledge age. These changes and transformations are re-shaping our thinking and recasting the way we view ourselves, the systems of which we are a part, the environment in which we live, and the way we view the world.

Literary criticism which started at an early stage as an activity simultaneous and dependent on literary creation has traversed a long way since the time of Plato. Literary theory is a mode or the philosophy of the interpretation of literature. Way back in the nineteenth Century, Matthew Arnold, through his definition of literary criticism as a “disinterested endeavour to learn and propagate the best that is thought and known in the world”, asserted the importance of intellectual freedom for critical understanding. Free play of the mind, curiosity and disinterestedness even today are the guiding principles for analysis. Literary criticism and theory are interpretive tools that help us think more deeply and meaningfully about literature that we read.

The word ‘theory’ is derived from Greek ‘theoria’ (Jerome) which means ‘contemplation’, and speculation, a looking at and is linked to ‘theoria’ (to consider, speculate) . Theory thus
suggests several things at once. By literary theory we refer not to the meaning of a work of literature but to the theories that reveal what literature can mean. It is literary theory that formulates the relationship between author and work. Literary theory develops the significance of race, class and gender for literary study. Literary theory today sometimes designated critical theory or “theory” and now undergoing a transformation into ‘cultural theory’ within the discipline of literary studies can be understood as set of concepts and intellectual assumptions.

The practice of literary theory has become more institutionalized and professional since later half of the twentieth century but it has historical roots that run as far back as ancient Greece and the aesthetic theories of philosophers from ancient philosophy.

Literary studies took an entirely new direction in the early twentieth century. Early in the century the school of criticism known as Russian Formalism and slightly later the New Criticism in Britain and America came to dominate the study and discussion of literature. New criticism especially brought literary study into the main academia.

It is important to note that academic literary criticism prior to the rise of New Criticism in the United States tended to practice traditional literary history, tracking influence, establishing the canon of major writers in the literary periods and clarifying historical context and allusions within the text.

The work of the Formalists had a general impact on later developments in Structuralism and other theories of narrative, Formalism like Structuralism sought to place the study of literature
on a scientific basis through objective analysis of the motifs, devices, techniques and other functions. New criticism, a product of the American University in the 1930s broke from the traditional methods. As a strategy of reading, New Criticism viewed the work of literature as an aesthetic object independent of historical context which exhibited the unified sensibility of an artist. Since then several literary theories have been inundating the literary critical front and the current state of theory is such that there are many overlapping areas of influence.

A glance at the changing world scenario reveals that we have embarked on a voyage into novel realms of thought and experience. We witness a transition from Modernist values to Postmodernist values, where we have to deal with emergent forms of culture, global economy, new form of politics and identity. Martin Irvin (23 January, 2012) views that postmodernism has given birth to the phenomenon of global village resulting in the globalization of cultures, races, images, capital and products of the information age. It is characterized by –

Redefinition of nature state identities, which were the foundation of the modern era, dissemination of images and information across national boundaries, a sense of erosion or breakdown of national, linguistic, ethnic and cultural identities, a sense of a global mixing of cultures, on a scale unknown to pre-information era societies.

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1Irvin, Martin "Postmodernism" "Postmodernity". Approaches to Po-Mo. Martin Irvine Communication, Culture & Technology Program Georgetown University Web http://www9.georgetown.edu/faculty/irvinem/theory/pomo.html).
Therefore, there is need to map and analyze some key moments to interrogate the key shifts in theory, culture and literature to understand the drift from modernism to postmodernism. One of the most influential theories that arose in the latter half of the twentieth century was developed by Jean Francois Lyotard (1924-1998) the French philosopher and thinker. He analyzed the epistemology of postmodern culture and the impact of post modernity on human condition in his book *The Postmodern Condition: A Report on knowledge* (1979). The book was originally written as a report to the council des Universities du Quebec.

Lyotard’s *Postmodern Condition* has influenced numerous thinkers in social sciences, science, philosophy and literary criticism. Lyotard explains that while modernism sought to place all knowledge and culture within one unifying description, postmodern arguments are usually seen as claiming such a metadiscourse to be impossible to a greater or lesser extent. He identifies that among the metanarratives are ‘reductionism’ and ‘teleological notions of human history, such as those of the Enlightenment. Lyotard writes:

I will use the term modern to designate any science that legitimates itself with reference to metadiscourse of this kind making an explicit appeal to some grand narrative, such as the dialectics of spirit, the hermeneutics of meaning, the emancipation of the rational or working subject or the creation of wealth. I define postmodernity as incredulity towards metanarrative.²

He further elaborates.

