

桜美林大学大学院

2025 年度Ⅲ期入試

博士後期課程 国際学術研究学位プログラム

心理学研究領域

専門外国語(英語)試験

問題用紙

| 受験番号 | 氏名 |
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- \* これは問題用紙です。答えは解答用紙に記入してください。
- \* 用紙が配布されても合図があるまで開かないでください。
- \* 試験中、監督の許可なしに、部屋の外に出ることはできません。
- \* 不正行為に対しては厳正に対処します。
- \* 試験終了後、問題用紙も回収しますが、メモなどは消さなくてもかまいません。



【問題】以下の二つの文献を参考にし、Reference 2 の下線部について心理学の研究方法の具体的な例をいくつか挙げ、それらの方法論的問題について二つの文献を参考にして 800 字以上で述べなさい。その際にこの問題に対する解決のための方法論についても言及すること。

回答欄が不足する場合は裏面や空欄を使用して良い。

(回答時間 50 分)

#### Reference 1

At the end of the twentieth century, terms such as “Chaos”, “Fractals”, and “Complex systems” got much attention in the field of science. Along with The Theory of Relativity and quantum mechanics, chaos was sometimes referred to as the three biggest findings of the twentieth century in the field of science. Chaos, as academic jargon, in general terms does not mean, “disordered”. Actually, the term chaos in science, has not been exactly defined, on this occasion, I consulted the Wikipedia. Researchers who are in the field of chaos would probably all agree that the Wikipedia page for chaos is quite good.

*Chaos theory is the field of study in mathematics that studies the behavior of dynamical systems that are highly sensitive to initial conditions—a response popularly referred to as the butterfly effect. Small differences in initial conditions (such as those due to rounding errors in numerical computation) yield widely diverging outcomes for such dynamical systems, rendering long-term prediction impossible in general. This happens even though these systems are deterministic, meaning that their future behavior is fully determined by their initial conditions, with no random elements involved.*

*In other words, the deterministic nature of these systems does not make them predictable.*

*This behavior is known as deterministic chaos, or simply chaos.*

*Although no universally accepted mathematical definition of chaos exists, a commonly used definition originally formulated by Robert L. Devaney says that, for a dynamical system to be classified as chaotic, it must have these properties:*

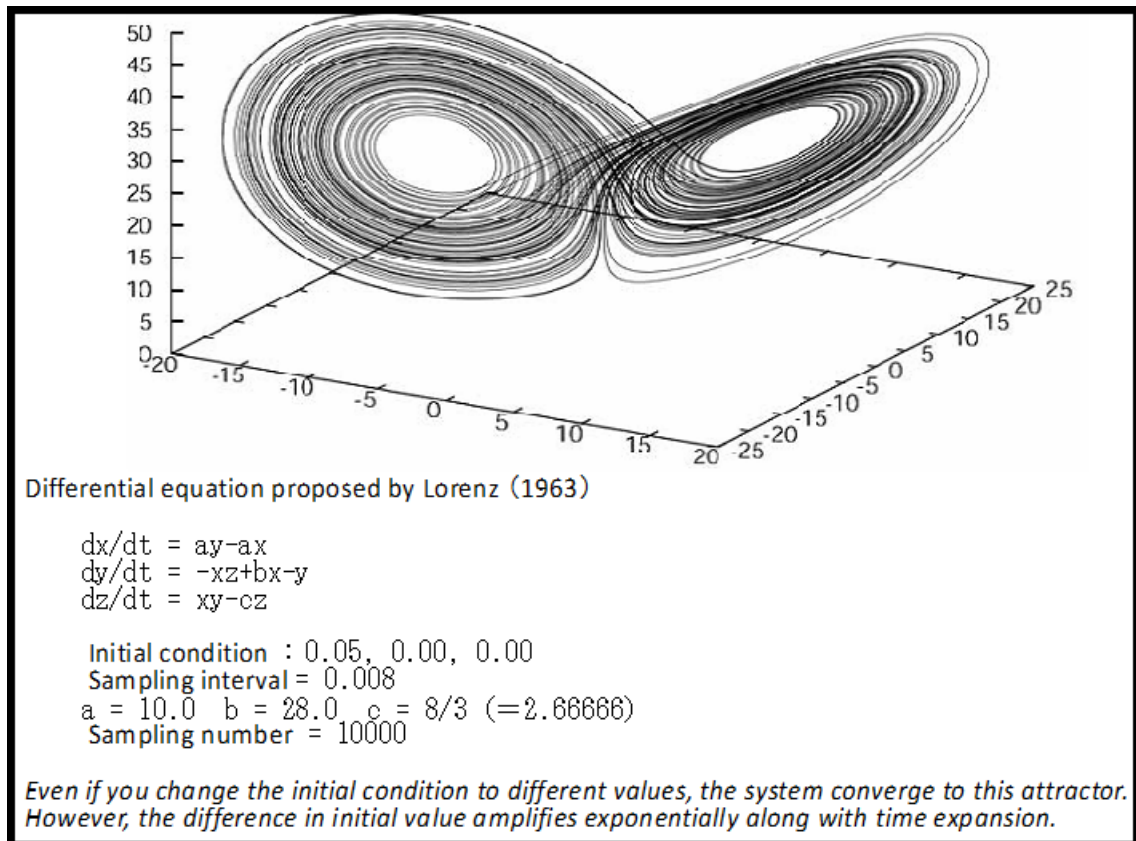
***it must be sensitive to initial conditions***

