

**GENERAL SYSTEMS ESSENTIALS:
AN INTRODUCTORY COURSE FOR A MODERN GENERALIST
CURRICULUM**

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ABSTRACT

General Systems Essentials is a course designed to serve as the introductory course for a Modern Generalist Curriculum leading to a doctoral degree in Modern Generalist Understanding. Because the course presents deep understanding of many factors of systems origins, structures, and processes, it is appropriate for anyone interested in studying systems science.

Ever since the advent of science and the consequent ever increasing body of new knowledge, it has been impossible to be a generalist in the traditional sense of quantity of knowledge. Becoming a specialist, whatever the degree of focus, was the only option.

It is now possible to become a generalist—not in the traditional manner of quantity and extent of knowledge, but in a new manner, based on quality and extent of understanding. The modern generalist mode is possible because it is a discipline-independent mode based on developments from general systems theory.

The course provides a practical introduction to the breadth and depth of the modern generalist mode by leading the student to an understanding of three universal aspects of the intrinsic nature of all that exists. (1) General factors are a more general form of general systems principles and isomorphies. (2) Structural logic is the way in which the intrinsic qualities of something that exists determine the kinds relations it can have with other things that exist. (3) Development is the sequential order of relations between things that exist, throughout space and structure, throughout time and process.

These three exist in reality as patterns of organization of space, time, and matter, and the modern generalist uses these patterns as conceptual tools of exploration, analysis, understanding, and description. Thus, the thinking within the mind matches the reality referents of that which is thought about, resulting in a high degree of objective understanding.

The modern generalist mode of exploration, analysis, understanding, and description has many benefits for understanding systems in any discipline. It enhances the ability to identify general patterns among multiple levels and disciplines through understanding the deep-structure of such patterns. It displays the interconnectedness between and within all the levels through the use of the general factors that play roles of connectivity between and within the subjects studied by the various disciplines. This generalist mode makes it possible to understand change in diverse systems and in their environments through the use of the general factors that form the bases of all forms of change. It enables critical

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reasoning at multiple levels through the use of the structural logic inherent in general factors and their interrelations. It enables integration of multidiscipline knowledge through the use of the general factor development, the universal general factor of connectivity. Using this method enables general holistic understanding through the use of those general factors that provide unity, depth, and breadth of understanding. Discipline-independent understanding can be achieved through the use of general factors whose core patterns of organization are independent of level of organization.

The modern generalist mode does not simplify complexity, but rather accepts it as is, gains access to the complexity by way of known general factors, observes what other factors are there playing roles of structure and process, and in that way achieves understanding of the intrinsic nature of the complexity.

Keywords: systems curriculum; modern generalist; general systems; deep structure; connectivity

INTRODUCTION

For decades a multidisciplinary approach has been required by the complexity of large scale problems and projects. Because of persistent problems with cross-disciplinary communication, there has been a concurrent call for some way to achieve an overview capability for large scale issues. This call sometimes comes in the form of a request for a generalist capability, a working knowledge of all the sciences—an apparent impossibility. For hundreds of years there has been no alternative to becoming a specialist. Now, however, due to developments in general systems understanding, it is possible to become a generalist—not in the traditional manner of quantity and extent of knowledge, but in a new manner, based on quality and extent of understanding.

General Systems Essentials is designed to serve as the introductory course for a Modern Generalist Curriculum leading to a doctoral degree in Modern Generalist Understanding. Because the course presents deep understanding of many factors of systems origins, structures, and processes, it is useful for anyone interested in studying systems science.

The modern generalist mode is possible because it is a discipline-independent mode based on three universal, omnipresent, aspects of the intrinsic nature of all that exists, three factors that play roles throughout all the disciplines.

- General factors.
- Structural logic.
- Development.

A general factor is anything that exists and plays a role in the intrinsic nature of reality in two to many different situations. General factors can be used as conceptual tools to obtain understanding of anything that exists. With any unfamiliar situation or system there will always be general factors present that can be used to obtain conceptual access to that situation or system.

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Structural logic is the intrinsic logic of reality, the manner in which the intrinsic qualities of something that exists determine the types of relations that something can have with other things that exist. Used as a conceptual tool, structural logic enables the development of understanding of the interrelations between things.

Development is the difference from one place, part, state, stage, or situation to another involving some form of enhancement. The enhancement can be as simple as increasing distance through space or the increasing quantity of time that is occurring, or it can be as complex as the consequences of biological evolution. Because development is the sequential order of relations between all that exists, through space and structure, through time and process, it can be used as a conceptual tool, providing understanding of the progression in structure and in process from what has gone before to what follows, from cause to effect, from parts to emergent wholes, from the simple to the complex.

These three exist as patterns of organization of space, time, and matter, and the modern generalist uses these patterns as conceptual tools of exploration, analysis, understanding, and description. Because general factors, structural logic, and development are factors of the intrinsic nature of reality, using them as conceptual tools matches the thinking within the mind to the reality referents of that which is thought about. Thinking in the mode of general factors, structural logic, and development, that is, thinking in the mode of their interrelating patterns of organization, specifically matches the qualities of the concepts within the mind to the qualities of the reality referents of those concepts, resulting in a high degree of objective understanding.

General factors, structural logic, and development are components of the modern generalist's intellectual toolkit. Three other components of the generalist toolkit, which are also presented in this introductory course, are of significant value to anyone studying systems science.

- Biological epistemology—The recognition that biological evolution has honed experiencing, knowing, and understanding to be effective tools to analyze, understand, and communicate diversity, change, and complexity.
- Realist philosophy—The recognition that systems are real, they exist throughout the universe, and therefore require a realist approach to create and/or work with them in an effective manner.
- The prime imperative of analysis—For the accurate analysis of the intrinsic nature of reality, of that which exists, look to reality itself, allowing the nature of reality to dictate the nature of the understanding of reality. Analyze the reality referents of concepts, rather than the concepts themselves.

These three components guide the use of the first three, and thereby further orient the mind to objective understanding. Practice with these six components greatly enhances the ability to analyze and understand the origins, structures, and processes of systems.

PRESENTATION OF COURSE CONTENT

In the course, this material, and what follows from it, is presented in the form of graphic outlines (Figure 1). A modern generalist needs to see as much of a situation as

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simultaneously as possible. Thinking in the mode of general factors, structural logic, and development is primarily pictorial, a dynamic mental imaging of interrelating patterns of organization. The most difficult task of a modern generalist is not discovering new knowledge. What is hard, and time consuming, is translating understanding from the multirelativity of three-dimensional space, matter, structure, motion, emergence, cause, and process into the linearity of language. On the printed page, the relations between the written concepts are further disguised by the block form of the paragraphs.