And invention is always born of dissension, postmodern knowledge is not simply a tool of the authorities, it refines our sensitivity to differences and reinforces our ability to tolerate the incommensurable. Its principle is not the expert's homology, but the inventor's paralogy.³

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While discussing Postmodernist denial of metanarratives and its sensitivity to differences leading to complexity it would be apt to refer to Ashby, the renowned cybernetician who propounded the law of requisite variety. Law of requisite variety is about managing complexity. What is going on in the dynamics of any enterprise or system is not merely the manipulation of entities- material, energy (physical solar (renewable), human physical, mental, spiritual) and information (or knowledge or wisdom), and inter-relationships among them but a more fundamental aspect, viz. management of complexity which is measured by variety (the number of possible states of a system). The basic axioms will assuredly hold that the variety of the environment greatly exceeds that of the enterprise or system of interest which operates in it (by serving or exploiting it, which in turn will greatly exceed the variety of management (manager or controller or analyst) that regulates or controls or models it). Hence, variety engineering (i.e. manipulation of varieties by design through attenuation (e.g. delineation of contextual relationship of interest and element-set of important elements), and amplification by taking recourse to group-consensus driven, interactive, iterative processes of management such as NGT and ISM) is invariably required to satisfy Ashby’s law of requisite variety which states that only variety can absorb variety. The essence of viability leads to the following principle of organization. Managerial, operational and environmental varieties, diffusing through an institutional system tend to equate; they should be designed to do so with minimum adverse effect on resources (such as cost and people).
If Postmodernism in art is visible through the epistemological and aesthetic strands, with its move towards non-referential, non-linear, abstract forms and the collapse of categories, in science Postmodernist stance is reflected through negation of its own metanarrative “reductionism”.

Scientists and scholars realized that science in a sense had become a victim of its own success as its reductionist programme succumbed to the law of diminishing returns. Stephen Toulmins (1922-2009) in his famous book Cosmo Polis :The Hidden Agenda of Modernity(1995) explains that the origin of reductionist programme can be traced back to Cartesian – Newtonian paradigm. Rene Descarte, (1595-1650) the French philosopher, mathematician and scientist, persuaded his fellow philosophers to renounce fields of study like ethnography, history, poetry etc., which are rich in content and context, and instead concentrate exclusively on abstract decontextualized fields. Thus it would not be wrong here to say that modern reductionist world view broke with the holistic world view which emphasized the interconnectedness of all beings and objects in the universe. The positivistic and mechanistic modern world view considered objectivity and rationality as sources of constant progress, development and human emancipation. Descarte also broke with the traditional scholastic- Aristotelian philosophy and promoted new mechanistic sciences. He denied the scholastic thesis that all knowledge comes from sensations. He argued that senses sometimes deceive thus cannot be taken as an authentic source of knowledge. He concluded there was one thing he could not doubt – his own existence and founded his new philosophy on his famous axiom ‘Cogito, ergo sum’ ‘I think, therefore I am’. He defined reality in terms of the thinking self and thought he had discovered a
certain and objective foundation of truth. In his essay ‘Meteorology’, that appeared alongside the Discourse on the Method (1637), he showed that clearer and fruitful explanations can be obtained only by way of deductions from the configuration and motion of parts.

The modern mechanistic world-view which was in the budding stage in the Renaissance flowered under the Enlightenment. The Enlightenment was an optimistic movement, which ran in western circle from approximately 1650 to 1800 reinforced, the orderly Newtonian universe and the certitude of Cartesian philosophy. Isaac Newton (1643-1727) was the greatest figure of the Enlightenment, whose discovery of the laws of motion made people regard cosmos as an entity which functions in an orderly way according to natural laws.

A juxtaposition reveals that modern world view presents the world as possessing an objective reality whereas ‘Postmodernism’ is taken as a critique of the modernist scientific mentality of certainty, objectivity and progress. Though Modern world view was shrouded by serious questions raised by skeptical philosophers such as David Hume (1711-1776) regarding the ability of the self to objectively comprehend the reality, it did not extinguish due to the efforts of philosophers like Immanuel Kant (1724-1804), who is known for his seminal work The Critique of Pure Reason (1781). Kantian philosophy allowed modernist era to continue for some time with its conviction in objective truth, but it also raised several crucial questions which ultimately led to the emergence of Postmodernism, which holds realities to be plural and relative. The genesis of Postmodernism can be traced to certain developments in science and philosophy and linguistics. At the philosophical front, Nietzsche with his view that truth is
nothing more than an illusion dethroned the self from the centre of the objective reality and negated the positivism, objectivism and foundationalism of the world view. Later in the twentieth century following Nietzsche major philosophical figures such as Michel Foucault.(1926-1984) Jean Jacques Derrida (1930-2004), Richard Rorty (1931- ) et. al. with their discussions of the essential issues of postmodernism revolutionized the intellectual world including literary theory. At the scientific front Einstein’s theory of relativity, Werner Heisenberg’s uncertainty principle, Quantum Mechanics etc. also challenged the absolutism of modernism. At the linguistic front scholars grappled with two major issues; one related to hermeneutics (how does one come to know the true interpretation?) and the other related to the ability of the language to objectively describe the truth.