***it must be topologically mixing***

***it must have dense periodic orbits***

[https://en.wikipedia.org/wiki/Chaos\\_theory](https://en.wikipedia.org/wiki/Chaos_theory)

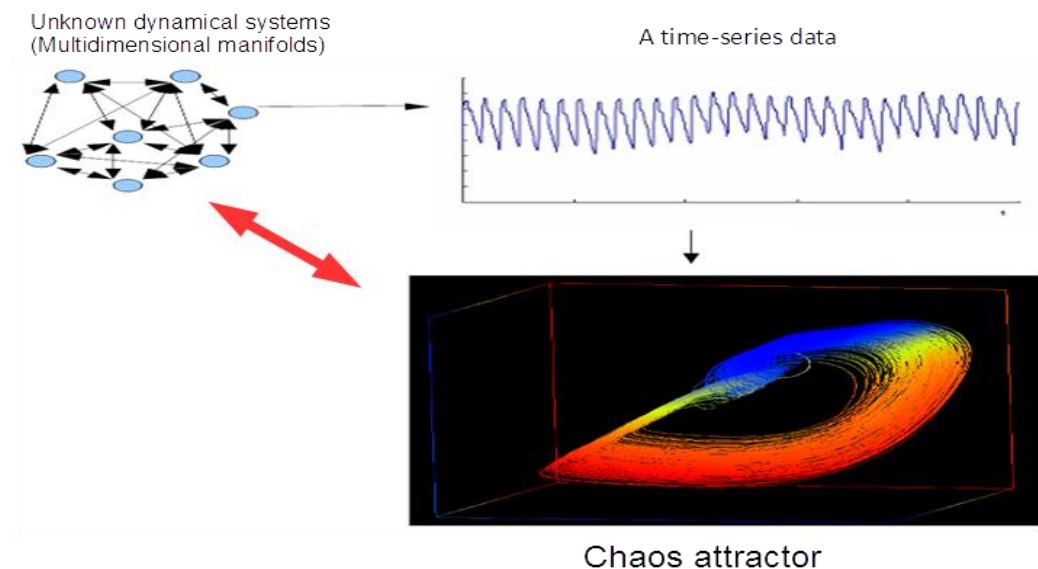
This is the famous differential equation proposed by Lorenz in 1963. This was calculated using a state of the art IBM computer of that time and it led to the finding of chaos. Even if you change the initial condition to different values, the system converge to this attractor. However, the difference in initial value amplifies exponentially along with time expansion. Although Lorenz's study is famous worldwide, in Japan, Ueda who was a graduate student of Kyoto University, also discovered the chaos attractor in 1961. His finding was later named as the Ueda attractor or the Japanese attractor.



Chaos provides a worldview, “complex phenomenon does not necessarily consist of numerous factors or numerous degrees of freedom”. Or we can say that complex behavior can be generated from simple deterministic equations, or that subtle difference in initial values get larger along with time expansion. These things can be attributed to the nonlinearity that produces chaos.

In the analysis of chaos, we take out one variable, which is a time-series data from “unknown dynamical systems” or “multidimensional manifolds”. This data contains “much” information because, in principle; the behavior of this variable includes not only the variable itself, but also other factors and variables that interact with this variable. The behavior of the factor is not a simple fluctuation of one variable, but it also contains the “whole” background information. So you can say that chaos attractors are low-dimensional mapping of the multidimensional manifolds. Moreover,

the part and the whole are inseparable, thus, perhaps we can say that in conventional science, we have been partially cutting out the linear parts of the whole that originally interacts in a non-linear dynamics.