As a counter to this disguising of conceptual relations, a modern generalist always writes in outline form, reformatting to standard paragraphs only for secondary reasons such as preparing a manuscript for publication. The outline format visually aids the identification of conceptual relations, increases the rate of comprehension, and enhances the overview. These benefits are in large part due to the hierarchic arrangement of the sentences. A further benefit occurs because the added clarity helps keep the discussion focused, making it more concise.

The graphic outline was devised to take advantage of these benefits, and to add to them. One of the reasons a picture is worth a thousand words is because the visual aids in the picture—spatial relations, color, patterns of organization, the holistic view—do a great deal of work for the mind. The mind is left free to focus on significance, on meaning.

There are a variety of visual aids employed in this graphic outline.

1. Hierarchic organization.
2. Connecting lines.
3. Dendritic organization.
4. Box outline for each sentence or concept.
5. Line thickness.
6. Color.
7. Color shade.
8. Numbering.
9. Font color.

It is a second role of the connecting lines that makes the graphic outline not just hierarchic, but also dendritic. The graphic outline format, with its dendritic pattern, makes the overview accessible.

These graphic outlines are designed to be used on a computer—the larger the screen the better. Each graphic outline is created as a single vertical image, and it is possible to scroll up and down to see any part not showing on the monitor. They are best viewed on a monitor that can be turned into a vertical or portrait position. The reason it is best to view them on a large vertical screen is to allow a view of the entire graphic outline. This gives the overview or holistic view that provides as much information as possible as simultaneously as possible. It enables the eyes to quickly roam over the entire chart relating various parts one with another. You see the big picture and the details simultaneously.

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There are Outline links that connect to additional graphic outlines, resulting in multiple pathways of investigation into deeper levels of details. These pathways of Outline links also have a dendritic organization of connections, similar to that of graphic outlines themselves. There are also Reference, Essay, and Illustration links connecting to supplementary material.

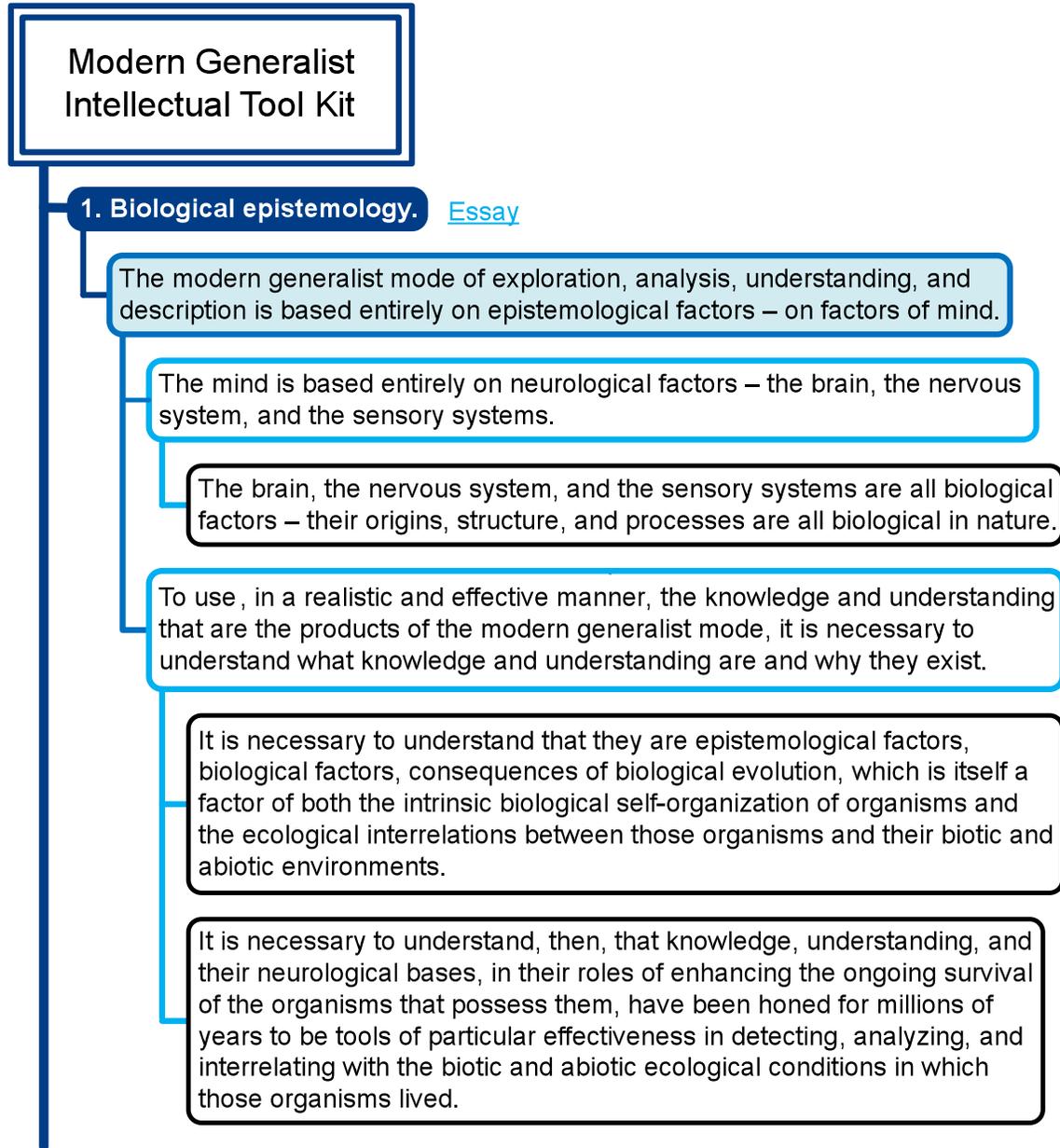


Figure 1. Modern generalist intellectual tool kit graphic outline.

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2. Realist philosophy.

Reality is that which exists.

There is but one reality – all that exists.

A realist philosophy is about achieving understanding of that which exists.

A modern generalist is a philosopher who uses intrinsic aspects of reality – general factors, structural logic, and development – to explore, analyze, understand, and describe that which exists.

The problems and the project situations that systems practitioners face exist, they are real. The stakeholders involved with those problems and projects are real.

3. Prime imperative of analysis.

Look to the subject of investigation itself. Let the intrinsic nature of reality dictate the nature of the understanding of reality.

Analyze the reality referents of concepts, rather than the concepts themselves.

Understand the scientific method foundationally, and as it is applied in various forms in the different disciplines.

The purpose of the scientific method is to obtain accurate knowledge and understanding of the intrinsic nature of that which exists.

