LOGOS OF THE INFORMATIONAL

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This paper is a preliminary study and presents a possibility how to begin the axiomatizing of the phenomenon that we call the informational and how to deduce still other axioms from the basic axiomatic viewpoint. If we solve the problem of an adequate formalization—introducing a symbolic and symbolically open language—the question of the logical consistency may still remain open. This situation may or may not represent an inadmissible position within different sciences. For after all, sciences have to deal with questions that rise the level of the traditional logical views and scientific disciplinability to a higher position of scientific cognition. Informational logic can offer a new and more critical view as it is customary in sciences rooting in classical logic. The logic of informational sets new standards that consider the active, also creative capabilities of informational entities in question. Decomposition and composition of entities in a parallel, spontaneous, circular, and intentional way can be the path on which parallelism, spontaneity, circularity, and intentionality become constructive capabilities of the informing of entities.

> Das Entwerfen des Verstehens hat die eigene Möglichkeit, sich abzubilden. Die Ausbildung des Verstehens nennen wir *Auslegung*. In ihr eignet sich das Verstehen sein Verstandenes verstehend zu.
>
> —Martin Heidegger [Heidegger 86] 148

1 Introduction

This essay deals with the logic of language concerning a theory of the informational, having its roots in the realm of the extended notion of informing of information [Železnikar 92b, Železnikar 93]. The informational might enter into a logician's language as something that is not consistently structured yet; thus, an additional effort is necessary to construct logical foundations, from which scientifically rigorous informational theories could be deduced. As we shall show indirectly by the presented discussion, the general foundations of a traditional mathematical logic may not suffice such undertaking. Right at the beginning of our discussion, we must reconcile of going our own logical way, which requires informational self–discipline in the realm, where entities inform and are informed in an arising, that is, spontaneous, circular, parallel, and interactive way. The main difference to traditional mathematical theories lies in the phenomena of informational arising, where entities (mathematical objects) perform and are performed in an active, that is, functionally arising way, which, in principle, is non–algorithmic, but only exceptionally algorithmic in a mathematical way.

How to deduce logically (naturally, realistically, linguistically) the concept of an informational entity that develops (emerges, arises, exists) in a spontaneous, cyclic, parallel, and intentional way? This is the question that will be in the focus of this paper[1] among other questions, which all concern a strict deductive (axiomatic) logical

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approach.

Our point of view will be to discuss the informational in terms of interacting (mutually impacting) informational entities (e.g. processes acting informationally upon informational entities), however, not to determine explicitly what by itself the informational might be. We shall axiomatize some basic phenomenal forms of things that we call informational entities. It is to understand that the following discussion is only a beginning on the way to a redefined, rethought, and broadened idea of the informational and its phenomenalism. This broadening view seems righteous if we consider the possibilities of the coming informational technology, for instance: parallel structured, networked and diversely performed processors; multimedia oriented memorizing and displaying devices; enormously information-supported designing and programming tools; and new philosophies of information use and development.

Nothing very new or uncommon will be said about the informational phenomenalism if we distinguish the dualistic character of information in a computer: both the information processing form and the information processed form of data, programs, and systems. Yet, the boundaries between regular data (passive information) and working programs (active information) are clear, strict, and indispensable within the prevailing (ruling) philosophy of sciences. The new informational philosophy grasps these boundaries and already comprehends how they are hindering the shifting into the realm of dynamically performing informational processes—natural and also artificial ones. The formal discussion of informational phenomena in this paper will smartingly reopen this question.

2 The First Informational Axiom

> Alle theoretische Forschung, obschon sie sich keineswegs bloß in ausdrücklichen Akten oder gar in kompleten Aussagen bewegt, terminiert doch zuletzt in Aussagen. Nur in dieser Form wird die Wahrheit und speziell die Theorie zum bleibenden Besitztum der Wissenschaft, sie wird zum urkundlich verzeichneten und allzeit verfügbaren Schatz des Wissens und des weiterstrebenden Forschens.
>
> —Edmund Husserl [Husserl 80] II/1 3

The operand and operator view (concept) is a common approach in formal theories of sciences. This view separates two categories of entities: the passive and the active ones. To apply this view in an informational theory is not so simple since a strict distinction of both categories may be possible only in a time, matter, or phenomenon slice, that is, on an abstract and ideal level of recognition. In the real nature, situation is similar. For instance, actors can be permuted, destroyed, enforced, etc. traversing from active state into a passive position where they can be modified, developed, changed, etc. Similarly, passive items of something can become actors with the force to impact passive and also acting entities. This is the well-known phenomenon in the living world.

As any other culturally based (abstract, idealized) cognition, the following one has its roots in human language. We search for a dynamic language category (e.g., verb, noun) that, on the general level, would be capable to cover a sufficiently broad realm of simultaneously (parallel) active and passive informational possibilities. On the route of our experience with the most sophisticated human tool, e.g., computer, we arrive to the verb *to inform* and to the noun *information*. In this respect, informing and information are candidates that may assure our needs, at least on the linguistic level, where we can say, for instance, information informs (something) [an *active* position], but also information is informed or is being informed (by something) [a *passive* position]. Thus, the active property of an informational entity may be called the *informingness* and the passive one the *informedness*. This view is in accord with even more general one, which is, for instance, any impacting(ness) and impactedness of something.

After this introduction we are ready to set the most basic informational axiom, a sort of *informatio prima* that, from the linguistic point of view, will suffice our further intention of a broadened informational theory development.

Definition 1 [Some Basic Operands and Operators] *We mark informational entities,*

which are operands of an emerging (informational) theory, by small and some distinguished capital Greek letters, that is,

$$\alpha, \beta, \gamma, \cdots, \omega, \Gamma, \cdots, \Omega \quad \textit{(informing entities)}$$

The corresponding informings of these entities we mark by capital calligraphic letters, that is,

$$\mathcal{A}, \mathcal{B}, \mathcal{C}, \cdots, \mathcal{Z}$$

or, explicitly, by

$$\mathcal{I}_\alpha, \mathcal{I}_\beta, \mathcal{I}_\gamma, \cdots, \mathcal{I}_\omega$$

Further, we define the informational operators with the following meaning:

$\models$ *'informs' or 'is informed (by)'*
$\Longrightarrow$ *'implies' or 'is implied (by)'*

We shall define other[2] *informational operands and operators simultaneously.* □

An informational entity α informs in its own way. We can express this property of informing by the most general informational operator of informing, marked by $\models$.

Axiom 1 (Informatio prima) [INFORMATIONAL EXTERNALISM; INFORMINGNESS; INFORMING FOR OTHERS] *An informational entity, marked by operand α, informs (informational operator $\models$); formally, $\alpha \models$. An informational entity α implies (informational operator $\Longrightarrow$) that it informs. Formally,*

$$\alpha \Longrightarrow (\alpha \models)$$

From this axiom other axioms can be deduced informationally by a common logical procedure. □

In the last axiom, we can distinguish three informational formulas: α as a simple operand of formula marker, $\alpha \models$ as the entity α externalism, and $\alpha \Longrightarrow (\alpha \models)$ as the basic implication pertaining to the entity α externalism. Expression $\alpha \models$ is an open informational formula. This formula (as any other informational formula), by itself, is an informational entity (operand). Thus, for instance, formula $(\alpha \models) \models$ is not only regular, but senseful. It says that *entity informs, informs.* The other view of the openness of Axiom 1 is operational (operator-like). On the empty right side of operator $\models$ in formula $\alpha \models$ there could stay another operand, for instance, $\alpha \models \beta$. As we can see, the openness of an informational formula is recursive. Denotation (also marker of something) α is the most primitive formula, that is, a single operand itself. This mean that any formula α can be developed in an informational way as $\alpha \models$ and recursively, beyond this formula.

3 Axioms that Extend Beyond the First Axiom

> Die Auslegung von Etwas als Etwas wird wesenhaft durch Vorhabe, Vorsicht und Vorgriff fundiert. Auslegung ist nie ein voraussetzungsloses Erfassen eines vorgegebenen.
>
> —Martin Heidegger [Heidegger 86] 150

In human language, the statement *something informs* presupposes that *something is being informed.* If the first form is an *active* informing (for the sake of clarity, we introduce the term *informingness*), the second one represents a *passive* informedness. Thus, the informedness of an entity (informational operand) is a consequence of an entity's informingness.

Axiom 2 (Informatio secunda) [INFORMATIONAL INTERNALISM; INFORMEDNESS; INFORMING FOR ITSELF] *An informational entity (operand), α, is informed or is being informed (informational operator $\models$); formally, $\models \alpha$. Informational entity (operand α) implies (informational operator $\Longrightarrow$) that entity is informed (or is being informed). Formally,*

$$\alpha \Longrightarrow (\models \alpha)$$

This axiom is a logical (axiomatic) consequence of the previous one (in the sense that if something informs, something will be informed). □

In fact, informatio secunda is an axiomatic consequence of informatio prima. To be consequent,

[2] Other markers for informational and informing operands can be the small and capital Fraktur letters, respectively, that is, $\mathfrak{a}, \mathfrak{b}, \cdots, \mathfrak{z}$ and $\mathfrak{A}, \mathfrak{B}, \cdots, \mathfrak{Z}$. Such markers are characteristically distinguishable, especially the capital ones.

we can "prove" the last axiom in the following formal way:

$$(\alpha \Longrightarrow (\alpha \models)) \Longrightarrow (\alpha \Longrightarrow (\models \alpha))$$

or, in short, $(\alpha \models) \Longrightarrow (\models \alpha)$. Formula $\models \alpha$ is informationally open in several respects. For instance: formula $(\models \alpha) \models$ says that *entity is being informed, informs*; formula $\models (\models \alpha)$ says that *entity is being informed, is being informed*; and formula $\beta \models \alpha$ says that *entity is being informed by another entity.* We see how the openness of an entity can be closed in different ways and how the results of certain closing remain recursively open for further possibilities of closing.

Both basic axioms generate consequences (lemmas, rules), which can still be comprehended as axiomatic since an ad hoc terminology concerning them is being introduced.

In fact, Axiom 1 hides another axiom, which concerns a basic consequence, that is, a rule of deduction. Informing of something has its sense only in case if something is being informed through informing of something.

Rule 1 (A consequence of informingness) [A BASIC DEDUCTION CONCERNING INFORMING] *If entities inform then there exist entities, which are informed. In general, the following implication holds:*

$$(\alpha \models) \Longrightarrow (\models \alpha)$$

This is an axiomatic consequence of informingness, which is logically evident in an informational way. □

Rule 2 (A consequence of informedness) [A BASIC DEDUCTION CONCERNING INFORMEDNESS] *If entities are informed then there exist entities, which inform. Generally,*

$$(\models \alpha) \Longrightarrow (\alpha \models)$$

This is an axiomatic consequence of informedness, which is logically evident in an informational way. □

The last two rules are basic deduction rules for formulas development. They are essential development procedures in formulas decomposition and composition approaches, treated later on in this paper. Many other rules follow from axioms, consequences, and theorems and can be applied in cases of formula development.

Axiom 3 (Informatio tertia) [INFORMATIONAL METAPHYSICALISM; INTERIOR CYCLICITY; INFORMING IN ITSELF] *An informational entity (operand), α, informs and is being informed simultaneously (in parallel) in itself and by itself; formally, $\alpha \models \alpha$. Informational entity (operand α) implies that entity informs and is informed (being informed) in itself. Formally,*

$$\alpha \Longrightarrow (\alpha \models \alpha)$$

This axiom logically follows from the previous ones. □

The last axiom follows from the previous ones. In its open informingness $(\alpha \models)$ and open informedness $(\models \alpha)$, entity α is a particular system per se, that is,

$$(\alpha \models; \models \alpha) \Longrightarrow (\alpha \models \alpha)$$

being informationally closed into itself (e.g., into its own existing, changing, emerging, vanishing). Thus, an informing entity implies its metaphysicalism where it informs itself and is being informed by itself (that is, exists, changes, emerges, vanishes in itself). In a particular way, concerning the entity, the described metaphysical situation seems normal (physical, philosophically acceptable).

