# Principles of a Formal Axiomatic Structure of the Informational

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*The article deals with some basic problems of a formal axiomatic structure pertaining to the phenomenalism of the informational. In this way, solid philosophical and formal foundations of an emerging informational science are set from the strict informational point of view [9]. A general informational theory conjoins the so-called object theory and its metatheory, in contrariness to a narrower mathematical theory, where the metamathematical theory serves as an exterior means for proving of the object theory. The principles of informational axioms are treated from the dualistic point of view conjoining the axioms of the object theory and inference axioms of the metatheory. Inference rules become regular informational formulas which arise informationally as any other informational operands (entities).*

## 1 Introduction

Axiomatic structure[1] of a general informational theory (GIT) is a problem per se, for it must be, for example, according to [9], self-contained in respect to the basic theory axioms on one side and the necessary initial inference rules (deduction, induction, abduction, modi of other possible inference) on the other side. Conception of GIT is certainly *logistic* [1] and *formalistic* [7], but not in the traditional mathematical sense. On contrary to the traditional mathematical theories, GIT can keep the inference rules within the theory itself while, in mathematics, deduction rules for example, remain outside the particular theory (e.g., in the so-called inferential metadomain, that is, metamathematics) as means by which a mathematician or machine can prove the correctness, logical consistency or non-contradictoriness of the theory.

*Mathematics is not more rigorous than historiology, but only narrower, because the existential foundations relevant for it lie within a narrower range.* (Heidegger [4], p. 195.) In mathematics, the metatheory by which an object theory is proved, lies outside of the object theory. It is mathematically unimaginable (uncommon) to join, for instance, an arithmetic theory (dealing with numbers) with the theory of deduction and induction, by which arithmetical theorems are proven and dealing with objects of logic of predicates. An object theory in mathematics is always meant as a narrower theory from which the metatheory is excluded.

Axiomatization in the described (informational) sense is a necessary step towards a sufficiently strict theory which can be applied as a constructing or designing tool for particular informational machines and programs. It is a sort of informational formalization [7] by which a calculus is introduced. On each step of formalization, there is certainly possible a look into the real world when formulas are *deformalized,* that is, made less formal through their interpretation (translation) in a less formal or object language (natural, picture, voice, signal, process language, etc.)

GIT is a theory of well-formed formulas of operands, operators, and parentheses pairs. It has a straightforward syntax where the formation

[1]This paper is a private author's work and no part of it may be used, reproduced or translated in any manner whatsoever without written permission except in the case of brief quotations embodied in critical articles.

of its formulas depends on several informational views, possibilities, and principles (methods), giving the theory the so-called informationally arising (emerging, generating) character. For instance, some of the principles of informational arising concern procedures of formula and formula system decomposition and composition. Decomposition means, for example, deconstruction [3] in the sense of a particular semantic and pragmatic analysis of a formal item (operand, operator, formula, formula system) in the form of additional arising, enlarging, changing or modifying.

Several formal means have to be introduced before the axiomatization of the informational can begin. During our axiomatic discourse, we have the substantially different theoretical entities, the aim and purpose of which must be explained in a clear and definite manner. These entities are:

1. *Definitions* are a kind of preaxiomatic and pretheoretical determination entities which explain the introduced symbolism and symbolic structures (markers, variables, formulas, formula systems) used within the course of an informational theory advancing. Definitions are nothing else than transparent interpretations of formal symbolism for the reader in a natural language. They connect the emerging logistic and formalistic world ([1, 7]) with the natural one. They simultaneously enable the emerging of the formal theory world and its informational connection with a common (linguistic) individual consciousness. As such, definitions function like initiators beyond a particular axiomatized theory, linking the emerging formal world and the existing conscious world of the theoretically concluding mind.

2. *Theory axioms* are the essential origins of a theory obtained by an intuitive investigation of the basics by a theory setter (e.g., an expert of a scientific discipline). Informational axioms are formulas that commend themselves to general acceptance; they are informationally well-established and universally-concerned principles presenting the maxima of the possible, assignable degree of recognition.