Accurate knowledge and understanding occur when there is an accurate correspondence between the concepts within the mind and the reality referents of those concepts.

Scientific method consists, foundationally, of

- (1) careful observation,
- (2) using what is known to indicate what is yet to be discovered, and
- (3) rigorous double checking.

Figure 1. (continued)

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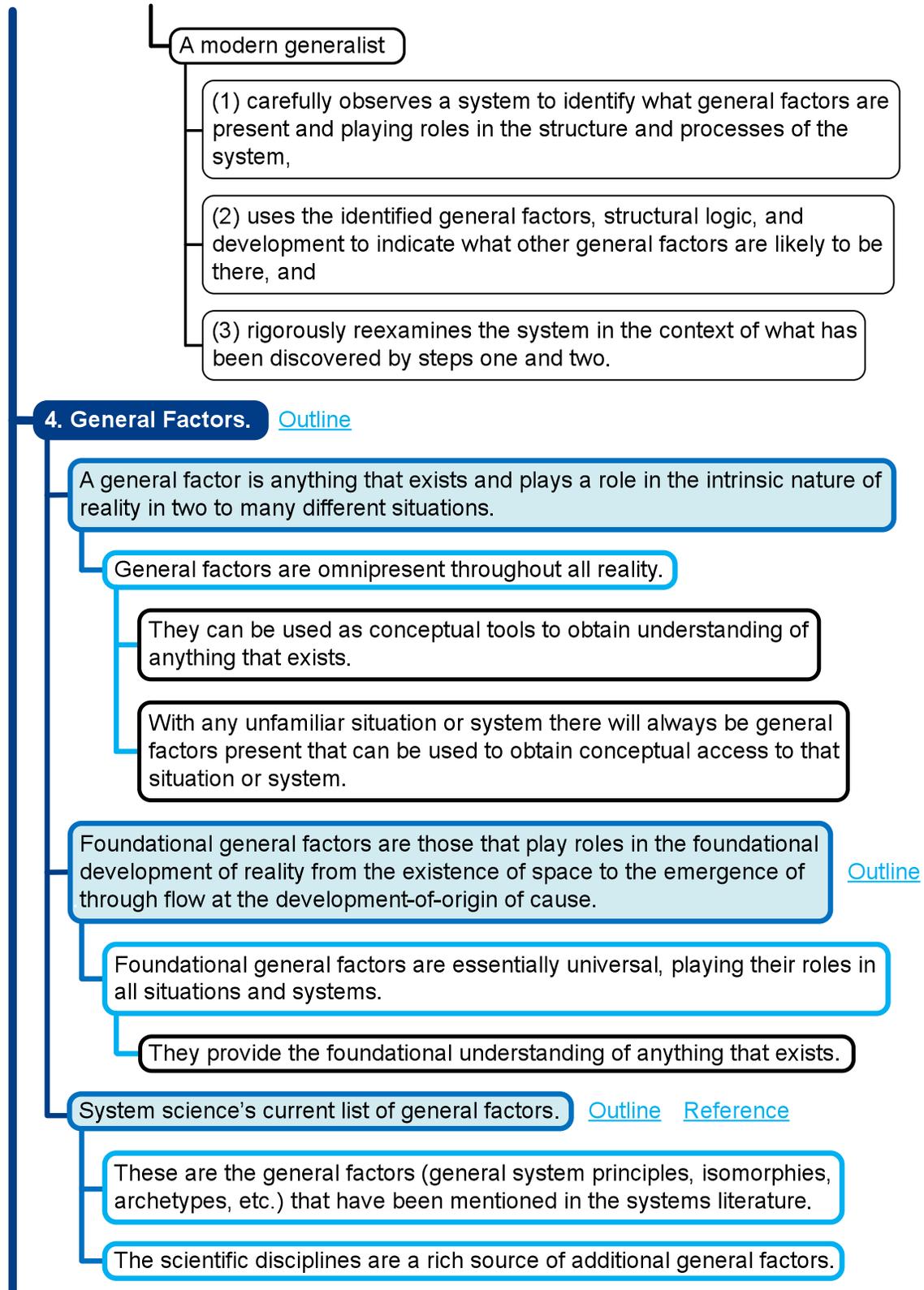


Figure 1. (continued)

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5. Structural logic.

[Essay](#)

Structural logic is the intrinsic logic of reality.

Structural logic is the manner in which the intrinsic qualities of something that exists determine the types of relations that something can have with other things that exist.

Structural logic determines the sequence of relations of most forms of development.

In all situations of change, the existence and intrinsic nature of what has gone before determines the existence and intrinsic nature of what follows.

Used as a conceptual tool, structural logic enables the development of understanding of the interrelations between things.

6. Development.

Universally, there are factors of sequential difference in the foundational deep structure of all that exists.

[Essay](#)

This sequential difference can be used as a conceptual tool to achieve understanding of the order of relations of one thing with another.

The universality of these sequential differences can be used to provide a natural universal organization of knowledge and understanding.

Development is sequential difference that involves some form of enhancement.

The enhancement can be as simple as increasing distance through space or the increasing quantity of time that is occurring, or it can be as complex as the consequences of biological evolution.

Figure 1. (continued)