An entity's internalism and metaphysicalism constitute together the attitude of the entity as observer. Internalism $\models \alpha$ is also an observing position of entity α. Internalism means that α might be capable of observing it concerning exterior and interior world, not only through $\models \alpha$, but $\models (\alpha \models \alpha)$, which considers α's metaphysicalism $\alpha \models \alpha$. Thus, internalism, $\models \alpha$, is a kind of α's observing metaphysicalism $\models (\alpha \models \alpha)$.

How objectively does α observe its exterior and interior world depends solely on the instantaneous state of α's metaphysical perception, that is on $(\models (\alpha \models \alpha))$'s structure and organization. The recognition of α's true world remains in the framework of $(\models (\alpha \models \alpha))$'s capabilities, which consider the intricate internalism $\models \alpha$ as well as the intricate metaphysicalism $\alpha \models \alpha$. For example, irrespective of the superb theories (gravitation, electromagnetism, relativity, quantum theory), contradictions in the form of incompleteness, insufficiency, paradoxicalness, etc. arise and show how the inner models and simulations fail to cover the outer world in its entirety.

Phenomena of informingness and informedness constitute the so-called phenomenalism of an informational entity.

Axiom 4 (Informatio quarta) [INFORMATIONAL PHENOMENALISM; INFORMATIONAL OPENNESS; INFORMING AS SUCH] *An informational entity (operand), α, informs and is being informed openly (in parallel) in respect to itself and to its environment; formally, $\alpha \models; \models \alpha$ is a formula system describing the phenomenalism of entity α. Informational entity (operand α) implies that entity informs and is informed (being informed) openly in any respect. Formally,*

$$\alpha \Longrightarrow (\alpha \models; \models \alpha)$$

This is a system axiom that follows from the previous axioms. □

Phenomenalism is the most general property of informing of an entity. It includes (informational operator $\subset$) the phenomena of externalism, internalism, and metaphysicalism. Thus,

$$\alpha \models, \models \alpha, \alpha \models \alpha \subset (\alpha \models; \models \alpha)$$

Informational entity behaves phenomenally, however, its phenomenalism is a particular form of informing characterizing the informational nature (Being, essence) of the entity in question. *Informatio quarta* unites all possible cases (externalism, internalism, metaphysicalism, and phenomenalism) of an entity appearance, occurrence, arising, coming into existence, etc. Thus, an adequate definition of entity α can be expressed considering the previous axiomatic origins.

Definition 2 (Informational entity) [PHENOMENAL DETERMINATION OF INFORMATIONAL ENTITY] *An informational entity, marked by α, is informationally determined by formulas of its externalism, internalism, metaphysicalism, and phenomenalism. There is,*

$$\alpha \rightleftharpoons_{\mathrm{Def}} \begin{cases} \alpha \models; & \text{externalism} \\ \models \alpha; & \text{internalism} \\ \alpha \models \alpha; & \text{metaphysicalism} \\ (\alpha \models; \models \alpha) & \text{phenomenalism} \end{cases}$$

where informational operator $\rightleftharpoons_{\mathrm{Def}}$ has the meaning "informs (means) in the sense of a definition" or, simply, "means by definition". □

Several facts have to be mentioned concerning the last definition. Firstly, the definition is a consequence (theorem) of four axioms. It would be necessary to prove that the definition pertaining to informational entity satisfies the concept of all entity-concerning informational phenomena. This seems to be true at least intuitively, that is, hypothetically. Secondly, the preceding definition is implicit in respect to α. The so-called definiendum (the defined–left side) means (informational operator $\rightleftharpoons_{\mathrm{Def}}$) definiens (the defining–right side), in which genus proximum is informational operand α and differentia specifica is informational operator $\models$ at the right and at the left position to operand α. The right side (definiens) is completely axiomatically determined. Operator $\rightleftharpoons_{\mathrm{Def}}$ may be understood as a particularization of the general informational operator $\models$, for instance, $\models_{\mathrm{definitional}}$, with the meaning *informs in a definitional way.* As we see, informational definitions will always inform implicitly, that is, in an informationally closed way within the realm of informational phenomenalism. Thirdly, the last definition possesses a parallel and an embedded parallel structure in the definiens part. Thus, we have to define the permissive parallel notations of informational formulas.

Definition 3 (Parallel notations) *Parallel informational entities (operands, formulas, and formula systems) can be formally expressed in different ways. The horizontal notation of parallel performing entities $\alpha, \beta, \cdots, \omega$ is*

$$(\alpha; \beta; \cdots; \omega) \quad \textit{or, simply,} \quad \alpha; \beta; \cdots; \omega$$

Vertical notations of parallelism explicate the parallel informing of entities in an formally evident manner. The following vertical parallel informational expressions are permissible:

$$\left\{ \begin{matrix} \alpha; \\ \beta; \\ \vdots \\ \omega \end{matrix} \quad \textit{or} \quad \begin{matrix} \alpha; \\ \beta; \\ \vdots \\ \omega \end{matrix} \right\} \textit{ or } \begin{pmatrix} \alpha; \\ \beta; \\ \vdots \\ \omega \end{pmatrix}$$

The semicolon simultaneously denotes the parallelism and the end of a particular entity in a parallel array. It is necessary when entities are presented by formulas, which exceed a single line. □

Definition 4 (Informational sets) *Informational sets are collections of entities (operands,*

formulas, and formula systems), which may be comprehended as informationally isolated items, where the question of their mutual informational interaction is not relevant. An informational set of elements $\alpha, \beta, \cdots, \omega$ is denoted by

$$\alpha, \beta, \cdots, \omega \quad or \quad \{\alpha, \beta, \cdots, \omega\}$$

A comma is the separator between isolated elements. Parallel notations of informational sets are permissible, that is,

$$\left\{\begin{matrix}\alpha, \\ \beta, \\ \vdots \\ \omega\end{matrix}\right\} \quad or \quad \left\{\begin{matrix}\alpha, \\ \beta, \\ \vdots \\ \omega\end{matrix}\right\} \quad or \quad \left\{\begin{matrix}\alpha, \\ \beta, \\ \vdots \\ \omega\end{matrix}\right\}$$

The comma has a similar function as the semicolon in the previous definition. □

4 Axioms of Informing

In this section we have to bring the duality of the presence (existing, arising) of an informational entity to the axiomatic surface. As a whole, in its entirety, or as an informational unit, informational entity α includes its own component of informing, marked by $\mathcal{I}_\alpha$ or, in the functional (predicative) notation, by $\mathcal{I}(\alpha)$. The informational duality of α lies in its nature to be a form and process simultaneously, that is in the parallel nature of its operational activism and passivism within the same unity, on one side (expressions $\alpha \models$ and $\models \alpha$), and the explicit expression of entity informing $\mathcal{I}_\alpha$, on the other side. That what we have to bring face to face are verbal phrases *to inform* and *to be informed*, on one side, and the integral property of *informing* of entity, on the other side. In fact, we have to decide between different kinds of expression of the phenomenon of informing.

If $\alpha \models$ and $\models \alpha$ say that α *informs* and that α *is being informed*, respectively, than $\mathcal{I}_\alpha$ represents the possibility of informing of α in α's entirety. In this respect, informing $\mathcal{I}_\alpha$ includes the expressive power of both $\alpha \models$ and $\models \alpha$ and introduces the informing of α as a distinguished operand within α, that is, informational entity.

Axiom 5 (Informing of an entity) [Existentialism of Informing] *We have the following senseful axiomatic implicational consequence:*

$$(\alpha \Longrightarrow (\alpha \models; \models \alpha)) \Longrightarrow \mathcal{I}_\alpha$$

Entity α implies that it informs and that it is informed (informational phenomenalism); informingness and informedness imply that entity has the entity, called informing $\mathcal{I}_\alpha$ as an informationally active part of the entity. □

In mathematical terms, $\mathcal{I}_\alpha$ seems legal as a predicative function of α, that is, $\mathcal{I}(\alpha)$. It represents the systemic (phenomenal) informing of α, expressed implicitly as $(\alpha \models; \models \alpha)$. On the other hand, operand-operator expressions $\alpha \models$ and $\models \alpha$ as operator open entities may not fit the traditional mathematical agreement and function (mean) as a non-consistent novum. This situation becomes even more inconvenient in case of expressions of the form

$$(\cdots((\alpha \models) \models) \cdots \models) \models$$

Imagine, for instance, the following: both $+a$ and $a+$ may still represent a reasonable expression of a's additivity. But, what could be said in cases of $+(+a)$, $(a+)+$, $+(a+)$, etc. New terminology (meaning) of such algebraic open cases has to be introduced. Operator $+$ always characterizes the operand, to which it belongs. Thus, in formula $+(+a)$, operator $+$ characterizes the operand $+a$.

Axiom 6 (Partitionism of informing) [Inclusiveness of an Entity Informing] *Axiom*

$$\mathcal{I}_\alpha \Longrightarrow (\mathcal{I}_\alpha \subset \alpha)$$

says that informing of an entity implies that the informing is a part (i.e., an active part) of the entity. □

The last axiom sounds natural, so, no further discussion is necessary.

Axiom 7 (Externalism of informing) [Entity Bounded Externalism of Informing] *Externalism of an entity informing (informing's informingness) is closed to the entity. That is,*

$$\mathcal{I}_\alpha \Longrightarrow (\mathcal{I}_\alpha \models \alpha)$$

says that informing $\mathcal{I}_\alpha$ informs its entity α in a closed way. □

Informing $\mathcal{I}_\alpha$ informs entity α.

Axiom 8 (Internalism of informing) [ENTITY BOUNDED INTERNALISM OF INFORMING] *Internalism of an entity informing (informing's informedness) is closed to the entity. That is,*

$$\mathcal{I}_\alpha \Longrightarrow (\alpha \models \mathcal{I}_\alpha)$$

says that the informedness of an entity informing is caused in an entity-closed way. □

Informing $\mathcal{I}_\alpha$ is informed by entity α.

Axiom 9 (Metaphysicalism of informing) [INFORMATIONAL REGULARITY OF METAPHYSICALISM OF INFORMING] *As usually,*

$$\mathcal{I}_\alpha \Longrightarrow (\mathcal{I}_\alpha \models \mathcal{I}_\alpha)$$

Informing of an entity informs metaphysically (basic-cyclically) as any other informational entity. □

The last axiom assures that informing $\mathcal{I}_\alpha$ can be metaphysically decomposed as a regular informational entity.