Postmodernism, as a tendency in the contemporary culture, as a movement is characterized by more flexible and diverse forms of production and consumption. For instance, due to the invention of new information and communicative technologies, we witness that money, productive capital (particularly information) commodities and labour now circulate through international space at a faster pace. Postmodernists consider modern notions of progress, development and emancipation as complex and problematic. A close examination of postmodern literature also reveals that it is a reaction against the Enlightenment-Humanist paradigm in the wake of the second world war with its disrespect for human rights, the atomic bombings of Hiroshima and Nagasaki, the Holocaust and the fire bombing of Tokyo. Postmodern literature also implies a reaction against the significant post-war events such as the beginning of the cold war, the civil rights movement in the United States and Post colonialism.
It is also characterized by the growth of Cyberpunk fiction and Hypertext fiction. Postmodernism in literature is usually associated with certain characteristics of post-world war II literature. Holocaust which shattered the Renaissance and Enlightenment ideals of individualism and Humanism, a brutal violation of human rights finds frequent expression in post-war literature. Existential philosophers like Soren Kierkegaard (1813-1855), Frederick Nietzsche (1844-1900) Jean Paul Sartre (1905-1980) and others, proposed that the most important questions in life were not explainable by science. These philosophers exposed the false assumptions and presuppositions behind modernism. Karl Marx (1818-1883) claimed that a person’s thinking was influenced and shaped by economic factors, Nietzsche claimed that all truth claims are mere power plays, Sigmund Freud (1856-1939) through his psychoanalysis emphasized on unconscious sexually driven drives. Thus, Postmodernism is extremely diverse with different strands of ideas.

Since postmodernism represents a de-centered concept of the universe in which individual artistic systems are not treated as isolated creations, much of the focus in the postmodern literature is on inter-textuality, the relationship between one text and another or one text within the interwoven fabric of literary history. The notion of ‘pastiche’ which means to combine or paste together multiple elements is also closely related to postmodernism. Jean Baudrillard (1929-2007) explains postmodernity in his famous treatise *Simulacra and Simulation* as a shift towards hyper reality in which simulations have replaced reality. Another striking feature is, postmodernism in literature overlapped with Poststructuralism and challenged the very notions of single author, meaning or text by positing multiplicities, openness, rhizomes,
reproduction and anti-totality, thus proposed experimentation, innovation, freedom and simulation. Postmodernism believes that language creates reality but since language changes and word-meanings vary, what is ‘real’ for one group of people may be ‘unreal’ for another.

Since artistic creation and appreciation are the twin tendencies which go together, postmodern literary theory has also assumed a new form where one sees how meaning emerges in all cultural practices which include all art forms; films, literature, sports, fashion, architecture etc. Theory today is the study of the production of meaning in texts and the reception of meaning. It is not abstract speculation in abstract language rather it is praxis – ‘Praxis’ may refer to a process by which a theory is implemented and realized. It may also refer to the act of practicing ideas. Aristotle believed that there were three basic activities – theories, poises and praxis which corresponded to three dimensions of knowledge; theoretical with truth as its goal, poetical with production as its end goal and practical with its end goal as action. The objectives of theory today are to analyze and reflect on the interpretative strategies applied to texts. The term text has also acquired various new dimensions as by text we now mean any form of representation, from fiction to film and also Google Search’s opening menu. One of the conspicuous developments in postmodern literary studies is that most of the theories have emerged from areas other than humanities and have implications beyond literature itself bringing respite to the intellectuals for whom the compartmentalization of knowledge and specifically the gulf between science and humanities are of great concern.
C.P. Snow (1905-1980), an English Physicist and novelist, best known for his *Two Cultures and the Scientific Revolution*, which was originally his influential Rede lecture delivered in 1959 in the Senate House, Cambridge, contended that the split between science and humanities is the major hindrance in solving most of the problems of the world.

Literary intellectuals at one pole - at the other, scientists, and as the most representative the physical scientists between the two a gulf of mutual incomprehension sometimes (particularly among the young) hostility and dislike, but most of all lack of understanding. They have a curious distorted image of each other. Their attitudes are so different, even on the level of emotion, they can't find much common ground.⁴

He strongly advocated 'rethinking our education'⁵. More recently David Lodge in his novel *Thinks (2001)* dramatized the conflict in which a scientist and a novelist enter into a debate over whether science or Creative Literature offers the best way of unraveling the mysteries of the universe of life and the novel concludes that both perspectives are valuable and restricting to one is limiting.

In the present era intellectuals accept that science and imaginative literature are complementary to each other.

⁵ Ibid., 19
Thus, one comes across ‘medical humanities’, “engineering humanities’ and also ‘digital humanities’. The literary atmosphere of postmodernism is permeated with the themes of discontinuity, unpredictability, complex cultures. Twentieth century discoveries in science and logic have contributed to the decline of belief in the mechanistic, rational and supremely ordered view of Universe. Much to the astonishment of the scholars, the Second law of Thermodynamics had an enduring impact on literature though mostly in the works of postmodern writers. Laws of thermodynamics take on a special turn because of their scope. Implications of the laws of thermodynamics, much more than other concepts, have sparked off fierce debate about the very origin of universe. The second law of thermodynamics left some popular scientific theories in doubts. The second law of thermodynamics describes the basic principles familiar in everyday life. It is partially a universal law of decay, the ultimate cause of why everything ultimately falls apart and disintegrates over time. Material things are not eternal including this human body. Everything ages and wears out. Even death is a manifestation of this law. Thermodynamics is the branch of theoretical physics which deals with the laws of heat, motion and energy. As believed by many thermodynamics was the product of industrial expansion. The laws of Thermodynamics describe some of the fundamental truths observed in the universe. The first law of Thermodynamics is often called the law of conservation of energy which suggests that energy can be transferred from one system to another. In 1850, Robert Clauses and Thomson discovered the second law of Thermodynamics which contradicted the first law of Thermodynamics – one of the fundamental laws of Physics which stated that energy can be transformed in different ways but
can neither be created nor destroyed. Whereas the second law states that there is an overall downward trend throughout the universe, ultimately when all the energy of the Cosmos has been degraded, all molecules will move randomly and the entire universe will cool to extinction. The concept of entropy is central to the Second Law of Thermodynamics which is an expression of disorder or randomness. The term entropy was coined in 1865 by Rudolf Clausius based on the Greek *entropia* meaning ‘turning towards’.