3. *Inference axioms* are rules (laws) for deriving formulas from theory axioms and formulas obtained already through regular derivation. Inference axioms are the very initial rules for inferring, that is, for the drawing of conclusions from theory and inference axioms. Inference rules can be derived in the form of inference theorems, lemmas, consequences, etc. getting more complex and informationally interweaved inference rules. In this function, derived inference rules represent regular processes for drawing conclusions within an informational theory.

4. *Theorems, lemmas, conclusions* etc. are informationally derived theory formulas by means of inference axioms and inferred inference rules from axioms and already derived theorems, lemmas, conclusions, etc. They are "object-theoretical" (non-inferential) as well as "inferential".

5. *Proofs of theorems, lemmas, and conclusions* are procedures (informational processes) using inference axioms and generated rules with the aim to achieve certain results (in the form of theorems, lemmas, etc.) E.g., metamathematics can be understood to be a proof theory (D. Hilbert, see, for instance, [7]). In formally loose theories, the process of proving becomes an art instead of a formal procedure.

6. *Analysis of theory axioms, theorems, and proofs* occurs after the process of proving a theorem, lemma, etc. to see what could be improved, complemented, and added for the sake of a more complete and powerful theory. Thus, one can glance at induced axioms, derived theorems, and accomplished proofs.

The enumerated theory entities (definitions, theory axioms, inference axioms, theorems, proofs, and analyses) constitute a spontaneous and circular discourse in the following sense:

**A.** *Construction of definitions and theory axioms* is an informational approach by which the theory designer is getting his/her *master* for the emerging formal theory. The inference of further axioms and their notional improvement is on the way to the theory-axiomatic consolidation (fortifying, strengthening).

**B.** Construction of the inference axioms belongs to the functioning of the master and without them there would not be possible to deduce (prove) new axioms and the initial theorems, lemmas, and consequences. In case of an informational theory, inference axioms are parts of the particular informational theory and are not excluded from the object theory as it is the case in mathematics ([8], p. 30). Thus the entire informational master domain which governs the emerging of a theory uses definitions, theory axioms, and inference axioms for the *mastering* of the informational arising (development) of the theory.

**C.** *Construction of theorems lemmas, consequences,* etc. brings to the surface the so-called *university* or *teaching discourse.* Theorems, lemmas, consequences, etc. can now be taught as a theory truth concerning the theory relevant entities. Derived theorems can be used in the same way as axioms together with the derived inference rules. But, new theorems have to be proved in a consequent manner, so that the teaching domain obtains the theory legacy.

**D.** *Construction of proofs* can become a questionable task because someone *wishes* to prove a certain theorem which was constructed in advance, with the one's intention for some particular purpose, that is, intuitively. In this respect, proving of theorems can constitute the so-called *histeric's discourse.* In mathematics, the object domain (a theory) and the metadomain (metamathematics as a proof theory) are separated. A mathematician, proving his/her theory uses the metamathematical principles intuitively, for instance, in the mixed form of a natural and a formal mathematical language.

**E.** *Construction of analyses of the arisen theory* constitutes the so-called *analyst's discourse.* Analysis governs the arising of cycles **A**, $\cdots$, **D** and constitutes also the long cycle of a theory design, that is, **A**, $\cdots$, **E**, **A**, $\cdots$.

The mentioned names (markers) of discourses have been invented by Lacan [14] and constitute a theoretical, cyclically and subcyclically structured discourse in its entirety.

# 2 Introducing Informational Operands and Operators

Informational operands and operators are, together with parenthesis pairs, the basic entities of informational formulas. It must be determined definitely, what these entities are, how they are structured and which kind of symbolism is used for their presentation.

## 2.1 Informational Operands

Informational operands are simple and complex entities in the most general sense. They have active and passive informational properties, when we say that they inform and are informed. In this manner, active components of entities can be explicated by two usual forms: as informational operands and as included informing entities within entities themselves. The included entities perform again as regular informational entities.

### 2.1.1 An Introduction to Informational Operands as Informing Entities

Informational philosophy says that, irrespective of their physical, mental, social, individual nature, entities inform and are informed. This statement has the meaning of the fact that entities impact entities and themselves, and are impacted by entities and themselves in an phenomenal way, that is, according to the entities' proprietary possibilities of entities-concerning phenomena (e.g., physicalism, biologicism, mentalism, linguisticism, or any specific phenomenalism).