Axiom 10 (Phenomenalism of informing) [CIRCULAR BOUNDING OF INFORMING] *Let us introduce four implications for the specific phenomenalism of an entity informing:*

Informing's first mode of phenomenal circularity:

$$\mathcal{I}_\alpha \Longrightarrow ((\alpha \models \mathcal{I}_\alpha) \models \alpha)$$

Informing's second mode of phenomenal circularity:

$$\mathcal{I}_\alpha \Longrightarrow (\alpha \models (\mathcal{I}_\alpha \models \alpha))$$

Informing's third mode of phenomenal circularity:

$$\mathcal{I}_\alpha \Longrightarrow ((\mathcal{I}_\alpha \models \alpha) \models \mathcal{I}_\alpha)$$

Informing's fourth mode of phenomenal circularity:

$$\mathcal{I}_\alpha \Longrightarrow (\mathcal{I}_\alpha \models (\alpha \models \mathcal{I}_\alpha))$$

The phenomenalism of an entity informing is closed to the entity itself. □

Let us interpret the last four modes of informing of an entity, which are characterized by specific cyclical ways. In the first mode, α informs $\mathcal{I}_\alpha$ and, then, this process (subformula) as an entity informs α. While informing $\mathcal{I}_\alpha$ is directly informed by α (subformula $\alpha \models \mathcal{I}_\alpha$), it informs α indirectly through the entity $\alpha \models \mathcal{I}_\alpha$ [formula $(\alpha \models \mathcal{I}_\alpha) \models \alpha$]. In this mode, the α-cycle is evident.

In the second mode, α informs the process $\mathcal{I}_\alpha \models \alpha$, in which informing $\mathcal{I}_\alpha$ directly informs entity α. On the other hand, informing $\mathcal{I}_\alpha$ is informed indirectly by α through the entity $\mathcal{I}_\alpha \models \alpha$ [formula $(\alpha \models (\mathcal{I}_\alpha \models \alpha)$]. In this mode, the α-cycle is evident too.

In the third mode, entity $\mathcal{I}_\alpha \models \alpha$ informs $\mathcal{I}_\alpha$. In this mode, the metaphysical cycle of the form $\mathcal{I}_\alpha \models \mathcal{I}_\alpha$ is coming to the surface. In this cycle, $\mathcal{I}_\alpha$ directly informs α, but entity α informs entity $\mathcal{I}_\alpha$ indirectly, through the composed entity $\mathcal{I}_\alpha \models \alpha$. In this mode, the so-called $\mathcal{I}_\alpha$-cycle is evident.

In the fourth mode, entity $\mathcal{I}_\alpha$ informs the composed entity $\alpha \models \mathcal{I}_\alpha$. In this mode, informing $\mathcal{I}_\alpha$ informs entity α indirectly, but entity α directly informs its informing $\mathcal{I}_\alpha$. In this mode, the $\mathcal{I}_\alpha$-cycle is evident too.

Definition 5 (Informing of an entity) [PHENOMENAL INFORMING OF AN ENTITY] *Informing $\mathcal{I}_\alpha$ of an entity α is an α's phenomenalism, that is, an interweavement of different informational phenomena determined in the previous axioms. Formally,*

$$\mathcal{I}_\alpha \rightleftharpoons_{Def} \begin{cases} \mathcal{I}_\alpha \subset \alpha; & \textit{partitionism} \\ \mathcal{I}_\alpha \models \alpha; & \textit{externalism} \\ \alpha \models \mathcal{I}_\alpha; & \textit{internalism} \\ \mathcal{I}_\alpha \models \mathcal{I}_\alpha; & \textit{metaphysicalism} \\ (\alpha \models \mathcal{I}_\alpha) \models \alpha; & \textit{phenomenalism 1} \\ \alpha \models (\mathcal{I}_\alpha \models \alpha); & \textit{phenomenalism 2} \\ (\mathcal{I}_\alpha \models \alpha) \models \mathcal{I}_\alpha; & \textit{phenomenalism 3} \\ \mathcal{I}_\alpha \models (\alpha \models \mathcal{I}_\alpha) & \textit{phenomenalism 4} \end{cases}$$

This system of informing-$(\mathcal{I}_\alpha)$-definitional formulas can be understood to be a set of independent single formulas or a system of arbitrarily informationally connected formulas. □

5 Implicational Nature of Axioms

Implication belongs to the informationally most common forms of expression. Implication means nothing else than a logical connection of informational entities, their implicitness in an informational context that always exists and informs

in a spontaneously (intentionally, orientationally, worldly) interconnecting, interwoven, and cyclic way. Implication in informational axioms points to an artificial origin, which has its roots anywhere in the existing informational context and is posed by the observer or observer's intention, aim, truth, or belief. That is nothing else than a phenomenological reasoning or attitude, which pervades the today logic, sciences, and technological undertakings.

By logical convention, informational implication $\alpha \Longrightarrow \beta$ is read in the following sense: α as an informational operand (entity, formula) *implies* β as an informational operand (entity, formula). In this context, "α as an informational operand" has the meaning of the statement "it is true that α is an informational operand", which is in accordance with the implicational convention in ordinary (mathematical) logic.

6 How to Deduce Informational Consequences

The informational is the most general term, which is not informationally particularized yet. The question is how to deduce the general and how the particular consequences (theorems) in the framework of a general and a particular informational theory. Some decomposition and composition philosophy, which concerns informational deduction, will be found in section 7.

After that we have axiomatized and defined, the deduction of a general informational theory is a pure syntactic procedure, which never ends. There are infinitely many general informational consequences, which can be deduced by pure syntactic means from the previous axioms and definitions. But, that does not hold for particular informational theories, which are axiomatically bounded and correspond (model) particular informational cases. Thus, for instance, informational theories of discourse, time, understanding, a certain intelligence, etc. become senseful in an informational manner. Such particularized and complex informational entities are described by some initial informational formula systems, which develop and behave informationally.

Consequence 1 (Informational Syntax) *A general syntax of informational formulas follows from the previous axioms and definitions and is the following:*

φ	informational entity: *operand, formula, or formula system;* any operand symbol: $\alpha, \beta, \cdots, \omega$ *or* $\mathcal{A}, \mathcal{B}, \cdots, \mathcal{Z}$*;*
(φ)	*parenthesized entity;*
$\varphi \models$	*entity externalism;*
$\models \varphi$	*entity internalism;*
$\varphi \models \varphi$	entity metaphysicalism: *informational serialism,* informing among different entities: *for instance,* $\varphi \models \psi$;
$\varphi \models; \models \varphi$	*entity phenomenalism: entity system informing;*
$\mathcal{I}_\varphi$, $\mathcal{I}(\varphi)$	*informing of entity* φ;
$\varphi, \varphi, \cdots, \varphi$	*informational set;*
$\varphi; \varphi; \cdots; \varphi$	*informational parallelism*

The general syntax of informational formulas is recursive. □

The consequence of informational syntax assures that by decomposition and composition of entities any possible formula or formula system can arise, irrespective of the nature of particular decomposition and composition rules (that is, formula constructing impulses, situations, attitudes, etc.). Within processes of decomposition and composition of informational formulas, operands and operators are particularized and universalized according to given situations, following the principles, by which various forms of informational semantics and pragmatics arise. Thus, the following consequence becomes senseful.

Consequence 2 (Informational Semantics and Pragmatics) *The arising and constitution of general semantics and pragmatics concerning syntactically structured informational formulas are a consequence of various semantic and pragmatic, spontaneous and circular, serial and parallel informational decomposition, composition, particularization, and universalization processes, which arise during intentional, interpretational, conscious, and other processes of formula systems development.* □

Consequence 1 and Consequence 2 are general informational paragons of any informational theory

development. We shall treat the most relevant decomposition and composition approaches in the next section.

Consequence 1 and Consequence 2 are general informational paragons of an informational theory development. Concrete theories are always concretely particularized and universalized in respect to the occurring informational operands and operators. These consequences are general schemes for the arising (deduction, induction, appearance, occurrence) of particular theorems. Proofs of such theorems are always in accordance with the previous two consequences.

7 Informational Decomposition and Composition

Informational consequences can be deduced and induced by various rules for decomposition and composition of formulas. The nature of decomposition and composition is parallel, serial, and circular. According to the discussed axioms, these rules can be very pragmatic following only the formula syntax convention and the characteristics (meaning, semantics) of particular or universal cases.

7.1 Some Basic Parallel Decomposition Principles, Rules, and Notations

Parallelism of informational phenomena belongs to the cognitively and technologically most obvious cases of informing of informational entities. For instance, one and the same phenomenon can be understood (interpreted) in different, that is, parallel ways at different (parallel) situations and attitudes of observation. Parallel decomposition means a splitting of entities (operands, formulas, formula systems) into greater interpretational details. Processes of parallel decomposition are both deductive (a theory-intentional) as well as inductive (spontaneous within theoretical boundaries).

Rule 3 (Informational Parallelism) *Informational entities inform in different, that is,* parallel *ways. Thus, by definition,* $\alpha \models$ *means different parallel occurrences of the form* $\alpha \models$. *There is, formally,*

$$(\alpha \models) \rightleftharpoons_{\text{mean}} \begin{cases} \alpha \models; & \textit{Parallel Externalism} \\ \alpha \models; & \\ \vdots & \\ \alpha \models & \end{cases}$$

Informational entities are informed in different, that is, parallel *ways. Thus, by definition,* $\models \alpha$ *means different parallel occurrences of the form* $\models \alpha$. *There is, formally,*

$$(\models \alpha) \rightleftharpoons_{\text{mean}} \begin{cases} \models \alpha; & \textit{Parallel Internalism} \\ \models \alpha; & \\ \vdots & \\ \models \alpha & \end{cases}$$

Informational entities inform metaphysically in different, that is, parallel *ways. Thus, by definition,* $\alpha \models \alpha$ *means different parallel occurrences of the form* $\alpha \models \alpha$. *There is, formally,*

$$(\alpha \models \alpha) \rightleftharpoons_{\text{mean}} \begin{cases} \alpha \models \alpha; & \textit{Parallel} \\ \alpha \models \alpha; & \textit{Metaphysicalism} \\ \vdots & \\ \alpha \models \alpha & \end{cases}$$

Informational entities inform phenomenally in different, that is, parallel *ways. Thus, by definition, system* $\alpha \models; \models \alpha$ *means different parallel occurrences of the system form* $\alpha \models; \models \alpha$. *There is, formally,*

$$(\alpha \models; \models \alpha) \rightleftharpoons_{\text{mean}} \begin{cases} (\alpha \models; \models \alpha); & \textit{Parallel} \\ (\alpha \models; \models \alpha); & \textit{Phenome-} \\ \vdots & \textit{nalism} \\ (\alpha \models; \models \alpha) & \end{cases}$$

To explicate the parallel informing of entity α *in the previous four cases, one can introduce notations* $\alpha \Vdash$, $\Vdash \alpha$, $\alpha \Vdash \alpha$, *and* $\alpha \Vdash; \Vdash \alpha$ *for parallel externalism, internalism, metaphysicalism, and phenomenalism, respectively. This completes the basic rules of parallel decomposition concerning informing of an informational entity* α. □

Decomposition rules concerning parallel externalism, internalism, metaphysicalism, and phenomenalism are not understood to be tautological or simply identical cases. Each occurrence of a parallel component, for example within $\alpha \models; \alpha \models; \cdots$,

represents a split case of $\alpha \models$ and it is to understand that at an end of decomposition the initial 'simple' meaning of $\alpha \models$ is in a way integrated meaning of parallel components $\alpha \models$. That means that after a parallel decomposition of an entity's externalism $\alpha \models$ an integrative (composed) meaning arises, described by a kind of the reverse formula, that is,

$$\left.\begin{array}{l}\alpha \models; \\ \alpha \models; \\ \vdots \\ \alpha \models\end{array}\right\} \rightleftharpoons_{\text{mean}} (\alpha \models)$$

The listed example is in no way a non-scientific case. For instance, in quantum theory, parallel occurrences of one and the same particle (photon) can appear in different places (two places at once), traveling different routes and being detected when they interfere with one another (Quantum Magic and Quantum Mystery in [Penrose 90]). On the other hand, arising of information in mind as described by parallel-decomposing processes lies outside of the conventional doubt and is consciously evident.