One of the remarkable illustrations from literature reflecting the impact of second law of Thermodynamics is Tom Stoppard’s 1993 play *Arcadia*. The primary concern has been to explore the impact of scientific developments on the psyche of man. Life is telling us that it can propagate forever, whereas this law states that every physical system must reach its thermal death. T.S. Eliot proclaimed in one of his most famous post war poems ‘Hollowmen’.

This is the way the world ends,
This is the way the world ends,
This is the way the world ends,
Not with a bang, but with a whimper!

While answering several questions related to second law of Thermodynamics, we may give a little more colour to it by referring to what the famous English mathematician, philosopher, writer Bertrand Russell (1872-1970) said about it in his famous essay ‘Free Man’s Worship’ (1916):
That man is the product of causes which had no provision of the end they were achieving, that his origin, his growth, his hopes, his fears, his loves and his beliefs are but the accidental collocations of atoms, that no fire, no heroism, no intensity of thought and feeling can preserve an individual life beyond the grave, that all the labours of the ages, all the devotion, all the inspiration, all the noonday brightness of human genius, are destined to extinction in the vast death of the solar system, and that the whole temple of man’s achievement must inevitably be buried beneath the debris of a universe in ruins— all these things, if not quite beyond dispute, are yet so nearly certain that no philosophy which rejects them can hope to stand. Only within the scaffolding of these truths, only on the firm foundation of unyielding despair, can the soul’s habitation henceforth be safely built.6

What Russell is saying, all in one breath is that increase in disorder is so certain that we had better get used to it as fast as possible, no serious philosopher can ignore it. Any belief that contradicts the second law, does not have much chance of being correct and we really are deluding ourselves if we think that we can escape its firm clutches. How Thomas Gray in his famous “Elegy Written in a Country Churchyard” proclaims the hardcore reality of life:

The boast of heraldry, the pomp of power,
And all that beauty, all that wealth ever gave

Awaits alike the inevitable hour
The paths of glory lead but to grave.₇

No system existing in this universe survives the evolutionary scale, be it information, language system, literary system, societies. An estimated 99.9% of the species that have lived on earth are now extinct. Linguists have concluded that several language systems which existed in the past, have extinguished today. Existing language systems also do not remain static, they evolve with time embrace changes and several words, linguistic structures become archaic and gradually extinguish. Literary texts/systems are also subject to the second law of thermodynamics to a great extent though they are considered universal and time-transcending yet the characters, the social, political and cultural values of the artist’s contemporary social milieu do not survive for ever. As Tennyson in the Victorian age said “old order changeth yielding place to new”, in each age we find new literary Systems with new structures and values.

Incidentally, if one finds Russell’s dismal view of universe and his statements a bit depressing, one should refer to German Philosopher Nietzsche, who has been the most powerful influence on postmodern philosophy and literature. He, in fact, based the whole of his philosophy on the premise that physics implies that life is ultimately pointless, eventually it must become extinct. The idea of absolute progress (The idea of progress to the point of perfection) must therefore ultimately be an illusion in direct contrast to the ideas underpinning the extinction of life. The

conclusion was so difficult to live with that Nietzsche needed to introduce the concept of 
_Ubermensch_, a German term meaning 'over human', 'above human' 'superman' in his 1883 book _Thus Spoke Zarathustrer_ to come to terms with the fact that life cannot achieve absolute progress. Unfortunately, he did not himself have the very attributes of his superhuman and spent the last 11 years of this life in a lunatic asylum unable to deal with life, disillusioned and alone.
In the wake of all these developments, in the twenty first century when the world has become an interdependent global community, the scholars from various realms of human endeavor are experimenting and evolving new methodologies to grapple with complex systems. It is also quite evident that a kind of disillusionment and dissatisfaction is rampant as most of the object based methodologies promote a reductive understanding of the world.

Emergent and cooperative phenomenon display synergy i.e. for them the whole is greater than the sum of its parts, as is characteristic of non-linear systems. Much of nature is non-linear including most of what is really interesting in the world.⁸

The above lines also bring to light a variant expression “whole is greater than the sum of its parts”, borrowed from Gestalt Psychology, which emerged in Germany in negation of the reductionist approach to the study of human behaviour, advocating the holistic study of the human brain. Thus it becomes quite evident that reductionist approach failed in other realms of knowledge also, but what needs to be mentioned here is that they all drew the roots from Aristotelian notion of “whole is more, than the sum of its parts”. Emergence, Synergy, holism, and complexity are all interconnected and form important concepts of study in systems science.