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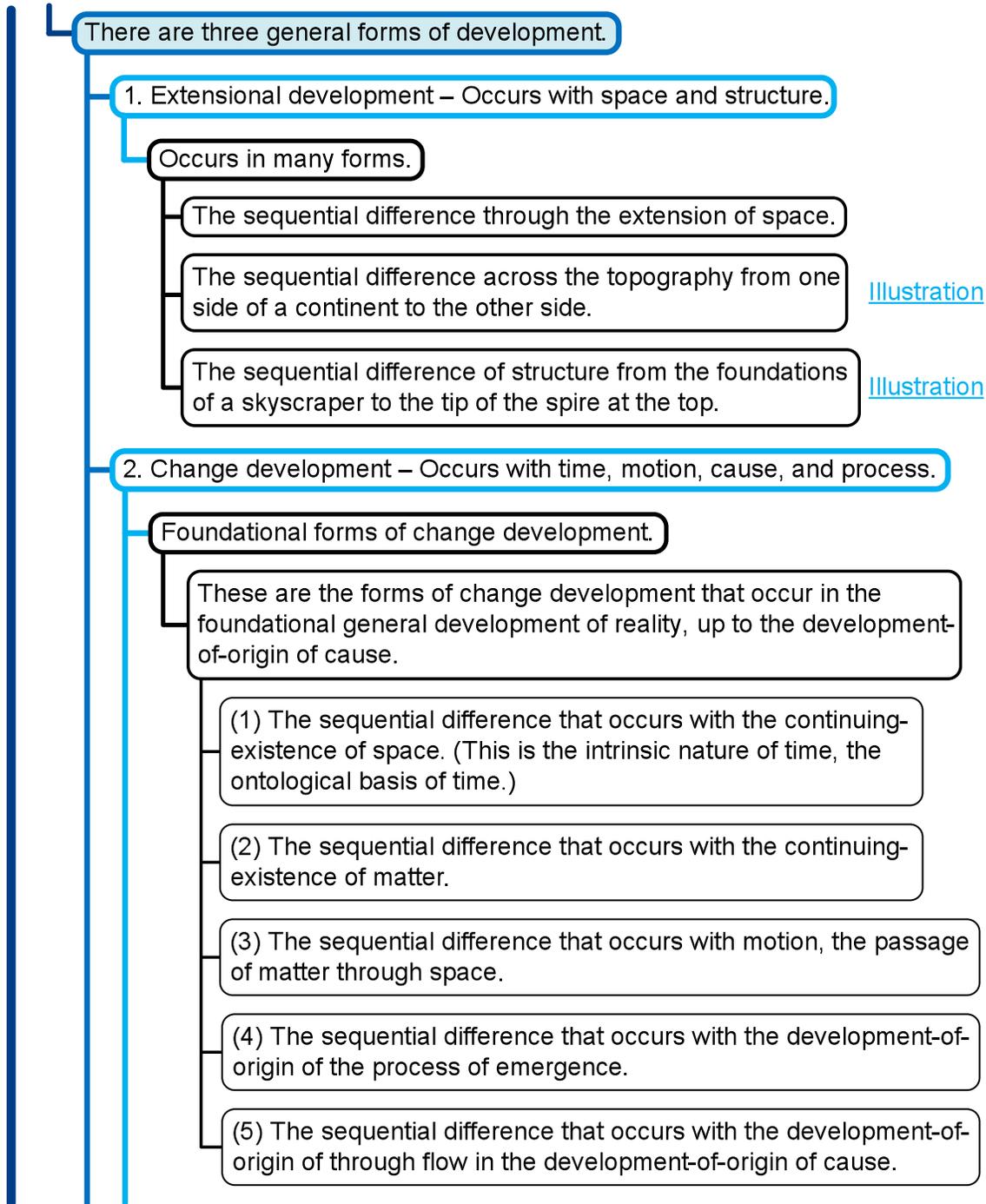


Figure 1. (continued)

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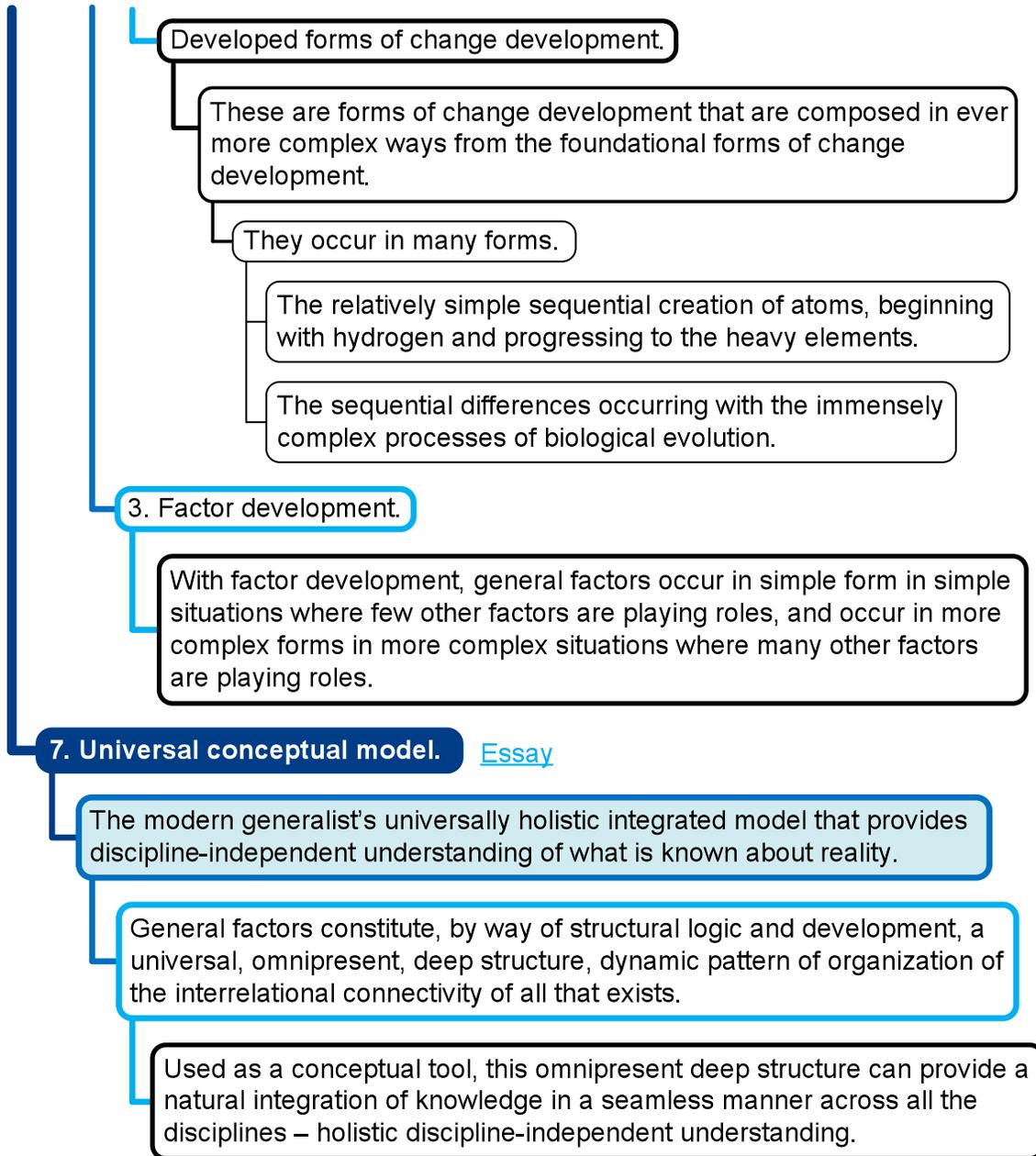


Figure 1. (continued)

At the beginning of Figure 1 there is a title box with two lines around it, and at the beginning of Figure 2 there is another title box, this one with four lines around it. These lines indicate the hierarchic depth of the graphic outlines. Figure 1 is a second level chart and Figure 2 is at the fourth level. There is a graphic outline above Modern General Tool Kit, linking to it, and another graphic outline, at level three, between Modern Generalist Tool Kit and There Are Two Basic Forms of Factor Development, linking up to the one and down to the other. In these examples the linkage is linear from the first level to the fourth level. But in the actual course material, each graphic outline will have multiple

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links down to lower level graphic outlines, resulting in the dendritic pattern of organization of the course syllabus.