Similar explanation schemes can hold for the remaining cases of Rule 3 (internalism, metaphysicalism, and phenomenalism).

Consequence 3 (Parallelism of Informing) *A consequence of Axiom 10 and Rule 3 is the parallelism of informing $\mathcal{I}_\alpha$. Thus,*

$$(\alpha \models; \models \alpha) \rightleftharpoons_{\text{Def}} \begin{cases} (\alpha \models; \models \alpha) \Longrightarrow \mathcal{I}_\alpha; \\ (\alpha \models; \models \alpha) \Longrightarrow \mathcal{I}_\alpha; \\ \vdots \\ (\alpha \models; \models \alpha) \Longrightarrow \mathcal{I}_\alpha \end{cases}$$

By this consequence, parallel (different, alternative) entities of informing, that is, $\mathcal{I}_\alpha; \mathcal{I}_\alpha; \cdots; \mathcal{I}_\alpha$, are introduced. □

The last consequence, introducing parallel occurrences of informing, which can be marked as $\mathcal{I}^1_\alpha, \mathcal{I}^2_\alpha, \cdots, \mathcal{I}^n_\alpha$, has to be understood as a particular (particularized) parallel phenomenalism of the form

$$(\alpha \models; \models \alpha) \rightleftharpoons_{\text{Def}}$$

$$\begin{pmatrix} (\alpha \models^1_{\text{particularly}}; \models^1_{\text{particularly}} \alpha) \Longrightarrow \mathcal{I}^1_\alpha; \\ (\alpha \models^2_{\text{particularly}}; \models^2_{\text{particularly}} \alpha) \Longrightarrow \mathcal{I}^2_\alpha; \\ \vdots \\ (\alpha \models^n_{\text{particularly}}; \models^n_{\text{particularly}} \alpha) \Longrightarrow \mathcal{I}^n_\alpha \end{pmatrix}$$

where α maintains its identity, but can inform in different (parallel) ways. Informational operators $\models^1_{\text{particularly}}, \models^2_{\text{particularly}}, \cdots, \models^n_{\text{particularly}}$ are differently particularized forms of the general operator $\models$ and read as 'inform(s) particularly'. This case is nothing other than an example of parallel decomposition of α's informing.

Definition 6 (A list of operands) *Instead of a sequence of parallel formulas of the form*

$$\alpha_1 \models \beta; \alpha_2 \models \beta; \cdots; \alpha_n \models \beta$$

the shortcut form

$$\alpha_1, \alpha_2, \cdots, \alpha_n \models \beta$$

can be used, where $\alpha_1, \alpha_2, \cdots, \alpha_n$ is a list of operands separated by commas. □

Definition 7 (A list of parallel formulas) *A formula system*

$$\alpha_1 \models \beta_1; \alpha_2 \models \beta_2; \cdots; \alpha_n \models \beta_n$$

means that formulas of the system, separated by semicolons, inform in parallel. This system of formulas can be marked, for instance, by φ and written as

$$\varphi \models_{\text{mark}} (\alpha_1 \models \beta_1; \alpha_2 \models \beta_2; \cdots; \alpha_n \models \beta_n)$$

or also, in a parallel clear form, as

$$\varphi \models_{\text{mark}} \begin{cases} \alpha_1 \models \beta_1; \\ \alpha_2 \models \beta_2; \\ \vdots \\ \alpha_n \models \beta_n \end{cases}$$

The last form was already used in some previous cases. Certainly, operator $\models_{\text{mark}}$ can be replaced (particularized) by (in) any meaningly adequate form. □

7.2 Spontaneity, Circularity, Intentionality, and Alternativity as Entity-parallel and Entity-circular Phenomenalism

The title of this subsection stresses that spontaneity, circularity, alternativity, and intentionality as informational phenomena is an entity-parallel and entity-circular phenomenalism. It means that these entities are interconnected, interdependent, and mutually supported in an informational (physical, biological, social, etc.) way. As observers of informational entities, we obviously consciously perceive this kind of interrelatedness. On the other side, spontaneity, circularity, alternativity, and intentionality seems to cover the most important aspects of human experience in philosophy, technology, and everyday life. Further, the four distinguished entities can spontaneously, circularly, alternatively, and intentionally resemble other significant informational entities which may appear in an intricate way.

One of the basic axioms concerning informational entity says that an informational entity informs in a spontaneous–circular or circular–spontaneous way. A special operator for this faculty of an informing entity can be introduced.

Definition 8 (Operator of a circular–spontaneous informing) *Let us introduce the following basic informational operator:*

$\alpha \looparrowright$ means α *informs circularly and spontaneously*

The particularized general operator would look cumbersome,

$$\alpha \models_{\text{circular–spontaneously}}$$

for example. □

The four special operators are as follows by the next definition.

Definition 9 (Operators of spontaneity, circularity, intentionality, and alternativity) *We introduce the following four basic informational operators:*

$\alpha \rightsquigarrow$	means	α *informs spontaneously*
$\alpha \circlearrowright$	means	α *informs circularly*
$\alpha \rightarrowtail$	means	α *informs intentionally*
$\alpha \rightrightarrows$	means	α *informs alternatively*

We can use also particularized general operators of informing, that is,

$$\alpha \models_{\text{spontaneously}}, \alpha \models_{\text{circularly}},$$
$$\alpha \models_{\text{intentionally}}, \alpha \models_{\text{alternatively}}$$

respectively. □

Although in the previous two definitions, the informational externalism of entity α is shown, the reader can easily complete the cases of internalism, metaphysicalism, and phenomenalism by himself/herself.

Consequence 4 (An implication concerning the spontaneous–circular informing) *A consequence of definitions 8 and 9 concerning the spontaneous–circular informing of an entity in general and its intricate particular informings of spontaneity, circularity, intentionality, and alternativity is the following:*

$$(\alpha \looparrowright) \Longrightarrow$$

$$\left(\begin{pmatrix} \alpha \rightsquigarrow; \\ \alpha \circlearrowright; \\ \alpha \rightarrowtail; \\ \alpha \rightrightarrows \end{pmatrix} \Longrightarrow (\alpha \rightsquigarrow \circ(\circlearrowright \circ (\rightarrowtail \circ \rightrightarrows)))\right)$$

where $\rightsquigarrow\circ(\circlearrowright\circ(\rightarrowtail\circ\rightrightarrows))$ *is a notation of the so-called informational composition (operational unity or perplexity) of informational operators* $\rightsquigarrow, \circlearrowright, \rightarrowtail,$ *and* $\rightrightarrows$. *Token '*$\circ$*' marks the operator of operator composition.* □

7.2.1 A Structure of Spontaneity

Spontaneity as an informational entity is in no way a purely chaotic phenomenon without boundaries in the spontaneity itself. Spontaneity does not mean a chaotic informational arising, but physical, biologic, discursive, social, etc. persevering, directionality, or intentionality. Simultaneously (in parallel), spontaneity as an informational entity is cyclically and alternatively structured, where alternativity can be understood as a specific form of spontaneity.

Our task is to capture spontaneity of informational entities as a regular informational faculty, to give the phenomenon an explicit formal character. For this purpose, a special informational operator ($\rightsquigarrow$) was introduced.

Consequence 5 (An implication of spontaneity) *Informational spontaneity means a certain circularity, intentionality, and alternativity of an informational entity. Thus,*

$$(\alpha \rightsquigarrow) \Longrightarrow \left(\begin{pmatrix} \alpha \circlearrowleft; \\ \alpha \mapsto; \\ \alpha \rightrightarrows \end{pmatrix} \Longrightarrow (\alpha \circlearrowleft \circ(\mapsto \circ \rightrightarrows))\right)$$

or also,

$$\left((\alpha \rightsquigarrow) \Longrightarrow \begin{pmatrix} \alpha \circlearrowleft; \\ \alpha \mapsto; \\ \alpha \rightrightarrows \end{pmatrix}\right) \Longrightarrow (\alpha \circlearrowleft \circ(\mapsto \circ \rightrightarrows))$$

where $\circlearrowleft \circ (\mapsto \circ \rightrightarrows)$ *is a notation of informational composition of informational operators* $\circlearrowleft, \mapsto$, *and* $\rightrightarrows$. *The duality of the first and the second expression is characteristic and can be observed elsewhere in the realm of the informational.* □

Alternativity may be recognized as an explicit spontaneous faculty of choice among different possibilities of informing. However, circularity and intentionality may have their own characters of spontaneity in their circular and intentional possibilities. Thus, spontaneity stays in the background of any informational activity.

7.2.2 A Structure of Circularity

Circularity (cyclicity) is one of the basic faculties of an informing entity. Circularity means recursiveness, metaphysical and other kinds of cycling, memorizing, maintaining of informational components, informational persevering which keeps a course of spontaneity, intentionality, alternativity, etc. Metaphysicalism is a basic interior mechanism of circularity. Cyclic processes can include parallel structures, representing circular–parallel forms of informing.

Consequence 6 (Implications and a meaning concerning metaphysical circularity) *Pertaining to metaphysicalism* $\alpha \models \alpha$, *there is,*

$$(\alpha \circlearrowleft) \Longrightarrow (\alpha \models \alpha);$$
$$(\circlearrowleft \alpha) \Longrightarrow (\alpha \models \alpha);$$
$$(\alpha \models \alpha) \rightleftharpoons (\alpha \circlearrowleft; \circlearrowleft \alpha)$$

where informational operator $\rightleftharpoons$ *means 'means'. Obviously,*

$$(\alpha \circlearrowleft) \Longrightarrow (\circlearrowleft \alpha);\ (\circlearrowleft \alpha) \Longrightarrow (\alpha \circlearrowleft)$$

Metaphysicalism is a specific circular form of informing. □

Consequence 7 (An implication concerning general circularity) *Informational circularity means a certain spontaneity, intentionality, alternativity, metaphysicalism, cyclic parallelism of an informational entity. This property of informational circularity means*

$$(\alpha \circlearrowleft, \circlearrowleft \alpha) \Longrightarrow$$

$$\left(\begin{pmatrix} \alpha \rightsquigarrow \alpha; \\ \alpha \mapsto \alpha; \\ \alpha \rightrightarrows \alpha \end{pmatrix} \Longrightarrow (\alpha \rightsquigarrow \circ(\mapsto \circ \rightrightarrows))\right)$$

or also,

$$\left((\alpha \circlearrowleft, \circlearrowleft \alpha) \Longrightarrow \begin{pmatrix} \alpha \rightsquigarrow \alpha; \\ \alpha \mapsto \alpha; \\ \alpha \rightrightarrows \alpha \end{pmatrix}\right) \Longrightarrow$$

$$(\alpha \rightsquigarrow \circ(\mapsto \circ \rightrightarrows))$$

□

Spontaneous, intentional, and alternative circularity is either metaphysical (that is, entity–interior) or entity–exterior (concerning entities outside the entity in question).

7.2.3 A Structure of Intentionality

Intentionality of something belongs to the most basic virtues of physical things, informational entities, social processes, and other informationally structured phenomena. In intention, there is besides linguistically known meanings always something spontaneous, cyclic, and alternative. Intentionality proceeds in the direction of, for example, a goal, belief, physical structure, organization, and process, keeping as it seems, the validity of the so-called physical laws as the most general images of minds. Thus, let us set the following frame consequence.