On the abstract or any informational level, phenomena concerning things can be marked (specifically encoded) and structured into formulas and formula systems. Usually, an entity is informationally represented by an adequate formula system in which phenomenal components of the entity occur as entities, that is informational operands, constituting together with informational operators and parenthesis pairs the so-called formula system. Markers, formulas, and formula systems are operands in the sense of informational variables if compared to adequately constructed mathematical entities.

An informational operand, representing (modeling, phenomenalizing) a real entity, is informationally structured, irrespective of the instantaneous possibilities of revealment or hiding of its informational nature. The operand structure can come to the surface through a stepwise, informationally consistent, and consequent decomposition, which is nothing else than a process of deconstruction [3] in the sense of semantic and pragmatic analysis and synthesis of the entity-structural case. This procedure of decomposition is carried of by principles (axioms, inference rules) of informational decomposition which is a part of the so-called counterinformational phenomenon of the entity itself and it impacting environment.

Operands are representatives of simple, composed and the most complex entities of the world. In this respect, operands are operand markers, informationally well-formed formulas, and formula systems. They represent informationally arising entities in the sense of informational spontaneity and circularity, according to the principles of information [9] called *informational principles.*

### 2.1.2 Operands Marking Informational Entities

Simple informational entities, marked as simple operands, are the beginning of something or something which is not informationally decomposed yet. On the other hand, arbitrary complex formulas and systems can be represented by simple markers.

**Definition 1** [OPERANDS REPRESENTING INFORMATIONAL ENTITIES] *Informational entities are distinguished markers for simple operands, informational formulas and informational formula systems represented as operands. The so-called* informational entities *which hide the entity's informing are marked by small letters of the Greek or Fraktur alphabet, which can be subscribed and superscribed and written in a functional form. E.g.,*

$$\begin{array}{l}\alpha, \beta, \gamma, \cdots, \omega; \mathfrak{a}, \mathfrak{b}, \mathfrak{c}, \cdots, \mathfrak{z};\\ \alpha_1, \beta_{\text{belief}}, \gamma_\alpha, \cdots, \omega_\mathcal{I};\\ \mathfrak{a}^1, \mathfrak{b}^{\text{belief}}, \mathfrak{c}^\alpha, \cdots, \mathfrak{z}^\mathcal{I};\\ \alpha(\beta), \beta_\alpha(\gamma), \gamma_{\text{consciousness}}(C), \cdots, \omega_\mathcal{Z}(\alpha)\end{array}$$

*are examples of single simple, subscribed, superscribed and functional operands, respectively.* □

### 2.1.3 Informational Operands Marking the Informing of Entities

Informing of an entity is meant to be an active component of (within) the entity, characterizing the entity's informational properties which can be observed by another entity or the entity itself. Informing of an entity is expressive (informational externalism) and impressive (informational internalism). Or said by other words: informing of an entity is distinguished in two characteristic ways that belong to the basic verbal forms which are *to inform* and *to be informed.*

There is no conceptual difference between informational operands as entities and informational operands as informings of entities. They are merely marked differently to distinguish them clearly between each other.

**Definition 2** [OPERANDS REPRESENTING INFORMING ENTITIES OF INFORMATIONAL ENTITIES] *Informing entities of informational entities are distinguished markers for simple informing operands, informational formulas and informational formula systems represented as operands belonging to the informings of entities. The so-called* informings of informational entities *can hide other informational entities and their informings and are marked by capital calligraphic or Fraktur letters, which can be subscribed and superscribed and written in a functional form. E.g.,*

$$\begin{array}{l}\mathcal{A}, \mathcal{B}, \cdots, \mathcal{Z};\\ \mathfrak{A}, \mathfrak{B}, \mathfrak{C}, \cdots, \mathfrak{Z};\\ \mathcal{A}_1, \mathcal{B}_{\text{believe}}, \mathcal{C}_\alpha, \cdots, \mathcal{Z}_\mathcal{I};\\ \mathfrak{A}^1, \mathfrak{B}^{\text{believe}}, \mathfrak{C}^\alpha, \cdots, \mathfrak{Z}^\mathcal{I};\\ \mathcal{A}(\beta), \mathfrak{B}_\mathfrak{a}(\mathfrak{c}), \mathcal{C}_{\text{be\_conscious}}(\mathfrak{C}), \cdots, \mathfrak{Z}_\mathcal{Z}(\alpha)\end{array}$$

*are examples of single simple, subscribed, superscribed and functional operands of informing of entities, respectively.* □

Operands of informing explicate the operational properties (like informational operators) to them belonging or they including informational entities.