The current scenario leaves the scholars with the following two options:-

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⁸ Jargodzi, Christopher. "From Reductionism to Emergence: Science takes a Cooperative Turn" Presented at Continuity and change: Perspectives on Science and Religion, June 3-7, 2006 Philadelphia, USA, a Programme of the Metanexus Institute.
(i) Employing different narratives while examining contextually dependent complex systems.

(ii) Finding out a holistic narrative which would enable us see conceptuality, complexity and emergence in systems.

The thesis does not oppose experimenting with multiple narratives but at the same time it reposes its firm conviction in the following:

In terms of systems modelling, instead of the System scientists and practitioners getting bogged down with similar dreams of modelling theory of everything, one could perhaps look for "theory of many things" i.e. modelling theory of many things .... This modelling theory of many things will then span perhaps all kinds of systems, including natural systems, designed physical systems, designed abstract systems and human activity system... My suggestion is that instead of looking for theory of everything, look for unified modelling theory of many things.⁹

The emergence of systems thinking and systems philosophy based on the notion of holism in 1950s corresponded with the postmodernist rejection of "reductionism" and its incredulity for static grand-meta narratives. If Terry Eagleton believed that literary theory is a metadiscourse, system science is a meta discipline which transcends disciplinary boundaries, integrating within

its framework the findings of various disciplines. Systems philosophy reinforces the old Aristotelian notion that “a whole is more than the sum of its parts.” Ludwig Von Bertalanffy who propounded the general theory of systems had a vision that spoke of a greater problem than just the efficiency of transferring the knowledge. His perspective was humanistic perspective, a reconstruction of the individual not as a separate entity in struggle against the world but in resonance with the universe. The following lines of Rev. Professor P.S. Satsangi are significant and also explanatory:

Problem of the real world call for integrative, holistic thinking which systems approach with its transdisciplinary concepts would seem to provide. The systems thinking assumes that the real world exhibits emergent properties at virtually all levels of complexity and that it is therefore useful to examine the world in terms of wholes which exhibit these properties.\(^{10}\)

Postmodernist thinking has generated in literary analysis a desire for flows, shifts, multiplicities rather than tyrannical coherence. It treats sports, fashion, literary text, film, advertisement, poster, and graffiti, equally important as Milton even if they belong to distinct genres. It puts forth the view that we cannot take any one form of thought or one genre as distinctive because every genre is part of the other.

Thus, when we place literary texts within the systemic framework, we realize that they are multidimensional systems, which are complex, open and contribute to their environment. They are wholes but also parts of larger systems and their constituents may also be the constituents of other systems. Systems are everywhere from the solar system to the rail network systems, internet and the World Wide Web. Moreover there are social, political, economic, esoteric and humanistic systems. A key observation that led to the development of systems philosophy by Ludwig Von Bertalanffy was that Systems in different disciplines, with dissimilar components exhibit similar behavior. He was looking for universal principles, applicable to systems in general.

Systems approach is a holistic approach which focuses on the way a system’s constituent parts interrelate and how systems work within the context of a larger system. The Systems approach integrates the analytic and the synthetic methods, encompassing both holism and reductionism, analysis looks into things, synthesis looks out of them. This attitude of systems thinking is often called expansionism, an alternative to reductionism. If analytical thinking concentrates on analysis of the structural properties, systems thinking concentrates on the function and behavior of whole systems. Analysis gives description and knowledge, systems thinking gives explanation and understanding. Peter Checkland in his recently published article shares his experience in the following lines:

Systems thinking, it seemed to me, sought to be less reductionist, more holistic than natural science, and hence in principle, more able to embrace complexity.
Also it was made legitimate by the real existence of the so-called emergent properties of whole entities, properties which relate to and are present only at the level of the whole.\textsuperscript{11}

In philosophy, Systems theory and science, ‘emergence’ is the way complex systems and patterns arise out of a multiplicity of interactions. Emergence is central to the theories of integrative levels and of complex systems. The concept of emergence has been in use since the time of Aristotle and it is a concept widely used in science arts and engineering. Before understanding emergentism in literary systems it becomes imperative to understand emergence from semantic and historical perspectives. Ales Kubik defines:

Emergence consists in the fact that we cannot describe (predict, expect) the behavior of the whole system from the description of its individual components.

He further observes:

\textit{In the study of emergence it is important to distinguish different sources of the macro-behavior, that is the behavior of the whole observed system that is due to interactions of agents with each other and with the environment}\textsuperscript{12}


An emergent property of systems, is one that is not a property of any component of that system, but is still a feature of the system as a whole.

The ‘macro-level’ considers the system as a whole and the ‘micro-level’ considers the system from the point of view of the individual entities that make up the system. Our modern world is increasingly being recognized as non-separable. The systems all around us are often designated as complex.

Thus the notion of emergence is attracting the attention of scientists in the complex systems research. It has become one of the most fascinating phenomena in complex systems fields including arts and engineering, Stephen C. Pepper defines ‘emergence’ in the following words:

> Emergence signifies a kind change ... which is a cumulative change, a change in which certain characteristics supervene upon other characteristics, these characteristics being adequate to explain the occurrence on their level.\(^{13}\)

Usually people describe ‘emergence’ as the phenomenon where global behaviour arises from the interactions among the local parts of the system. Some general examples of emergence often quoted are: global phenomena paths that arise from local path-following, the swarming movement of a flock of birds, a traffic jam from the interactions of the car. Tom de Wolf and Tom Holvoet describing emergence from a historical perspective, explain that emergence is not pre-given but a dynamical construct arising over time. In the context of a dynamical system

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emergence was initially used by the English philosopher George Henry Lewes (1817-1878) who distinguished between ‘resultant’ and ‘emergent’ chemical compounds coming about from a chemical reaction. Lewes’s term was later borrowed during the 1920s to form the backbone of a loosely connected movement in the sciences, philosophy and theology.