Consequence 8 (An implication concerning intentionality) *Intentionality of something implies its spontaneity, circularity, and alternativity in its fragmental and composite form. Evidently, one can set*

$$(\alpha \mapsto) \Longrightarrow \left(\begin{pmatrix} \alpha \rightsquigarrow; \\ \alpha \circlearrowleft; \\ \alpha \rightrightarrows \end{pmatrix} \Longrightarrow (\alpha \rightsquigarrow \circ(\circlearrowleft \circ \rightrightarrows))\right)$$

or also,

$$\left((\alpha \rightarrowtail) \Longrightarrow \begin{pmatrix} \alpha \rightsquigarrow; \\ \alpha \circlearrowright; \\ \alpha \rightrightarrows \end{pmatrix}\right) \Longrightarrow (\alpha \rightsquigarrow \circ(\circlearrowright \circ \rightrightarrows))$$

□

7.2.4 A Structure of Alternativity

When an informational entity informs, it informs alternatively to some extent. Within a kind of informing there is possible to observe the so-called counterinforming. Alternativity (alternative choice of possibilities) belongs to the phenomenalism of counterinforming. So, to a kind of informing there may exist an alternative informing. Alternativity means alternativeness, alternation, opposition, otherness, pluralism, parallelism, severalty, succession, etc. as a unity. To each informational operator there is possible to determine its alternative type. One of the most general informational alternativity is that which concerns an entity informing.

Definition 10 (Alternative informing) *Let us mark by* $\dashv\!\!\!=$ *the alternative operator to the general operator* $\models$. *We have the following reading convention:*

$$\begin{array}{lll} \alpha \models \beta & \text{reads} & \alpha \textit{ informs } \beta \\ \beta =\!\!\!\!\dashv \alpha & \text{reads} & \beta \textit{ is informed by } \alpha \end{array}$$

□

The alternativity of the case is in the difference between 'to inform' and 'to be informed', where objects which inform and which are informed may have different functions. This difference lies in an entity's externalism and internalism. In the first case, a first entity informs something. In the second case, a second entity is informed by something. We can agree that, e.g. intention of the first entity might be different of the intention of the second entity. In this sense, to each informational operator its informational alternate can be introduced. The following convention seems to be appropriate.

Definition 11 (Alternative operators) *We can define a set of alternative operators corresponding to the original ones. The following pairs of operator–alternative_operator conventions are introduced:*

$\models$,	$=\!\!\!\!\dashv$	*informs [alternatively]*
$\not\models$,	$\not=\!\!\!\!\dashv$	*does not [alternatively] inform*
$\Vdash$,	$=\!\!\!\!\dashv\!\Vert$	*informs [alternatively] in parallel*
$\nVdash$,	$\not=\!\!\!\!\dashv\!\Vert$	*does not [alternatively] inform in parallel*
$\vdash$,	$\dashv$	*informs cyclically [alternatively]*
$\nvdash$,	$\not\dashv$	*does not cyclically inform [alternatively]*
$\Vert\!\vdash$,	$\dashv\!\Vert$	*informs [alternatively] parallel-cyclically*
$\Vert\!\nvdash$,	$\not\dashv\!\Vert$	*does not parallel-cyclically inform [alternatively]*
$\looparrowright$,	$\looparrowleft$	*informs spontaneous-circularly [alternatively]*
$\rightsquigarrow$,	$\leftsquigarrow$	*informs spontaneously [alternatively]*
$\circlearrowright$,	$\circlearrowleft$	*informs circularly [alternatively]*
$\rightarrowtail$,	$\leftarrowtail$	*informs intentionally [alternatively]*
$\rightrightarrows$,	$\leftleftarrows$	*informs alternatively [alternatively]*

□

Several other alternative operators can be introduced. Any particularized operator has its alternate. For example,

$$\models_{\text{particularized}} \quad \text{and} \quad =\!\!\!\!\dashv_{\text{particularized}}$$

are cases alternative to each other. The directionality of the original and alternative operators is evident. The original operators point from the left to the right, and the alternative from the right to the left. But, there is not only the directionality, because by alternative operators their semantics in comparison to the original ones is essentially changed. The original operators express the informingness of their left operand, while the alternative ones express the informedness of their left operands. The difference between the informing and informedness, that is, between an entity's externalism and internalism is substantial. Alternativity means the distinction which arises in an expressing and impressing process, when something emits information and something accepts it.

Within the scope of the discussed circumstances concerning informational alternativity we can consider the next consequence.

Consequence 9 (Implications concerning alternativity) *Informational alternativity of an*

entity is alternatively recursive entity, is an alternativeness of alternativeness, which causes the alternative operator of informing. There is,

$$(\alpha \rightleftarrows) \Longrightarrow (\leftleftarrows \alpha);$$
$$(\leftleftarrows \alpha) \Longrightarrow (\alpha \rightleftarrows)$$

By this consequence, the alternative informational operators are introduced, according to Definition 11. □

According to the previous discussion, there is possible to agree with a general consequence pertaining to alternativity in the following way.

Consequence 10 (General implications concerning alternativity) *For the alternativity and alternative alternativity there is*

$$(\alpha \rightleftarrows) \Longrightarrow$$

$$\left(\begin{pmatrix} \leftleftarrows \alpha; \\ \alpha \Vdash; \\ \alpha \rightsquigarrow; \\ \alpha \circlearrowleft; \\ \alpha \rightarrowtail \end{pmatrix} \Longrightarrow (\leftleftarrows \alpha; \alpha \Vdash \circ (\rightsquigarrow \circ (\circlearrowleft \circ \rightarrowtail)))\right);$$

$$(\leftleftarrows \alpha) \Longrightarrow$$

$$\left(\begin{pmatrix} \alpha \rightleftarrows; \\ \rightleftarrows \alpha; \\ \rightsquigarrow \alpha; \\ \circlearrowleft \alpha; \\ \rightarrowtail \alpha \end{pmatrix} \Longrightarrow (\alpha \rightleftarrows; ((\rightleftarrows \circ \rightsquigarrow) \circ \circlearrowleft) \circ \rightarrowtail \alpha)\right)$$

There exist various other alternative consequences. □

7.3 Serial, Parallel, Circular, and Metaphysical Modes of Informational Decomposition

We shall now develop a systematic approach to the topical modes of informational decomposition which concern the informationally serial, parallel, circular, and metaphysical. For this purpose we introduce a standardized symbol Δ which is a mark for the formula of informational decomposition in general. Different superscripts and subscripts then determine the specific cases of the mentioned decompositions of an informational entity. As we shall recognize, informational decomposition concerns an entity, formula, or formula system as an entity (informational unity) in question.

7.3.1 Marking Decomposition Formulas

In principle, decomposition proceeds from a topical theme, e.g., a marker, basic formula, or even formula system into greater details. On contrary, composition proceeds from particular detail themes and builds up a topical theme.

Definition 12 (Markers of informational decomposition) *For informational decomposition Δ of informational entity α, that is $\Delta(\alpha)$ in general, we introduce the following particularized decompositional cases:*

$\Delta(\alpha)$	*informational decomposition Δ of entity α;*
$\Delta_{\text{serial}}(\alpha)$	*serial decomposition;*
$\Delta_{\text{parallel}}(\alpha)$	*parallel decomposition;*
$\Delta_{\text{serial-parallel}}(\alpha)$	*serial–parallel decomposition;*
$\Delta_{\text{parallel-serial}}(\alpha)$	*parallel–serial decomposition;*
$\Delta^{\text{circular}}_{\text{serial}}(\alpha)$	*circular serial decomposition;*
$\Delta^{\text{circular}}_{\text{parallel}}(\alpha)$	*circular parallel decomposition;*
$\Delta^{\text{circular}}_{\text{serial-parallel}}(\alpha)$	*circular serial–parallel decomposition;*
$\Delta^{\text{circular}}_{\text{parallel-serial}}(\alpha)$	*circular serial–parallel decomposition;*
$\Delta^{\text{metaphysical}}_{\text{serial}}(\alpha)$	*metaphysical serial decomposition;*
$\Delta^{\text{metaphysical}}_{\text{parallel}}(\alpha)$	*metaphysical parallel decomposition;*
$\Delta^{\text{metaphysical}}_{\text{serial-parallel}}(\alpha)$	*metaphysical serial–parallel decomposition;*
$\Delta^{\text{metaphysical}}_{\text{parallel-serial}}(\alpha)$	*metaphysical parallel–serial decomposition*

□

7.3.2 Serial Decomposition

Serial decomposition of an entity α has to proceed in consequent steps from one decomposed state to another. The serial has the meaning of the consecutive. In this way, there exists an ordered sequence of possibilities in which something can be decomposed in a serial way. By serial decomposition of an informational entity, the process of informing enters into informational details, that is, subentities concerning the entity in question. By decomposition, informational components of

something come to the surface and the entity is being analyzed to the possible constitutional details. Thus, a decomposition procedure always concerns the chosen entity and its own components, which within the informational framework of the entity, arise to the informational existence.

Consequence 11 (Serial decomposition of an entity) *For a serial decomposition situation of entity α, marked by $\Delta_{\text{serial}}(\alpha)$, where entities $\beta, \gamma, \cdots, \omega$ are α's components, there is,*

$$\Delta_{\text{serial}}(\alpha) \rightleftharpoons$$

$$\left(\begin{array}{l} (\beta, \gamma, \cdots, \omega \subset \alpha) \Longrightarrow \\ \\ \left(\begin{array}{l} \alpha \models (\beta \models (\gamma \models (\cdots (\psi \models \omega) \cdots))); \\ (\alpha \models \beta) \models (\gamma \models (\cdots (\psi \models \omega) \cdots)); \\ \vdots \\ (((\cdots (\alpha \models \beta) \cdots) \models \chi) \models \psi) \models \omega \end{array} \right) \end{array} \right)$$

etc. Also other patterns (decompositional alternatives) of serial decomposition are possible. □

7.3.3 Parallel Decomposition

A parallel decomposition of something anticipates a parallel set of autonomous and also informationally (sequentially) connected formulas concerning the entity in question and its components.

The needs for a parallel decomposition appear, for instance, in semantic and pragmatic analysis of an entity (e.g., headword, sentence, paragraph, text, etc.), where by parallel formulas an entity is additionally (in a detailed way) *interpreted* in various possible (also unforeseeable, counterinformational) ways, according to the semantic and pragmatic linguistic conventions and innovations. Understanding of something represents a characteristic process of interpreting not only in parallel, but also in various serial, circular (tautological), and metaphysical ways. Parallelism is one of the semantically most powerful approaches of decomposition.

Consequence 12 (Parallel decomposition of an entity) *Let us have the following of one possible general structures (meanings) of the parallel decomposition of entity α:*

$$\Delta_{\text{parallel}}(\alpha) \rightleftharpoons$$

$$\left(\begin{array}{l} \left(\left(\begin{pmatrix} \alpha_1, \alpha_2, \cdots, \alpha_{n_\alpha}, \\ \beta_1, \beta_2, \cdots, \beta_{n_\beta}, \\ \vdots \\ \omega_1, \omega_2, \cdots, \omega_{n_\omega} \end{pmatrix} \subset \alpha \right) \Longrightarrow \right. \\ \\ \left(\begin{pmatrix} \alpha \models \alpha_1; \\ \alpha_1 \models \alpha_2; \\ \vdots \\ \alpha_{n_\alpha - 1} \models \alpha_{n_\alpha} \end{pmatrix}; \begin{pmatrix} \alpha \models \beta_1; \\ \beta_1 \models \beta_2; \\ \vdots \\ \beta_{n_\beta - 1} \models \beta_{n_\beta} \end{pmatrix}; \right. \\ \\ \left. \left. \cdots; \begin{pmatrix} \alpha \models \omega_1; \\ \omega_1 \models \omega_2; \\ \vdots \\ \omega_{n_\omega - 1} \models \omega_{n_\omega} \end{pmatrix} \right) \right) \end{array} \right)$$

□

7.3.4 Serial–parallel Decomposition

Another logical situation is the so–called serial–parallel decomposition of something. In this case, within a serial decomposition some parallel blocks appear. One can express this possibility by the following consequence.