### 2.1.4 Functional Informational Operands

Functional operands express the informational functionalism which is an extreme generalization of function. The notion of mathematical function on the other (lower) side is a simple, reductionistic notion. In the last consequence, it represents an algorithm (mathematical definition) by which an argument set is mapped onto or into a value set, where arguments and values can be any abstractly determined objects. On the other side, informational functions are arbitrary formulas or formula systems being informationally dependent in a complex manner, e.g. as defined recursively and mutually-informingly in [13].

**Definition 3** [OPERANDS REPRESENTING INFORMATIONAL FUNCTIONS] *There are two equivalent forms of functional notation,* $\varphi(\xi)$ *and* $\varphi^*\xi$. *The first form follows the mathematical notation convention while the second one is more transparent in cases where* $\varphi$ *and* $\xi$ *are arbitrarily complex formulas or formula systems. The second form shows already the substantial (structural) difference between a mathematical and an informational function. For instance, an informational function of the form*

$$(\alpha \models \beta)^*(\gamma \models \delta)$$

*where* $\models$ *is an informational operator, has not an adequate notional equivalent in mathematics. According to [13], the following definition of an informational function is senseful:*

$$\varphi(\xi) \rightleftharpoons_{\mathrm{def}} \left( \begin{array}{l} \varphi \models_{\mathrm{of}} \xi; \\ \xi \models \varphi; \\ (\varphi \models_{\mathrm{of}} \xi) \subset \varphi; \\ (\xi \models \varphi) \subset_{\mathrm{of}} \varphi \end{array} \right)$$

*In this formula, operator* $\rightleftharpoons_{\mathrm{def}}$ *means* means by definition, $\models_{\mathrm{of}}$ *means* is a function of *or* depends informationally on, *etc. Operators of informational inclusion* $\subset$ *and* $\subset_{\mathrm{of}}$ *are determined recursively, in this particular case, by*

$$((\varphi \models_{\mathrm{of}} \alpha) \subset \varphi) \rightleftharpoons \left( \begin{array}{l} \varphi \models (\varphi \models_{\mathrm{of}} \alpha); \\ (\varphi \models_{\mathrm{of}} \alpha) \models \varphi; \\ (\varphi \models (\varphi \models_{\mathrm{of}} \alpha)) \subset \varphi; \\ ((\varphi \models_{\mathrm{of}} \alpha) \models \varphi) \subset \varphi \end{array} \right)$$

*where operator* $\rightleftharpoons$ *is read* means *and, for the second informational includedness, according to [12],*

$$((\alpha \models \varphi) \subset_{\mathrm{of}} \varphi) \rightleftharpoons \left( \begin{array}{l} \varphi \models_{\mathrm{of}} (\alpha \models \varphi); \\ (\alpha \models \varphi) \models_{\mathrm{of}} \varphi; \\ (\varphi \models_{\mathrm{of}} (\alpha \models \varphi)) \subset_{\mathrm{of}} \varphi; \\ ((\alpha \models \varphi) \models_{\mathrm{of}} \varphi) \subset_{\mathrm{of}} \varphi \end{array} \right)$$

*Operators as informational entities will be defined in the next subsection.* □

### 2.1.5 Other Informational Operands

Other informational operands concern special arrays of formulas as a consequence of, for example, informational decomposition, composition, gestalt, etc.