The concept of ‘emergence’ has been discussed and mainly used against reductionism which stated that system can be reduced to the sum of its parts.

It is interesting to note that creative literature also exhibits emergence and some of its characteristic features can be traced in literary systems. Literary systems are complex multi-dimensional systems which exhibit emergent properties at various levels. One of the most important features of emergence, ‘micro-macro effect’, which is mentioned explicitly in all the discussions of emergentism, can be found in literary systems as well.

The micro-macro effect refers to properties, behaviours, structures or patterns that are situated at a higher macro level and arise from the interactions at the lower micro-level of the system. Usually a complex literary system has surface structure and deeper structure. The emergent deeper structure is the result of the interactions among the various elements of the surface structure. Emergence is characterized by radical novelty. The individual elements in a system sometimes do not have any representation of the emergent behaviour. Since in a literary system a sign has multiple signifiers, an image/word is crowded with multiple emergent connotative associations which are radically different and new from the denotative dimension.
of the word image thus proving that the whole is more than the sum of its parts. Literary systems are organic wholes, the collective behaviour is however, implicitly contained in the behaviour of individual elements, which can be realized if they are studied in the context in which they are found. Emergent meaning of a literary system can be understood by analyzing the elements of the system as a whole. Without interaction, interesting emergent behavior will never emerge. Literary systems are also characterized by coherence i.e. there is correlation between various elements which scale a coherent whole.

The notion of emergence and complexity are inextricably tied together. Many systems of interest to humans are complex systems. Some well known examples of complex systems include ant colonies, nervous system, cells and living things. In this context, literary texts are also highly complex and stylized systems, which show structure with variations and are systems in process that constantly evolve and unfold over time. Literary texts are not easily comprehensible and verifiable due to the complexity in their design, thought and function.

In the words of Revered Professor P.S. Satsangi :-

Literary systems are perceived intuitive systems which belong to the typology of human activity systems rather than other types such as natural systems,
designed physical or designed abstract systems. Accordingly, they represent soft ill-defined problems or concepts or situations which are complex.\textsuperscript{14}

We live in a complex world consisting of various complex systems, ranging from our own bodies to ecosystems to economic systems and also fictional systems. A complex system is a system composed of inter connected parts that as a whole exhibits one or more properties, thus a complex system can be defined in simple terms as “network of heterogeneous components that interact nonlinearly, to give rise to emergent behaviour.”

Paul Cilliers writes:

A complex system cannot be reduced to a collection of its basic constituents, not because the system is constituted by them, but because too much of the relational information gets lost in the process.\textsuperscript{15}

One of the striking features is a complex system comprises a large number of components which exhibit a large number of different interactions. Interactions are generally nonlinear and complex in these systems.

Literary systems fall in the category of complex systems with dynamic network of complexity with components which are also complex. For instance, in a fictional discourse, the plot may be complex and nonlinear, a large number of characters and relationships among them may be


complex. Theme/idea may be complex with multiple layers of meaning and the progression of narrative may embody twists and turns, blanks and silences, arousing suspense, anxiety and curiosity in the readers. In linear systems the effect is directly proportional to the cause but in non-linear systems such is not the case. Literary systems are both ‘structurally complex systems’ and also ‘dynamically complex systems’. They are structurally complex systems as they can be analyzed into many components having relatively many relations among them, and the behaviour of each component depends on the behaviour of others. They are also ‘dynamically complex systems’ as they involve numerous interacting agents with variable complexity evolving over space and time whose aggregate behaviour, which is non-linear in nature has to be understood. A complex system is a highly irregularly structured system which shows structure with variations. The notion of ‘structure’ of literary discourse has been drawing the attention of several postmodern theorists. Roland Barthes in his famous essay “Death of the Author” refers to the notion of ‘structuration of structure”. Jean Jacques Derrida in his very famous essay “Structure, Sign and Play in the Discourse of Human Sciences” throws light on how in the discourse of human sciences structure escapes structuralism. Literary systems are open system. Their boundaries cannot be determined, the final interpretation has to be given by the reader. Thus literary systems can be called ‘complex evolving systems’, which embrace new interpretations. A literary discourse is an open-ended system, which is time-bound but also timeless, space-bound and space less. A literary system like the biological system interacts with the outside environment and evolves and develops sowing new seeds of thought every time. Aristotle compared drama to a living organism, which grows and matures with time and in the process of maturation, acquires different meanings at every stage. Like other complex systems,
it is not easy to predict the emergent behaviour of a complex literary system, because the number of interactions among components of a system increases in accordance with the number of components, allowing many new and subtle types of behavior to emerge. At this point, the following observation of the renowned scientist Kirsty Kitto is quite relevant:

Complexity is often equated in a rather circular manner with emergence a complex system is one where new or emergent behaviour arises which is not obviously apparent in its definition. This sometimes leads to an attack on the very existence of the phenomena such as complexity and emergence, where the stance is taken that emergence arises only in our understanding of systems, rather than in the systems themselves.\(^{16}\)

She further observes that in such an understanding, the emergence of complex behaviour is the byproduct of our perception, which is true of literary systems also.