#### Reference 2

As it turns out, systems considered to be chaotic aren't really chaotic at all – they are just not as predictable as the cause-and-effect kind of ideas associated with linear dynamics. Linear systems work within clear, definable limits and things “add up” to form a predictable outcome – add together certain causes, perform an equation, and you get a predictable result. The statistics we use in psychology and elsewhere, derive from the study of linear systems. So do the ideas of what a clock is, and how the universe is like a clock – including the people in it. If we can just discover all the rules for clocks, we will also have all the rules for people. And if we can figure out how to control clocks, we can probably discover not only how to control the weather but how to control people as well.

The only problem is that linear systems exist more in theory than in practice. Living systems and forces of nature are nonlinear, regardless of whether we talk about the weather, planetary systems, a cell or a therapy group. A nonlinear system means you cannot quantify outcome based on additive equations. As a result, cause and effect are not necessarily functionally related. In linear systems, output is proportional to input. In nonlinear systems this is not the case – a little bit of input can produce an enormous change in output – or not. In linear systems change can be

predicted by what has happened in the past. In nonlinear systems, change is discontinuous, with sudden unpredictable jumps, more like the change in a horse's gait from walking, to trotting to galloping – sudden transitions resulting from dramatic reorganization.

This nonlinear idea is extremely inconvenient for researchers who depend on changing one variable at a time, measuring it, and discovering causality. Up to a point, this methodology can be helpful, and lead to significant advances. But when we need to look at actual situations that occur in messy and complicated real life situations, rather than in highly controlled laboratory settings, we run into trouble. All kinds of unpredictable things happen when you get joint interactions between systems. These things that happen, although unpredictable are quite frequently, not chaotic at all, but well organized. For an example there is none better than the function of the exceedingly complex human brain.

Formally, the focus of chaos theory is on the manner in which simple systems give rise to very complicated unpredictable behavior, while complexity theory focuses on how systems consisting of many elements can lead to well-organized and predictable behavior. Self-organization is the tendency of certain, but not all, systems operating at a state known as “far from equilibrium” to shift to a new state when their constituent elements generate unlikely combinations. When systems become sufficiently populated and properly interconnected, the interactions assemble themselves in a new order: proteins into cells, cells into organs, organs into organisms, organisms into societies.

Self-organization is a notion that holds that new levels of form, organization and complexity often arise out of the interchanges between organisms and their contexts – order “for free”. As an example, groups of neurons self-organize into a pattern of firing in response to changes in experience. This idea becomes very important in Creating Presence because we hope that the outcome of the course will be that the organization as a whole, and all of the people within and connected to the organization, will have a much greater capacity for self-organizing in the face of constant change.

**Emergence** is the outcome of all this. In describing collective behaviors, emergence refers to how collective properties arise from the properties of parts, how behavior at a larger scale arises from the detailed structure, behavior and relationships at a finer scale. For example, cells that make up a muscle display the emergent property of working together to produce the muscle's overall structure and movement. A water molecule has emergent properties that arise out of the properties of oxygen and hydrogen atoms. Many water molecules together form river flows and ocean waves.

Trees, other plants and animals form a forest. An ant colony is an emergent phenomenon as is a jazz orchestra, or any orchestra for that matter, as are YOU. You are the emergent phenomenon of billions of cells interconnected with each other. The place you call “where you work” is an emergent phenomenon of every person connected to the organization and all the interconnections within and outside of the organization. In describing function, emergence suggests that there are properties that we associate with a system that are actually properties of the relationship between a system and its environment. This is what makes understanding the many levels of context so important.

Taken together, this all represents the “science of change” and it’s all about relationships. Relational therapists will note the continuity with general systems theory. One psychologist in this new field has stated that general systems theory focuses on stability while chaos theory explores how systems change. Others propose that chaos and complexity are the basis for a postmodern self. In contrast to the modern man who could objectively discover the machine-like workings of the universe, a self-contained individual able to uncover the One Truth, the post-modern self is an open system, dependent on context, always in a state of becoming, actively integrating new information and exchanging that information with a changing environment, and uncovering many truths.

出典：

Sandra L. Bloom (2019). CHAOS, COMPLEXITY, EMERGENCE, AND SELF-ORGANIZED CHANGE.

*Creating PRESENCE.*

<https://learn.lakesidettraining.org/wp-content/uploads/2024/06/Chaos-Complexity->

*Emergence-and-Self-Organized-Change.pdf*

Taira Suzuki (2016). New Perspectives of the Theory and Method of Psychology: The Eastern Paradigm of Sciences of Human Being as a Whole. Psychology as a complex system. The 31st International Congress of Psychology.

MEMO ご自由にお使いください。

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