**Definition 4** [OPERANDS REPRESENTING INFORMATIONAL DECOMPOSITION, COMPOSITION, GESTALT, ETC.] *Special informational operands are distinguished markers for simple operands, informational formulas and informational formula systems which represent arrays of formulas being a consequence of informational decomposition, composition and gestalt structuring. The so-called* special informational operands *hide systematically (e.g. metaphysically, syntactically, etc.) derived formulas and are marked by the distinguished capital letters of the Greek alphabet [11], that is* $\Gamma, \Delta, \Theta, \Lambda, \Xi, \Pi, \Sigma, \Upsilon, \Phi, \Psi, \Omega$, *which can be subscribed and superscribed and written in a functional form. E.g.,*

$$\begin{array}{l} \Gamma, \Delta, \Theta, \cdots, \Omega; \\ \Gamma_{\mathrm{composition}}, \Gamma_{\mathrm{gestalt}}, \Delta_{\mathrm{decomposition}}, \cdots, \Omega_{\alpha}; \\ \Gamma(\alpha), \Delta_{\mathrm{serial}}(\alpha), \Delta^{\mathrm{metaphysical}}_{\mathrm{serial-parallel}}(\alpha), \cdots, \Omega_{\mathcal{I}}; \\ \Gamma_{\mathrm{serial}}(\alpha_1, \alpha_2, \cdots, \alpha_n), \cdots, \\ \qquad \Omega^{\mathrm{metaphysical}}_{\mathrm{gestalt}}(\psi_1, \cdots, \psi_n) \end{array}$$

*are examples of single simple, subscribed, superscribed and functional special operands, respectively [13].* □

**Definition 5** [OPERANDS REPRESENTING INFORMATIONAL INFERENCE RULES, PREMISES, CONCLUSIONS, AND OTHER ENTITIES] *Many other operand symbols can be introduced marking special informational entities or to them belonging formulas. For instance, for inferential rules, their premises and conclusions, the various alphabets of small and capital letters, e.g.*

$$\begin{array}{c} \mathbb{A}, \mathbb{B}, \mathbb{C}, \cdots, \mathbb{Z}, \\ \mathsf{a}, \mathsf{b}, \mathsf{c}, \cdots, \mathsf{z}, \\ \mathsf{A}, \mathsf{B}, \mathsf{C}, \cdots, \mathsf{Z} \end{array}$$

*can be introduced. Thus,*

$$\mathbb{R}^{\mathrm{rule},\, i}_{\mathrm{inferential}}(\mathsf{A}_i, \mathsf{B}_i) \rightleftharpoons \frac{\mathbb{P}^i_{\mathrm{premise}}(\mathsf{A}_i, \mathsf{B}_i)}{\mathbb{C}^i_{\mathrm{conclusion}}(\mathsf{B}_i)}$$

*where* $\mathsf{A}_i$ *and* $\mathsf{B}_i$ *are variables of the premise and the conclusion function, respectively.* □

Other specific operand symbols can be used to make entities clearly (characteristically) distinguished from each other.

## 2.2 Informational Operators

Informational operators inform the properties of the entities to which they belong. In this sense, they are dualistic entities in regard to the informing of entities [e.g. marked by $\mathcal{I}(\alpha)$ or $\mathcal{I}_\alpha$]. Like informing of an entity, the corresponding informational operator expresses the entity's property in an active informational manner. This correspondence is twofold: the informingness of the entity (informational externalism) and the informedness of the entity (informational internalism). In principle, various sorts of operators belong to an entity's externalistic and internalistic informing.

### 2.2.1 An Introduction to the Notion of Informational Operator

An informational operator expresses the general property of an entity in the form of entity's informing. It does not mean that by an operator the entire operational possibility of an operand is exhausted. A general case operator can be particularized and universalized in many ways, depending on the happening of an operand as informer and observer. We introduce the most general operator and its possible particularizations and universalizations by the following definitions.

**Definition 6** [General Informational Operator as a Unique Operational Joker] *The general informational operator, marked by* $\models$*, expresses the most general property of an entity, represented by an informational operand in a simple (marker) or a complex form (formula system). Although this operator is from-the-left-to-the-right-oriented, to enable its reading in the form* inform(s) *and* are (is) informed, *it does not mean that operator* $\models$ *does not possesses, within its generality, the potentiality of being from-the-right-to-the-left-oriented. Thus, any particularized, universalized or direction-concerning informational operator has its ground in* $\models$ *and represents nothing less and nothing more than a special case of this operator. Operator* $\models$ *performs as an informational joker which can act as a substitute and (mutual) replacement of any operational phenomenon.* □

A general informational operator embraces everything which can be imagined as operator, as an informational activity (informing and informed property) of the operand to which it belongs, to which it is attributed. Introducing the operational joker has the notional roots in the potentiality for leaving open any possibility of informing and determining the joker just in case when the property of an operand (informational entity) becomes (arises, emerges as) clearly identified. Thus, general informing means informing in a free and unforeseeable way, to guarantee the phenomenalism of informational spontaneity and circularity of the entity. The operational joker implicitly expresses just this informational situation and attitude of an entity which informs and is being informed.