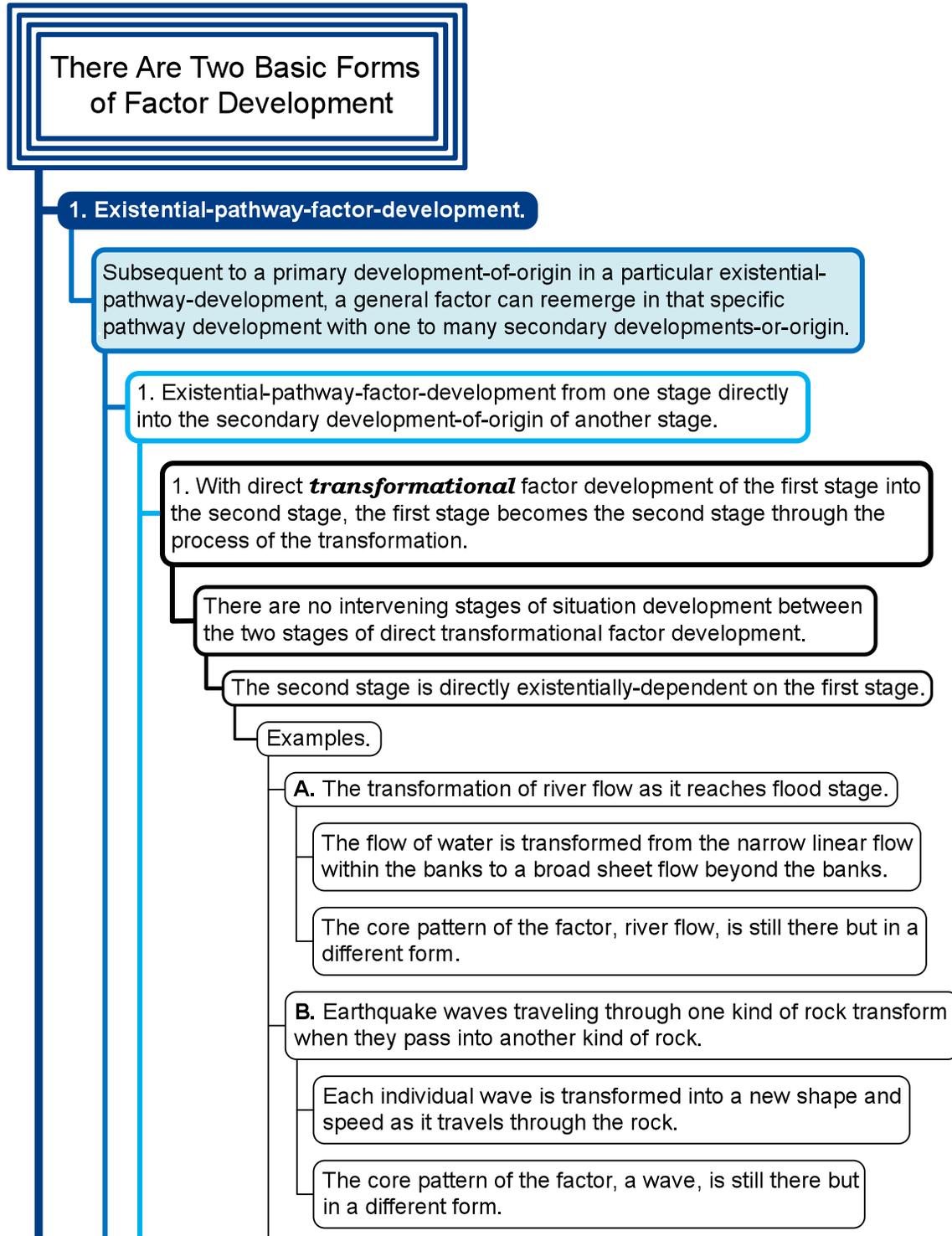


Figure 2. There are two basic forms of factor development.

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C. The transformation of breathing with vigorous exercise.

Breathing is transformed to a new stage with a different pattern, increased rate and depth, with the activation of a control subsystem by increased level of CO₂ in the blood.

The core pattern of the factor, breathing, is still there but in a new form initiated by additional factors.

2. With direct **transitional** factor development from the first stage to the second stage, the first stage does not turn into the second stage – the components of the first stage do not become components of the second stage.

The first stage can play the role of a template for the creation of the second stage.

Examples.

A. In the process of metal casting a liquid metal is poured into the hollow space of a mold. When the metal cools it has taken on the pattern of organization of the hollow.

In the direct transitional factor development of the pattern of organization of the hollow in the mold, the first stage is the pattern as it exists based on the material of the mold.

The second stage is the pattern as it exists based on the metal of the object that has been created.

These are distinct stages of factor development because, even though the pattern itself is essentially the same in both stages, the material that plays the role of the existential basis of the pattern occurs on opposite sides of the pattern in the two stages.

The first stage has played the role of a template in the creation of the second stage.

B. In the mold and cast process of fossilization, an organism is buried in sediments and its original remains are disintegrated, leaving a hollow in the sediment which has the shape of the organism.

In this direct transitional factor development, the pattern of organization of the organism has played the role of a template for the pattern of organization of the hollow.

Figure 2. (continued)