Consequence 13 (Serial–parallel decomposition of an entity) *For a serial–parallel decomposition situation of entity α, marked by $\Delta_{\text{serial-parallel}}(\alpha)$, where entities β_{par}, γ_{par}, $\cdots$, χ_{par}, ψ_{par}, ω_{par} mark α's parallel structured components, that is,*

$$\beta_{\text{par}} \rightleftharpoons \begin{pmatrix} \beta_1; \\ \beta_2; \\ \vdots \\ \beta_{i_\beta} \end{pmatrix}; \gamma_{\text{par}} \rightleftharpoons \begin{pmatrix} \gamma_1; \\ \gamma_2; \\ \vdots \\ \gamma_{i_\gamma} \end{pmatrix}; \cdots;$$

$$\chi_{\text{par}} \rightleftharpoons \begin{pmatrix} \chi_1; \\ \chi_2; \\ \vdots \\ \chi_{i_\chi} \end{pmatrix}; \psi_{\text{par}} \rightleftharpoons \begin{pmatrix} \psi_1; \\ \psi_2; \\ \vdots \\ \psi_{i_\psi} \end{pmatrix};$$

$$\omega_{\text{par}} \rightleftharpoons \begin{pmatrix} \omega_1; \\ \omega_2; \\ \vdots \\ \omega_{i_\omega} \end{pmatrix}$$

respectively, one of the serial-parallel decomposition schemes, marked by $\Delta_{\text{serial-parallel}}(\alpha)$, *may have the following form:*

$$\Delta_{\text{serial-parallel}}(\alpha) \rightleftharpoons$$

$$\left(\begin{array}{l}(\beta_{\text{par}}, \gamma_{\text{par}}, \cdots, \omega_{\text{par}} \subset \alpha) \Longrightarrow \\ \left(\begin{array}{l}\alpha \models (\beta_{\text{par}} \models (\gamma_{\text{par}} \models (\cdots(\psi_{\text{par}} \models \\ \quad \omega_{\text{par}})\cdots))); \\ (\alpha \models \beta_{\text{par}}) \models (\gamma_{\text{par}} \models (\cdots(\psi_{\text{par}} \models \\ \quad \omega_{\text{par}})\cdots)); \\ \vdots \\ (((\cdots(\alpha \models \beta_{\text{par}})\cdots) \models \chi_{\text{par}}) \models \psi_{\text{par}}) \models \\ \quad \omega_{\text{par}}\end{array}\right)\end{array}\right)$$

□

Another scheme, demonstrating the dominance of the parallel principle, the so–called parallel–serial decomposition, belongs to the category of the parallel type of decomposition.

7.3.5 Parallel–serial Decomposition

As mentioned in the preceding subsection, another possible logical situation is the so–called parallel–serial decomposition of something. In this case, within a parallel decomposition various serial decompositions appear. One can express such a possibility by the following consequence.

Consequence 14 (Parallel–serial decomposition of an entity) *For a parallel–serial decomposition situation of entity* α, *marked by* $\Delta_{\text{parallel-serial}}(\alpha)$, *there is,*

$$\Delta_{\text{parallel-serial}}(\alpha) \rightleftharpoons$$

$$\left(\begin{array}{l}\left(\left(\left(\begin{array}{l}\alpha_1, \alpha_2, \cdots, \alpha_{n_\alpha - 1}, \alpha_{n_\alpha}, \\ \beta_1, \beta_2, \cdots, \beta_{n_\beta - 1}, \beta_{n_\beta}, \\ \vdots \\ \omega_1, \omega_2, \cdots, \omega_{n_\omega - 1}, \omega_{n_\omega}\end{array}\right) \subset \alpha\right) \Longrightarrow\right) \\ \left(\begin{array}{l}\alpha \models (\alpha_1 \models (\cdots(\alpha_{n_\alpha - 1} \models \alpha_{n_\alpha})\cdots)); \\ \alpha \models (\beta_1 \models (\cdots(\beta_{n_\beta - 1} \models \beta_{n_\beta})\cdots)); \\ \cdots \\ \alpha \models (\omega_1 \models (\cdots(\omega_{n_\omega - 1} \models \omega_{n_\omega})\cdots)); \\ \\ (\alpha \models \alpha_1) \models (\cdots(\alpha_{n_\alpha - 1} \models \alpha_{n_\alpha})\cdots); \\ (\alpha \models \beta_1) \models (\cdots(\beta_{n_\beta - 1} \models \beta_{n_\beta})\cdots); \\ \cdots \\ (\alpha \models \omega_1) \models (\cdots(\omega_{n_\omega - 1} \models \omega_{n_\omega})\cdots); \\ \vdots \; \vdots \\ (((\cdots(\alpha \models \alpha_1)\cdots) \models \alpha_{n_\alpha - 1}) \models \alpha_{n_\alpha}; \\ (((\cdots(\alpha \models \beta_1)\cdots) \models \beta_{n_\beta - 1}) \models \beta_{n_\beta}; \\ \cdots \\ (((\cdots(\alpha \models \omega_1)\cdots) \models \omega_{n_\omega - 1}) \models \omega_{n_\omega}\end{array}\right)\end{array}\right)$$

This is only one of the possible cases of parallel–serial decomposition of entity α. □

7.3.6 Circular Serial Decomposition

Besides of the circular serial decomposition in this subsection, we shall discuss circular parallel, circular serial–parallel, and circular parallel–serial decompositions in the next subsections. Circular decomposition of something closes its decomposition circularly into something itself. From the view of the decomposed entity, circular decomposition is a kind of the self-reflexive analysis or also the top–down design, by which the informational components of the entity in question come to the formal surface, for instance, in the form of extended and new informational formulas and formula systems.

Consequence 15 (Serial circular decomposition of an entity) *Serial circular decomposition of entity* α *follows the principle of serial decomposition with the condition that the system must be circularly (cyclically) closed in regard to* α. *According to serial decomposition in Consequence 11, the right–most operand in any serial*

formula, where the left–most operand is α, must be α too. Thus,

$$\Delta^{\text{circular}}_{\text{serial}}(\alpha) \rightleftharpoons$$

$$\left(\begin{array}{l}(\beta,\gamma,\cdots,\omega \subset \alpha) \Longrightarrow \\ \left(\begin{array}{l}(\alpha \models (\beta \models (\gamma \models (\cdots(\psi \models (\omega \models \alpha)\cdots); \\ (\alpha \models \beta) \models (\gamma \models (\cdots(\psi \models (\omega \models \alpha)\cdots); \\ \vdots \\ (\cdots(\alpha \models \beta)\cdots) \models \chi) \models \psi) \models \omega) \models \alpha\end{array}\right)\end{array}\right)$$

etc. where $\Delta^{\text{circular}}_{\text{serial}}(\alpha)$ marks a serial circular scheme of α's decomposition. □

From the technical point of view, circular serial decomposition has the meaning of an internal insight into the successive functional structure of entity α.

7.3.7 Circular Parallel Decomposition

Consequence 16 (Parallel circular decomposition of an entity) *Parallel circular decomposition concerning entity α may perform indirectly (in an indirectly visible, 'subconscious', hidden, or unrevealed way). So, instead of a serial structured formula system in Consequence 12, there can be an arbitrarily mixed structure of parallel formulas such that*

$$\Delta^{\text{circular}}_{\text{parallel}}(\alpha) \rightleftharpoons$$

$$\left((\beta,\gamma,\cdots,\omega \subset \alpha) \Longrightarrow \left(\begin{array}{l}\alpha \models \beta; \\ \beta \models \gamma; \\ \vdots \\ \psi \models \omega; \\ \omega \models \alpha\end{array}\right)\right)$$

where $\Delta^{\text{circular}}_{\text{parallel}}(\alpha)$ marks a circular parallel scheme of α's decomposition. □

Circular parallel decomposition of an entity has its evident paragons in different physical and artificial systems, and in social informational systems.

7.3.8 Circular Serial–parallel Decomposition

A circular serial–parallel decompositional scheme (concept) of a phenomenon seems to be close to a natural picture of a thing's structure and organization. Pure serial and pure parallel situations and attitudes are a matter of an abstract or technological approaches within artificial and theoretical systems. Circular serial–parallel decomposition of an entity is a decomposition or a set of decompositions closed circularly into the entity itself. In this way, circular serial–parallel decomposition can be obtained from Consequence 13 by setting the last operands in serial sequences by α.

Consequence 17 (Circular serial–parallel decomposition of an entity) *For a circular serial–parallel decomposition situation of entity α, marked by $\Delta^{\text{circular}}_{\text{serial–parallel}}(\alpha)$, where entities $\beta_{\text{par}},\gamma_{\text{par}},\cdots,\omega_{\text{par}}$ mark parallel α's components in Consequence 13, there is,*

$$\Delta^{\text{circular}}_{\text{serial–parallel}}(\alpha) \rightleftharpoons$$

$$\left(\begin{array}{l}(\beta_{\text{par}},\gamma_{\text{par}},\cdots,\omega_{\text{par}} \subset \alpha) \Longrightarrow \\ \left(\begin{array}{l}(\alpha \models (\beta_{\text{par}} \models (\gamma_{\text{par}} \models (\cdots(\psi_{\text{par}} \models \\ \qquad \omega_{\text{par}}) \models \alpha)\cdots); \\ (\alpha \models \beta_{\text{par}}) \models (\gamma_{\text{par}} \models (\cdots(\psi_{\text{par}} \models \\ \qquad \omega_{\text{par}}) \models \alpha)\cdots); \\ \vdots \\ (\cdots(\alpha \models \beta_{\text{par}})\cdots) \models \chi_{\text{par}}) \models \psi_{\text{par}}) \models \\ \qquad \omega_{\text{par}}) \models \alpha\end{array}\right)\end{array}\right)$$

The circular serial–parallel decomposition can be characterized also as a parallel type of circular-serial decomposition when considering various informing possibilities of α. □

7.3.9 Circular Parallel–serial Decomposition

Another possible logical situation is the so–called circular parallel–serial decomposition of something. In this case, within a parallel decomposition circular serial decompositions appear. One can express this possibility by the following consequence.