At this point it would also be interesting to refer to the following lines distinguishing the difference between complicated and complex systems.

A complicated system is composed of a large number of interacting components. Importantly, the properties of such a system can be accurately predicted from a knowledge of the properties of each of its components and a complete enumeration of their interactions. In other words, a complicated system is exactly the sum of its parts. Complex, on the other hand, is a term reserved for systems that display properties that are not predictable from a complete

description of their components and that are generally considered to be qualitatively different from the sum of its parts.\textsuperscript{17}

Another way of distinguishing complicated system and complex system may be in terms of the former being large but well (i.e. regularly and predictably) structured while the latter is not only large but ill (i.e. irregularly, variably and unpredictably) structured. Accordingly in both cases (whether complicated or complex) the system is more than the sum of its parts, but while the complicated system is deducible from its component parts and structure, the complex system is not.

The above distinction is worth considering as systems are simple, complicated and also complex. A close scrutiny of literary systems reveals that there is a scale of complex behaviour and all literary systems are complex but some are more complex than the other. All literary systems embody subjectivity, contextuality and reader dependence but there is a variation in the degree of complexity. Keeping in view the variations in in the levels of complexity the scale shows two points: low end and high end. Relatively simpler systems have been placed at the low-end of the complexity scale. The systems transit towards the high end of the complexity scale with the increase in the complexity of its various components and structure. Literary systems can also lie anywhere between low end and high end of the complexity scale but for accuracy and proper analysis two extreme points have been shown in the complexity scale. The given scale which shows the rising curve from low-end to high-end has been designed with

reference to commonly accepted features of various literary systems. In general, the complexity of literary systems increases exponentially with the increase in the subjectivity, contextuality and reader dependence. The following hypothetical complexity scale can be proposed to understand the levels of complexity in literary systems:

![Complexity Scale in Literary Systems](image)

<table>
<thead>
<tr>
<th>Complexity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low-end Complexity</td>
</tr>
<tr>
<td>Lyric</td>
</tr>
<tr>
<td>Sonnet</td>
</tr>
<tr>
<td>Short story</td>
</tr>
<tr>
<td>Essay</td>
</tr>
<tr>
<td>One-act play</td>
</tr>
<tr>
<td>High-end Complexity</td>
</tr>
<tr>
<td>Ode</td>
</tr>
<tr>
<td>Elegy</td>
</tr>
<tr>
<td>Novel</td>
</tr>
<tr>
<td>Five act play</td>
</tr>
<tr>
<td>Epic</td>
</tr>
<tr>
<td>Long Narrative Poems</td>
</tr>
</tbody>
</table>

Subjectivity, Contextuality and Observer/reader dependence are the features which are present in all complex Literary systems and a higher level/extent of these features leads to a higher level of complexity.

Systems Science offers a variety of transdisciplinary theories which can be applied on a variety of Systems. The thesis discusses the following theories and also presents their applicational case studies taking a variety of texts.
Interpretive structural Modelling (ISM) is one of the tools of Interactive Management (IM). IM tools assist groups in dealing with complex issues. These tools promote the integration of contributions from individuals with diverse views, backgrounds, and perspectives through a process that is structured, inclusive, and collaborative. A group of participants who have knowledge of the situation are engaged in

a. Collectively developing a deep understanding of the current State of affairs

b. Establishing a clear basis for thinking about the future

c. Producing a frame work for effective action.

The IM system promotes communication, consensus and commitment from the participants involved. ISM is a computer-assisted method that helps a group identify the relationships among ideas and impose a structure on the complexity of the issue. The ISM software utilized mathematical algorithms that minimize the number of queries necessary for exploring relationships among a set of ideas. ISM can be used to develop several types of structures.

John N. Warfield in his book Introduction to system science discusses two types of processes - neutral and specific. These processes are useful while working with systems. The neutral ones are readily identifiable as those which contain no carry forward mathematics other than the mathematics of logic. The specific ones will contain some type of mathematics associated with numerical spaces from which the quantitative data such as time, intensity, mass, standard deviation, weight and reaction factor enter quantitatively. Specific processes are applicable to some kinds of systems only. The neutral processes of Nominal Group Technique (NGT) and
Interpretive Structural Modelling (ISM) are sufficient for system science. The context for all systems application is the problematic / ambiguous / complex situation. A problematic situation is polysemic in nature. For instance in a literary system / text / discourse, a word / phrase / sentence can have multiple meanings, and an event / situation can have plurality and there can also be structural complexity. Warfield writes that the term polysemy “does not appear often in English Texts. It means a word or phrase that has multiple meaning.”\(^\text{18}\) This phenomenon of language has confused, fascinated and compelled literary scholars from time to time to explore the figurative / rhetorical dimension of language, thus challenging the idealistic view of language existing since the time of Plato.

One of the most important developments in system theory is the “Physical Systems Theory Model (PST Model)”, which is founded on linear graph theory.