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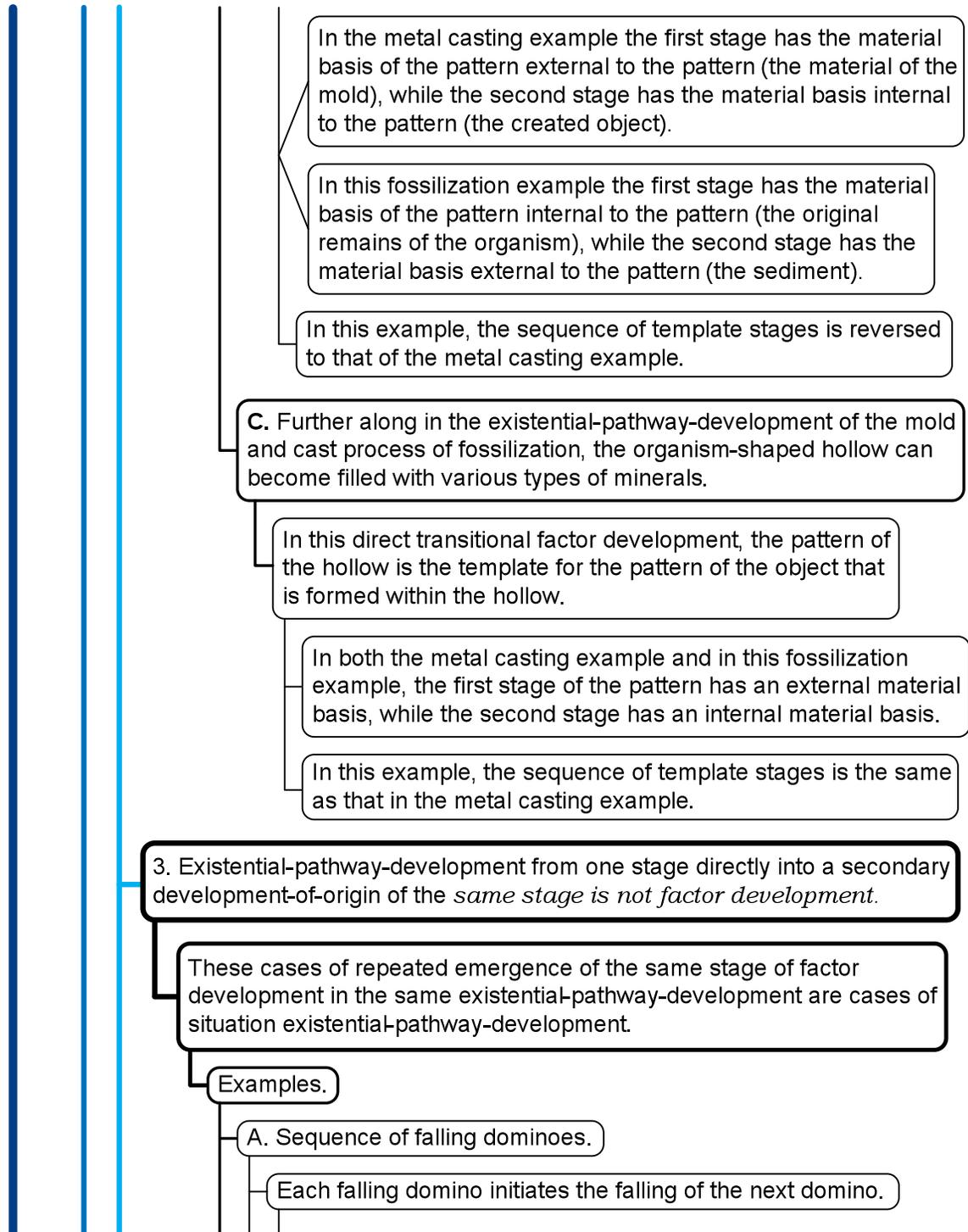


Figure 2. (continued)

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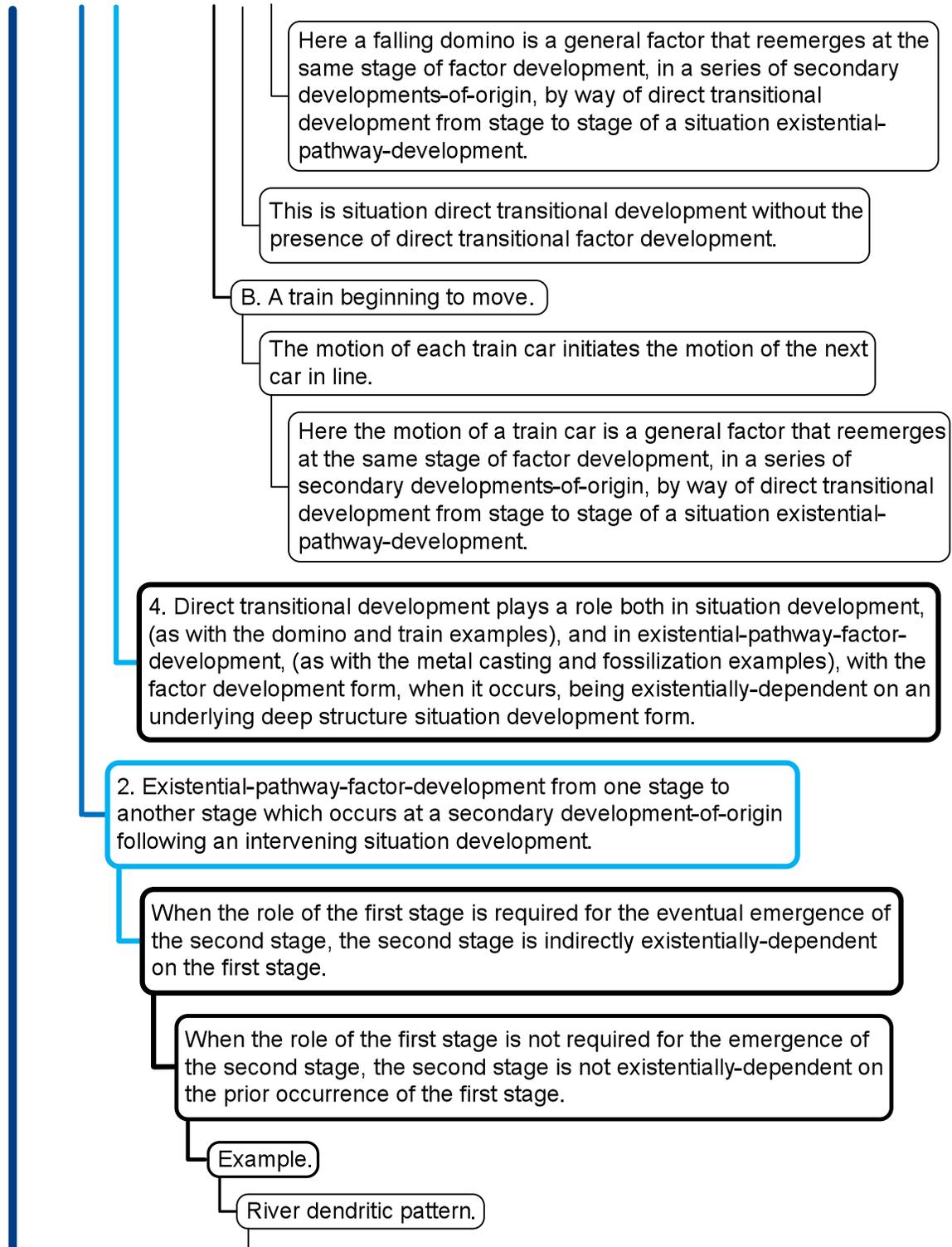


Figure 2. (continued)