Consequence 18 (A Circular parallel–serial decomposition of an entity) *For a circular parallel–serial decomposition situation of entity α, marked by $\Delta^{\text{circular}}_{\text{parallel–serial}}(\alpha)$, there is,*

$$\Delta^{\text{circular}}_{\text{parallel–serial}}(\alpha) \rightleftharpoons$$

$$\left(\left(\begin{pmatrix}\alpha_1,\alpha_2,\cdots,\alpha_{n_\alpha},\\ \beta_1,\beta_2,\cdots,\beta_{n_\beta},\\ \vdots\\ \omega_1,\omega_2,\cdots,\omega_{n_\omega}\end{pmatrix} \subset \alpha\right) \Longrightarrow \right.$$

$$\left.\begin{pmatrix}\alpha \models (\alpha_1 \models (\cdots(\alpha_{n_\alpha} \models \alpha)\cdots));\\ \alpha \models (\beta_1 \models (\cdots(\beta_{n_\beta} \models \alpha)\cdots));\\ \cdots\\ \alpha \models (\omega_1 \models (\cdots(\omega_{n_\omega} \models \alpha)\cdots));\\ \\ (\alpha \models \alpha_1) \models (\cdots(\alpha_{n_\alpha} \models \alpha)\cdots);\\ (\alpha \models \beta_1) \models (\cdots(\beta_{n_\beta} \models \alpha)\cdots);\\ \cdots\\ (\alpha \models \omega_1) \models (\cdots(\omega_{n_\omega} \models \alpha)\cdots);\\ \vdots\ \vdots\\ ((\cdots(\alpha \models \alpha_1)\cdots) \models \alpha_{n_\alpha}) \models \alpha;\\ ((\cdots(\alpha \models \beta_1)\cdots) \models \beta_{n_\beta}) \models \alpha;\\ \cdots\\ ((\cdots(\alpha \models \omega_1)\cdots) \models \omega_{n_\omega}) \models \alpha\end{pmatrix}\right)$$

This is only one of the possible cases of the circular parallel–serial decomposition of entity α. □

7.3.10 Metaphysical Decomposition

We can standardize a certain form of metaphysical decomposition of an informing entity α, saying that the informing process is a structure and organization of entity's informing, counterinforming, and informational embedding. This decomposition standard carries a logical background—which considers the entity's intentional spontaneous-circular informing—by the informing of which information arrives and arises spontaneously, is accepted (embedded, interpreted, connected) in a certain amount and way, and all this processing runs in one or another circular way regarding the entity in question.

A standardized and pragmatical metaphysical scheme was already discussed in [Železnikar 93]. For entity α, its standardized (metaphysically universalized or generalized) components are informing $\mathcal{I}_\alpha$, counterinforming $\mathcal{C}_\alpha$, counterinformation γ_α, informational embedding $\mathcal{E}_alpha$, and embedding information ε_α. For these components, including α, metaphysical serial, parallel, serial–parallel, and parallel–serial decomposition can be determined in various possible ways. These standardized components can be pragmatized (metaphysically particularized) according to the entity inner structure and organization, and according to the outer informational impacts. In this way, metaphysical decomposition is meant to be the α's own way of inner informational arising, its autonomous informing in the realm of α–influencing environment.

Consequence 19 (Metaphysical decompositions by an entity's standardized components) *Let us have to an entity belonging metaphysical entities marked in the following way:*

α	for	*an informing entity,*
$\mathcal{I}_\alpha$	for	*informing of entity* α,
$\mathcal{C}_\alpha$	for	*counterinforming of entity* α,
γ_α	for	*a counterinforming entity within entity* α,
$\mathcal{E}_\alpha$	for	*informational embedding of entity* α,
ε_α	for	*an embeddingly informing entity of entity* α

Then some of possible metaphysical decomposition schemes are, systematically, the following:

$$\Delta^{\text{metaphysical}}_{\text{serial}}(\alpha) \rightleftharpoons$$

$$\left((\mathcal{I}_\alpha,\mathcal{C}_\alpha,\gamma_\alpha,\mathcal{E}_\alpha,\varepsilon_\alpha \subset \alpha) \Longrightarrow \right.$$

$$\left.\begin{pmatrix}(\alpha \models (\mathcal{I}_\alpha \models (\mathcal{C}_\alpha \models (\gamma_\alpha \models (\mathcal{E}_\alpha \models\\ \quad (\varepsilon_\alpha \models \alpha)))));\\ (\alpha \models \mathcal{I}_\alpha) \models (\mathcal{C}_\alpha \models (\gamma_\alpha \models (\mathcal{E}_\alpha \models\\ \quad (\varepsilon_\alpha \models \alpha)))));\\ \vdots\\ ((((\alpha \models \mathcal{I}_\alpha) \models \mathcal{C}_\alpha) \models \gamma_\alpha) \models \mathcal{E}_\alpha) \models\\ \quad \varepsilon_\alpha) \models \alpha\end{pmatrix}\right)$$

for the long-cycle metaphysical serial informing;

$$\Delta^{\text{metaphysical}}_{\text{parallel}}(\alpha) \rightleftharpoons$$

$$\left((\mathcal{I}_\alpha,\mathcal{C}_\alpha,\gamma_\alpha,\mathcal{E}_\alpha,\varepsilon_\alpha \subset \alpha) \Longrightarrow \right.$$

$$\left.\begin{pmatrix}\alpha \models \mathcal{I}_\alpha;\\ \mathcal{I}_\alpha \models \mathcal{C}_\alpha;\\ \mathcal{C}_\alpha \models \gamma_\alpha;\\ \gamma_\alpha \models \mathcal{E}_\alpha;\\ \mathcal{E}_\alpha \models \varepsilon_\alpha;\\ \varepsilon_\alpha \models \alpha\end{pmatrix}\right)$$

for a metaphysical parallel informing of entity α;

$$\Delta^{\text{metaphysical}}_{\text{serial–parallel}}(\alpha) \rightleftharpoons$$

$$\left((\mathcal{I}^{\text{par}}_{\alpha}, \mathcal{C}^{\text{par}}_{\alpha}, \gamma^{\text{par}}_{\alpha}, \mathcal{E}^{\text{par}}_{\alpha}, \varepsilon^{\text{par}}_{\alpha} \subset \alpha) \Longrightarrow \left(\begin{array}{l} (\alpha \models (\mathcal{I}^{\text{par}}_{\alpha} \models (\mathcal{C}^{\text{par}}_{\alpha} \models (\gamma^{\text{par}}_{\alpha} \models \\ \quad (\mathcal{E}^{\text{par}}_{\alpha} \models (\varepsilon^{\text{par}}_{\alpha} \models \alpha))))); \\ (\alpha \models \mathcal{I}^{\text{par}}_{\alpha}) \models (\mathcal{C}^{\text{par}}_{\alpha} \models (\gamma^{\text{par}}_{\alpha} \models \\ \quad (\mathcal{E}^{\text{par}}_{\alpha} \models (\varepsilon^{\text{par}}_{\alpha} \models \alpha))))); \\ \vdots \\ (((((\alpha \models \mathcal{I}^{\text{par}}_{\alpha}) \models \mathcal{C}^{\text{par}}_{\alpha}) \models \gamma^{\text{par}}_{\alpha}) \models \\ \quad \mathcal{E}^{\text{par}}_{\alpha}) \models \varepsilon^{\text{par}}_{\alpha}) \models \alpha \end{array} \right) \right)$$

for the long-cycle metaphysical serial–parallel informing where, for example,

$$\mathcal{I}^{\text{par}}_{\alpha} \rightleftharpoons \begin{pmatrix} \mathcal{I}^{\text{spont}}_{\alpha} \\ \mathcal{I}^{\text{circu}}_{\alpha} \\ \mathcal{I}^{\text{inten}}_{\alpha} \\ \mathcal{I}^{\text{alter}}_{\alpha} \\ \vdots \end{pmatrix}; \quad \mathcal{C}^{\text{par}}_{\alpha} \rightleftharpoons \begin{pmatrix} \mathcal{C}^{\text{spont}}_{\alpha} \\ \mathcal{C}^{\text{circu}}_{\alpha} \\ \mathcal{C}^{\text{inten}}_{\alpha} \\ \mathcal{C}^{\text{alter}}_{\alpha} \\ \vdots \end{pmatrix};$$

$$\gamma^{\text{par}}_{\alpha} \rightleftharpoons \begin{pmatrix} \gamma^{\text{spont}}_{\alpha} \\ \gamma^{\text{circu}}_{\alpha} \\ \gamma^{\text{inten}}_{\alpha} \\ \gamma^{\text{alter}}_{\alpha} \\ \vdots \end{pmatrix}; \quad \mathcal{E}^{\text{par}}_{\alpha} \rightleftharpoons \begin{pmatrix} \mathcal{E}^{\text{spont}}_{\alpha} \\ \mathcal{E}^{\text{circu}}_{\alpha} \\ \mathcal{E}^{\text{inten}}_{\alpha} \\ \mathcal{E}^{\text{alter}}_{\alpha} \\ \vdots \end{pmatrix};$$

$$\varepsilon^{\text{par}}_{\alpha} \rightleftharpoons \begin{pmatrix} \varepsilon^{\text{spont}}_{\alpha} \\ \varepsilon^{\text{circu}}_{\alpha} \\ \varepsilon^{\text{inten}}_{\alpha} \\ \varepsilon^{\text{alter}}_{\alpha} \\ \vdots \end{pmatrix}$$

In this system of parallel structured metaphysical components, spont, circu, inten, alter, etc. *mark spontaneous, circular, intentional, alternative, etc. parts, respectively which can be shaped pragmatically according to the situation and attitude of entity α. The pragmatical means sufficiently concretized, for instance, intelligent in a certain (intentional, understanding) way (informational–associative, counterinformational–creative, embedding–interpretative) (look at [Železnikar 93] where intelligence as an informational entity's metaphysicalism is discussed). Thus, lastly,*

$$\Delta^{\text{metaphysical}}_{\text{parallel–serial}}(\alpha) \rightleftharpoons$$

$$\left(\left(\begin{pmatrix} \mathcal{I}^{1}_{\alpha}, \cdots, \mathcal{I}^{n_{\mathcal{I}}}_{\alpha}, \mathcal{C}^{1}_{\alpha}, \cdots, \mathcal{C}^{n_{\mathcal{C}}}_{\alpha}, \\ \gamma^{1}_{\alpha}, \cdots, \gamma^{n_{\gamma}}_{\alpha}, \mathcal{E}^{1}_{\alpha}, \cdots, \mathcal{E}^{n_{\varepsilon}}_{\alpha}, \\ \varepsilon^{1}_{\alpha}, \cdots, \varepsilon^{n_{\varepsilon}}_{\alpha} \end{pmatrix} \subset \alpha \right) \Longrightarrow \left(\begin{array}{l} (\cdots((\alpha \models \mathcal{I}^{1}_{\alpha}) \models \mathcal{I}^{2}_{\alpha}) \cdots) \models \mathcal{I}^{n_{\mathcal{I}}}_{\alpha}; \\ (\cdots((\mathcal{I}^{n_{\mathcal{I}}}_{\alpha} \models \mathcal{C}^{1}_{\alpha}) \models \mathcal{C}^{2}_{\alpha}) \cdots) \models \mathcal{C}^{n_{\mathcal{C}}}_{\alpha}; \\ (\cdots((\mathcal{C}^{n_{\mathcal{C}}}_{\alpha} \models \gamma^{1}_{\alpha}) \models \gamma^{2}_{\alpha}) \cdots) \models \gamma^{n_{\gamma}}_{\alpha}; \\ (\cdots((\gamma^{n_{\gamma}}_{\alpha} \models \mathcal{E}^{1}_{\alpha}) \models \mathcal{E}^{2}_{\alpha}) \cdots) \models \mathcal{E}^{n_{\varepsilon}}_{\alpha}; \\ (\cdots((\mathcal{E}^{n_{\varepsilon}}_{\alpha} \models \varepsilon^{1}_{\alpha}) \models \varepsilon^{2}_{\alpha}) \cdots) \models \varepsilon^{n_{\varepsilon}}_{\alpha}; \\ \varepsilon^{n_{\varepsilon}}_{\alpha} \models \alpha \end{array} \right) \right)$$

for a metaphysical parallel–serial informing of entity α. □

7.3.11 Marking Composition Formulas

In principle, composition proceeds from given, also to the greatest detail particularized entities and builds up a topical entity, which represents a new operand Γ, coming into existence by a procedure of composition of sequentially informing components.