It enables one to formulate the mathematical or descriptive model of the system in the form of system equations or characteristics for a large variety of linear/non-linear, lumped/distributed parameter, static/dynamic, deterministic/stochastic, crisp/fuzzy, classical/quantum, physical/conceptual, fictional and esoteric systems of consciousness.\(^\text{19}\)

The PST develops on the assumption whether it is an electrical, mechanical, hydraulic, managerial or socio-economic system, that its structure can be represented in the form of a


linear graph. This requires a well-defined system structure, which is true for the physical real systems and also for a class of physical conceptual systems, managerial and socio-economic, and literary systems. As PST is primarily interested in (classic/quantum) force field modelling, the directed/oriented graphs are used to represent the structure.

The beginning point is, thus, qualitative definition of the system/process to be modelled. In case of managerial, socio-economic systems and literary systems the graphic representation acts as a means of system conceptualization and communication of system structure. Though theoretically it demands a transparent structure, its practice helps in clearing the ambiguity (through consensus-building approach of NGT where necessary) and making systems more transparent to the users.

The use of graph theoretic consideration in PST facilitates the system comprehension, and provides a framework through which the power of graph theoretic tools and techniques can be effectively used for systems modelling and analysis.

PST is based on a philosophy, which is comprehensive in successfully dealing with both causal as well as noncausal phenomena. The PST models, where relevant and admissible, bring out the causal relationships in the system. On the other hand Sahni, Srivastava and Satsangi (2009), and Srivastava, Sahni and Satsangi (2011) have successfully generalized PST modelling in the form of Graph Theoretic Quantum Field/System Modelling (GTQF/SM) so as to successfully
apply this Unified Modelling Theory to Quantum Information/Computational Systems which are random in nature.

The fundamental premises of PST are discussed as follows:

i. Fundamental Axiom of Physical System Theory (PST)

A fundamental axiom of the discipline is that a mathematical model of a component characterizes the behavior of that component of the system as an entity and independently of how the component is interconnected with other components to form a system.

ii. Formulation of system characteristics or behavior

The analysis of system requires

(1) **Component postulate:** Mathematical description of each component

   (a) Terminal graph: Oriented line segment or segments where one orientation is used to represent both the across measurement and the through measurement reference, and
   
   (b) Terminal characteristics; and

(2) **System Structure Postulate**

   Mathematical description of how the components are combined to form the system
(a) System graph postulate: System graph: a collection of component terminal graphs obtained by uniting the vertices of the terminal graphs in one-to-one correspondence with the union of the component terminals.

(b) **Interconnection Constraint Postulate**: Fundamental cut-set (continuity) postulate and fundamental circuit (compatibility) postulate. The aggregate of these mathematical or behavioral characteristics is called system characteristics or system behavioral characteristics. The theory of oriented linear graphs, developed as an abstract mathematical topic, is valuable in the analysis of systems as a means of achieving a simple systematic procedure for formulating the system characteristics.

The “Physical System Theory Model” helps in the formulation of general analytical solutions and in the analysis of various multi-dimensional complex systems. Through models of sub-assemblies using sub-system to system construct. Prof. Prem Saran Satsangi considers “Physical Systems Theory” as a system of general principles of modelling which includes not only engineering or technical systems but also socio-economic environmental, fictional/literary and spiritual systems. He writes:

The vast success of Physical Systems Theory as an operational Modelling Methodology is owing to the fact that it is not just based on analysis, but invokes the fundamental properties of measurement or observation (whether quantitative, qualitative fuzzy, emotional, perceptional, intuitive or experiential) for each discipline of its application and is founded on linear graph theory in
capturing the structure as a model of interrelationships between the various parts of the whole which is the essence of systems thinking.\(^\text{20}\)

“Systems Modelling” is the representation of our so called “real world” in mathematical terms so that we may gain a more precise understanding of its significant properties and which may hopefully allow some form of prediction of future events. The System Model of a real life situation/literary system will certainly reflect in an appropriate manner both component behavior and system structure.

**Graph Theoretic Field Model (GTFM)**

The graph theoretic field model (GTFM) is a mathematical model of a field or continuum problem founded on the linear graph theory, the continuum mechanics, and a simple spatial discretization.

One of the hallmarks of this systems theory is that the models of the viable subsystems or subassemblies or smaller “wholes” of a larger system or “whole” is developed (including parameterization, to the extent feasible) as separate constituent entities of a larger system or assembly. This form of development of the system model (even state model for a dynamic system) allows subsystem to be added or modified at any time without reorganizing the total model structure. The use of graph theoretic systems modelling methodology as a basic

theoretical framework enables exploitation of "tools" and "techniques" which the graph theoretic concepts provide to a systems problem.

Another major element of the graph theoretic systems modelling framework is that it provides a tool for computerized formulation of large-scale system models by invoking subsystem-to-system modelling construct with considerable saving in time and effort.

The graph theoretic systems modelling is ideally suited for the modelling of multidimensional systems. By separating the system topological equations from the component constitutive equations, very efficient formulations and computer algorithms can be obtained. In fact, GTFM has been applied to a broad range of different types of systems: electrical circuits, fluid flow networks, mechanical systems, and even socio-economic systems.