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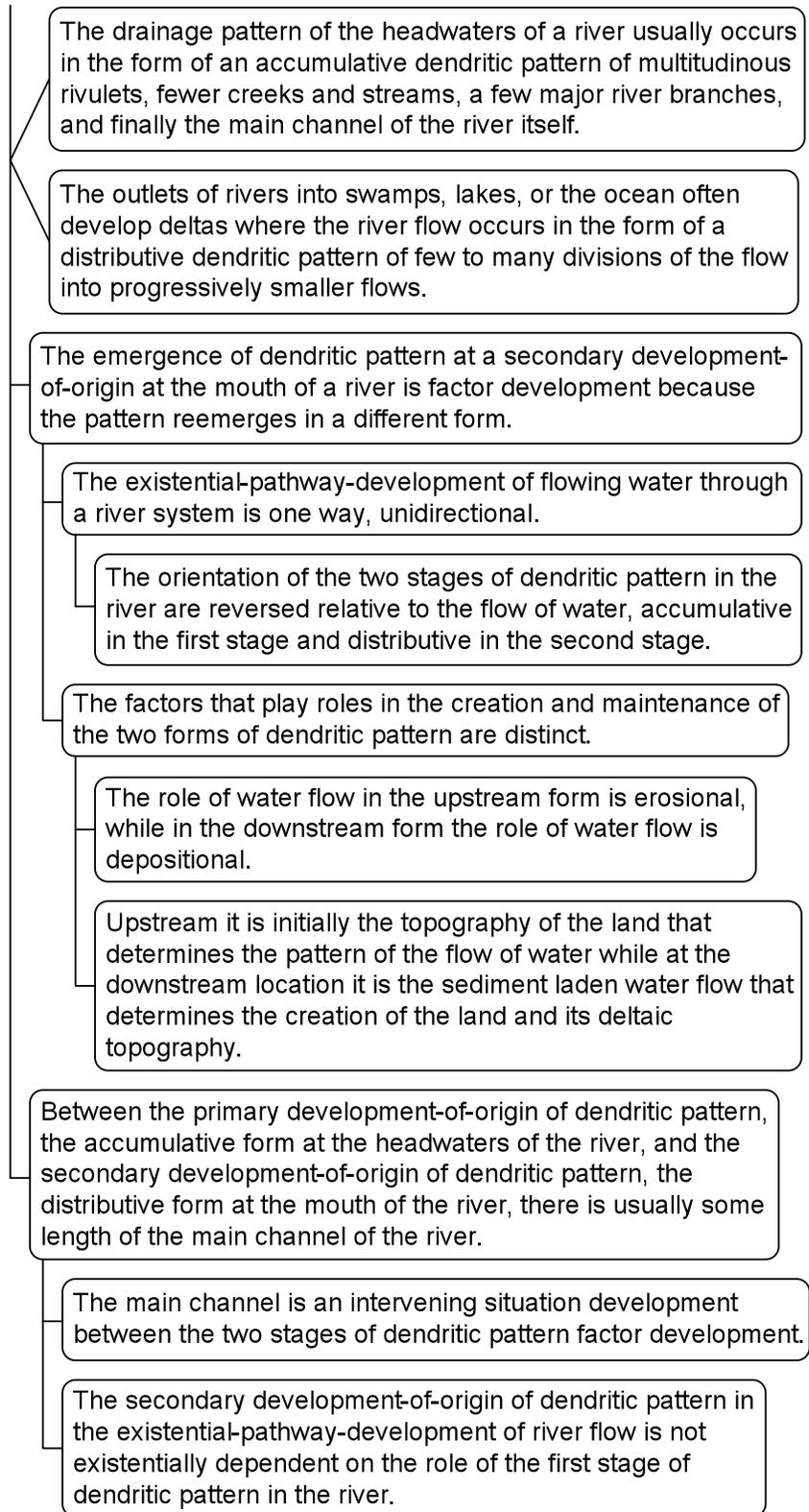


Figure 2. (continued)

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3. Existential-pathway-development from one stage to a secondary development-of-origin of the same stage following an intervening situation development, *is not factor development*.

Examples.

A. Repeated collisions between molecules in a cooling chamber of a gas with intervening stages of motion between the collisions.

The sequence of multiple collisions in the existential-pathway-development of the dissipating energy are much the same, with only minor differences of intensity and angle of strike.

There is no real development of the factor collision.

B. Repeated emergence of the factor contact, after intervening stages of motion.

Each reemergence of contact at the initiation of each new collision is essentially identical to its emergence at the previous collisions.

There is no real development of the factor contact.

C. Repeated existential-pathway-development of tree to seed to tree to seed, and so on.

Both trees and seeds play roles as intervening stages.

In the absence of any significant genetic developments, the trees and seeds that reemerge with the sequence of secondary developments-of-origin are essentially the same, at least in the short run.

The factors, tree and seed, are undergoing situation development rather than factor development.

2. Nonpathway factor development.

In the general development of reality, when general factors occur in simple form in simple situations, and in more complex form in more complex situations, it often happens that the next more complicated form of the factor occurs in a different existential-pathway-development from that of the prior simpler form of the factor.

Nonpathway factor development involves only the increasing complexity of the general factor, wherever in the general development of reality the next stage occurs.

Figure 2. (continued)