Definition 13 (Markers of informational composition) *For informational composition Γ of a set ψ of informational entities α_1, α_2, $\cdots$, α_n, that is $\Gamma(\alpha_1, \alpha_2, \cdots, \alpha_n)$, we introduce the following particularized compositional cases:*

$\Gamma(\psi)$	*informational composition Γ of entity set ψ;*
$\Gamma_{\text{serial}}(\psi)$	*serial composition;*
$\Gamma_{\text{parallel}}(\psi)$	*parallel composition;*
$\Gamma_{\text{serial–parallel}}(\psi)$	*serial–parallel composition;*
$\Gamma_{\text{parallel–serial}}(\psi)$	*parallel–serial composition;*
$\Gamma^{\text{circular}}_{\text{serial}}(\psi)$	*circular serial composition;*
$\Gamma^{\text{circular}}_{\text{parallel}}(\psi)$	*circular parallel composition;*
$\Gamma^{\text{circular}}_{\text{serial–parallel}}(\psi)$	*circular serial–parallel composition;*
$\Gamma^{\text{circular}}_{\text{parallel–serial}}(\psi)$	*circular serial–parallel composition;*
$\Gamma^{\text{metaphysical}}_{\text{serial}}(\psi)$	*metaphysical serial composition;*
$\Gamma^{\text{metaphysical}}_{\text{parallel}}(\psi)$	*metaphysical parallel composition;*

$\Gamma^{\text{metaphysical}}_{\text{serial-parallel}}(\psi)$ *metaphysical serial–parallel composition;*

$\Gamma^{\text{metaphysical}}_{\text{parallel-serial}}(\psi)$ *metaphysical parallel–serial composition*

□

7.3.12 Serial Composition

In a serial composition Γ_{serial} of sequentially acting entities (components) $\alpha_1, \alpha_2, \cdots, \alpha_n$, the procedure of composition runs from the left to the right by the informing insertion of operands, operators, and parentheses or, in the reverse direction, when alternative cases are composed.

A serial composition may consider both the interior and exterior components in respect to a given informational components $\alpha_1, \alpha_2, \cdots, \alpha_n$. If only some interior components are considered, the composition may follow a (partial) metaphysical concept, in which some components become cyclically informed. If exterior components are considered, the composed formula models a new exterior, that is, a non–metaphysical phenomenon in which component entities are involved. A serial composition has to proceed in consequent steps from one composed state to another. In this way, there exists an ordered sequence of possibilities in which something can be composed in a serial manner.

Consequence 20 (Serial composition of an informational entity) *For a serial composition, marked by* $\Gamma_{\text{serial}}(\alpha_1, \alpha_2, \cdots, \alpha_n)$*, where entities* $\alpha_1, \alpha_2, \cdots, \alpha_n$ *are components, there is,*

$$\Gamma_{\text{serial}}(\alpha_1, \alpha_2, \alpha_3, \cdots, \alpha_{n-2}, \alpha_{n-1}, \alpha_n) \rightleftharpoons$$

$$\begin{pmatrix} (\alpha_1 \models (\alpha_2 \models (\alpha_3 \models (\cdots(\alpha_{n-1} \models \alpha_n)\cdots); \\ (\alpha_1 \models \alpha_2) \models (\alpha_3 \models (\cdots(\alpha_{n-1} \models \alpha_n)\cdots); \\ \vdots \\ (\cdots(\alpha_1 \models \alpha_2)\cdots) \models \alpha_{n-2}) \models \alpha_{n-1}) \models \alpha_n \end{pmatrix}$$

etc. Also other patterns (compositional alternatives) of serial composition are possible. □

7.3.13 Parallel Composition

We have to make a clear distinction between the processes of formula or formula system decomposition and composition. A decomposition is a top-down development (project, design) proceeding from a top idea (concept, basic structure) into more specific details in parallel, serial, and circular ways following some informational intention in such or another way. A composition means a combining of already existing entities (a kind of bottom-up development) into new entities, where, for instance, new relations, combinations, operations between entities are introduced. The introducing of new operand and operator entities is characteristic for both decomposition and composition, because it follows the so-called principle of informational spontaneity.

Consequence 21 (Parallel composition of an informational entity) *For a parallel composition, marked by* $\Gamma_{\text{parallel}}(\alpha_1, \alpha_2, \cdots, \alpha_n)$*, where entities* $\alpha_1, \alpha_2, \cdots, \alpha_n$ *are components, there is,*

$$\Gamma_{\text{parallel}}(\alpha_1, \alpha_2, \cdots, \alpha_n) \rightleftharpoons$$

$$\left(\begin{pmatrix} \alpha_i \models \alpha_j; \\ i, j \in \{1, 2, \cdots, n\} \end{pmatrix} \Longrightarrow \begin{pmatrix} \alpha_1; \\ \alpha_2; \\ \vdots \\ \alpha_n \end{pmatrix} \right)$$

In this consequence only some $\alpha_i \models \alpha_j$ *may exist, so the composed system in not necessarily completely informationally connected.* □

Other compositional (e.g. serial–parallel and parallel–serial) cases, analogous to the previously discussed decomposition cases, can easily be constructed by the reader according to the scheme of compositional markers in Definition 13.

7.3.14 Circular versus Metaphysical Composition

While a common circular composition is a free case of circularly structured components, a metaphysical composition is actually a case of metaphysical decomposition. Certainly, the metaphysical composition can also consider the so–called internalization of exterior phenomena which impact the entity in question. But, this means nothing else than an internally occurring informational affair within the entity's metaphysicalism.

Consequence 22 (Circular serial composition of an informational entity) *For a circular serial composition,*

marked by $\Gamma^{\text{circular}}_{\text{serial}}(\alpha, \alpha_1, \alpha_2, \cdots, \alpha_n)$, *where entities* $\alpha, \alpha_1, \alpha_2, \cdots, \alpha_n$ *are components, and entity* α *is the cycling operand, there is,*

$$\Gamma^{\text{circular}}_{\text{serial}}(\alpha, \alpha_1, \alpha_2, \cdots, \alpha_{n-1}, \alpha_n, \alpha_n) \rightleftharpoons$$

$$\begin{pmatrix} (\alpha \models (\alpha_1 \models (\alpha_2 \models (\cdots(\alpha_n \models \alpha)\cdots); \\ (\alpha \models \alpha_1) \models (\alpha_1 \models (\cdots(\alpha_n \models \alpha)\cdots); \\ \vdots \\ (\cdots(\alpha \models \alpha_1)\cdots) \models \alpha_{n-1}) \models \alpha_n) \models \alpha \end{pmatrix}$$

etc. Also other patterns (compositional alternatives) of circular serial composition are possible. □

Consequence 23 (Circular parallel composition of an informational entity) *For a circular parallel composition, marked by* $\Gamma^{\text{circular}}_{\text{parallel}}(\alpha, \alpha_1, \alpha_2, \cdots, \alpha_n)$, *where entities* $\alpha, \alpha_1, \alpha_2, \cdots, \alpha_n$ *are components and entity* α *is the cycling operand, there is,*

$$\Gamma^{\text{circular}}_{\text{parallel}}(\alpha, \alpha_1, \alpha_2, \cdots, \alpha_n) \rightleftharpoons$$

$$\left(\begin{pmatrix} \alpha \models \alpha_i; \\ \alpha_i \models \alpha_j; \\ \alpha_j \models \alpha; \\ i, j \in \{1, 2, \cdots, n\} \end{pmatrix} \Longrightarrow \begin{pmatrix} \alpha; \\ \alpha_1; \\ \alpha_2; \\ \vdots \\ \alpha_n \end{pmatrix} \right)$$

In this consequence only some sequences $\alpha \models \alpha_i$; $\alpha_i \models \alpha_j$; $\alpha_j \models \alpha$ *may exist, so the composed system in not necessarily uniquely circularly closed.* □

The reader can easily construct the consequences which pertain to other circular and metaphysical compositions, following the ideas of the adequate (discussed) cases of decomposition (symbol Δ). In this way, the study of possible decomposition and composition cases is coming to a reasonable end.

8 Conclusion

> A very large–scale information processing technology has two aspects: one is to enlarge the amount of knowledge and the other to enlarge the capacity to process knowledge. (...) Very large–scale knowledge does not simply mean collecting knowledge in substantial amounts. Totally new technologies are required to automatically acquire and store massive knowledge as efficiently as possible. (...) Knowledge is varied, diversified, and comes in many forms.
>
> —[Knowledge 92] 3–5

The problem of a new informational theory is how to organize its structure and symbolism in a way (e.g. counterinformationally), that formal, discursive (mathematical, scientific), and semantic conventions remain preserved and that communication (informational embedding, interpreting) to existing theories is possible. The problem is how to keep the individual of the new theory and put it into the discourse of a new reality, for which it is believed that it will find a philosophical, scientific, and technological background (understanding). The question of a general informational theory is how to set the boundaries sufficiently wide, apart from conventional possibilities, enabling the informational fragmentation (decomposition) and, simultaneously, the synthesization (composition). In this view, a general informational theory is possibility–trivial, possessing an infinite set of consequences (theorems, lemmas, rules) which follow from basic axioms. For instance, we learned that symbol $\models$ represents an extremely general (powerful) informational operator, which can replace any particular or universal operational concept and acts in an informational formula game (scenario) as an operator joker (trump–operator).

Such a trivial situation of a general informational theory changes in case of a theory particularization where informational operands and operators become informationally closed (e.g. tautologically determined) entities. But, formal expressions (formulas, formula systems) carry their own stories, inform and counterinform surprisingly in regard to the traditional, that is, logical, mathematical, and linguistically abstract forms. There is much more informational background in that what is called informationally arising, coming to informational surface and much less of that what in traditional theories is reduced, neglected, unconscious, and simply eliminated as insignificant. The realm of the informational is meaningly broader, parallel, interconnected; in short, it is more complex, perplexed, interwoven, circular, and spontaneous; it corresponds better than

the traditional philosophies do to that that approaches as evolution of man's abstract, circular, and spontaneous mind and what has to a reasonable extent been impacted by human informational tools where, for example, information processing of information processing became an evident and logically possible, manageable task.

The concept of an informational machine implementation [Železnikar 92c] remains one of the most challenging projects for the coming decades. It has to follow some essential changes in the design of both machine's hardware and software, where the informationally arising machine components are regularly supported by the machine system. It was shown, how understanding of text can become informationally arising in the framework of an informational environment [Železnikar 92d] (e.g., at the analysis and interpretation of the most lucid, comprehensive, and circularly perplexed philosophical texts and their translation from one natural language into another [Heidegger 86]).

At the end, it seems evident that informational concepts in the form of machines and programs need an informational formalism which can guarantee sufficiently safe, error–free and efficient design. This experience is nothing new in the realm of computer design and use where mathematically rigorous techniques have been applied at the design of computer architecture, operating systems, structured programming and the like. In this view, mathematics seems to be only a specific mental technique which can assure the repeatability, efficiency, and safety (security) of computational processes (algorithms). So let us close with the following remarkable citation ([Husserl 80] I, p. 253) concerning also the phenomenon of construction of future informational machines and programs (written down at the very beginning of this century, in the year 1900): *Hier ist zu beachten, daß der Mathematiker in Wahrheit nicht der reine Theoretiker ist, sondern nur der ingeniöse Techniker, gleichsam der Konstrukteur, welcher, in bloßem Hinblick auf die formalen Zusammenhänge, die Theorie wie ein technisches Kunstwerk aufbaut. So wie der praktische Mechaniker Maschinen konstruiert, ohne dazu letzte Einsicht in das Wesen der Natur überhaupt und in das Wesen ihrer sie bedingenden Begriffe und Gesetze besitzen zu müssen. Ähnlich verhält es sich ja bei allen „Spezialwissenschaften".*

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