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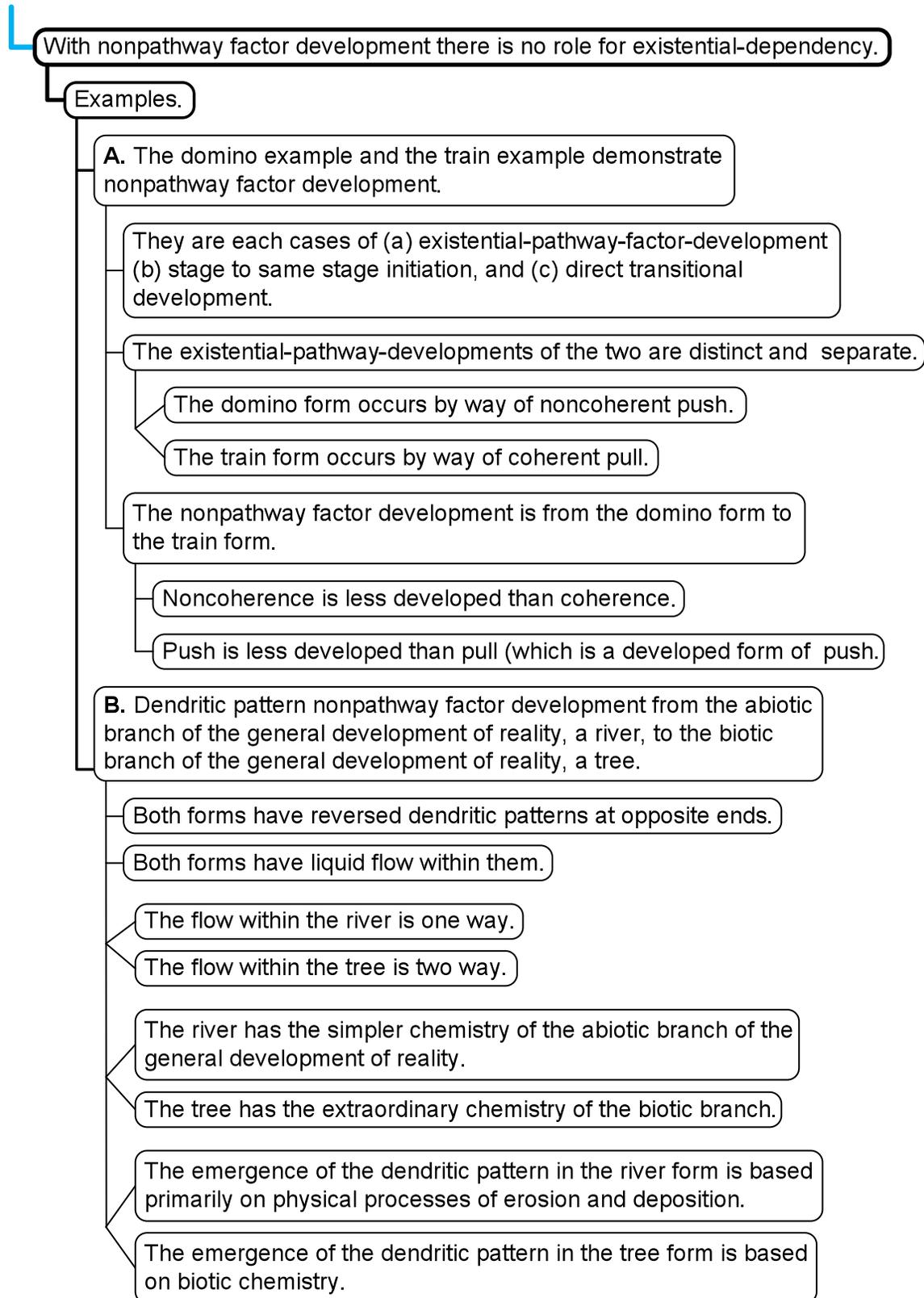


Figure 2. (continued)

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BENEFITS

The modern generalist mode can be used to understand systems in any discipline. It enhances the ability to identify general patterns at various levels and in different disciplines through understanding the deep-structure of such patterns. With factor development, general factors occur in simple form in simple situations, and in more complex forms in more complex situations. No matter how complicated a developed form may be, the pattern of organization of the basic form is still there, giving the developed form its identity as a case of that particular general factor. Thus, understanding the basic pattern enhances recognition of more complex forms at whatever level they may occur or in whatever discipline. Searching out higher level developed forms of simpler general factors instills the habit of mind to see things and relations as patterns of organization. The mind soon begins to notice the patterns of organization of general factors as common features of systems in various disciplines and at multiple levels.

The generalist way of looking at things displays the interconnectedness between and within all the levels through the use of the general factors that play roles of connectivity between and within the subjects studied by the various disciplines. Everything that exists is connected to something else that exists. Through continuing-existence that which has gone before is connected to that which follows. Through emergence higher levels develop from the interrelations of lower levels. Material structure emerges by way of contact and coherence. Process emerges by way of motion and cause. These pathways of connection through space and structure, through time and process, provide pathways of understanding. Understanding these pathways of connection establishes conceptual coherence.

This way of looking at systems makes it possible to understand change within individual systems, and between systems, through the use of the general factors that constitute the basis of all forms of change. Change originates in simple forms such as continuing-existence, motion, emergence, cause, and accumulation. Developmentally prior forms of change, such as continuing-existence, motion, and emergence, play necessary roles in the nature of more developed forms of change, such as cause and accumulation. In general, the simpler forms of change together constitute the deep-structure core of well developed forms of change, such as growth, ontogeny, evolution, ecological succession, and social development. The consequence of this role of the simpler core factors is that in all forms of change the existence and intrinsic nature of what goes before determines the existence and intrinsic nature of what follows. Change general factors, structure general factors, and structural logic together determine the consequences of all forms and cases of change, thus providing the conceptual tools needed to analyze change in various types of systems.

The generalist mode enables critical reasoning at multiple levels through the use of the structural logic inherent in general factors and their interrelations. Structural logic is the manner in which the intrinsic qualities of a general factor determine the kinds of relations that general factor can have with other things that exist. Structural logic, as a conceptual

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tool, is a method of reasoning about the nature of systems that is derived from the intrinsic nature of systems themselves. General factors provide the organization of structure and process of the systems in which they occur. General factors, as conceptual tools, provide a way for the mind to enter into a situation or system and make sense of the particulars and their interrelations. Systems dynamics does this by recognizing archetypes in complex situations. Suddenly something is known about a situation, something about its pattern of organization and how it functions. Thinking in the mode of general factors allows the intrinsic structural logic of general factors to dictate the use of that logic to understand systems at multiple levels.

Using the conceptual tools of a modern generalist enables the integration of multidiscipline knowledge through the use of the general factor development, the universal general factor of connectivity. Everything that exists is developmentally connected by way of structural logic to something else that exists. Development establishes the interrelated order of all other factors. As a conceptual tool, development establishes the interrelated order of all knowledge.

The modern generalist mode enables general holistic understanding through the use of those general factors that provide unity, depth, and breadth of understanding. Unity through developmental factors of connectivity, such as structural logic, emergence, cause, coherence, and process. Depth through general factors of hierarchic organization, factor development, and system deep structure. Breadth through the universality of many general factors. General holistic understanding is achieved by way of general factors that provide understanding of the seamless developmental connectivity of the structural logic of the emergence of one level from another—as in the emergence of the subject areas of the higher disciplines from the subject areas of the lower disciplines.

The generalist way of thinking provides discipline-independent understanding through the use of general factors whose core patterns of organization are independent of level of organization. Well developed stages and higher level forms of a general factor are usually different in various ways from the basic form at its first stage and lowest level. Nonetheless, that basic form of a general factor is still there as the core pattern at developed stages and higher levels. The particulars of the various disciplines are not required to understand the core patterns of organization of general factors. The patterns of organization of general factors can be understood independently of any discipline. Understanding core patterns of general factors, plus factor development, in combination with general holistic understanding results in discipline-independent understanding—the modern generalist mode of understanding.