### 2.2.2 General Informational Operator and Its Particularization and Universalization

Everything which is not a general informational operator, that is, $\models$, can be understood to be particularized or universalized through a meaning attributed to the operator. Operator particularization and universalization concerns a semantical content belonging to the operator as a consequence of the operand to which the operator is bound in an informing (externalistic) or informed (internalistic) manner.

The difference between particularization and universalization is merely semantic. In fact, both mean a specialization or concretization of the operational joker. On the other hand, a particularized operator can be meaningly universalized (replaced) to some extent and up to the joker itself.

**Definition 7** [Generally Particularized and/or Universalized Operational Joker] *One can introduce, together with the operational joker, four groups of four operators in the following way:*

- *Symbols* $\models, \not\models, =\!\!|, \not=\!\!|$ *are operators of informing, non-informing, alternative informing, and alternative non-informing, respectively. The alternative operators are read (from the left to the right) as* is (are) informed *and* is (are) not informed.

- *Symbols* $\Vert\!\models, \Vert\!\not\models, \models\!\Vert, \not\models\!\Vert$ *represent operators of parallel, non-parallel, alternative parallel, and alternative non-parallel informing, respectively. They are read in the following sense: inform(s), do(es) not inform, alternatively inform(s), alternatively do(es) not inform in parallel.*

- *Symbols* $\vdash$ , $\nvdash$ , $\dashv$, $\not\dashv$ *represent operators of circular (cyclical, loop-like) informing, non-informing, alternative informing, and alternative non-informing, respectively. They are read in the following way: inform(s), do(es) not inform, alternatively inform(s), alternatively do(es) not inform circularly.*

- *Symbols* $\Vert\!\vdash$ , $\Vert\!\nvdash$ , $\dashv\!\Vert$, $\not\dashv\!\Vert$ *represent operators of parallel-circular (parallel-cyclical, parallel-loop-like) informing, non-informing, alternative informing, and alternative non-informing, respectively. They are read in the following way: inform(s), do(es) not inform, alternatively inform(s), alternatively do(es) not inform parallel-circularly.*

□

Although, according to informational principles [9], informational entities inform in a circular way, the circular non-informing represents a particular (abstract) situation where circularity is excluded (e.g., mathematical formulas).

**Definition 8** [SEMANTICALLY PARTICULARIZED AND/OR UNIVERSALIZED OPERATIONAL JOKER] *Arbitrary informational subscripts and superscripts for informational operators can be used. The following examples demonstrate such possibilities:*

$$\models_\alpha, \not\models_\alpha, \models_\alpha^{\text{alternatively}}, \not\models_\alpha^{\text{alternatively}},$$
$$\models_\alpha^{\text{in\_parallel}}, \not\models_\alpha^{\text{in\_parallel}}, \models_{\text{alternatively}, \alpha}^{\text{in\_parallel}},$$
$$\models_{\text{circularly}}, \models_{\text{in\_parallel}, \alpha}^{\text{circularly}},$$
$$\models_{\text{inferentially}}, \models_{\text{by\_modus\_ponens}}^{\text{inferentially}}$$

*etc.* □

Particularization and universalization of informational operators can be chosen pragmatically, according to a language convention.

### 2.2.3 Informational Semicolon as an Operator of Parallelism

Parallelism of phenomena belong to the most general happening of the informational. Informational semicolon, marked by ';', has the meaning of parallelism of formulas between which it is set. It can be interpreted operator-rigorously by the use of parenthesis pairs. But usually, the parenthesis pairs are omitted.

**Definition 9** [SEMICOLON REPRESENTING INFORMATIONAL PARALLELISM] *A semicolon between two markers, formulas or formula systems* $\alpha$ *and* $\beta$ *means that these operands inform in parallel irrespective of their mutual informational connection. In traditional logic, parallelism means a conjunction of logical operands, e.g.* $\alpha \& \beta$ *or* $\alpha \wedge \beta$. *Informationally, operator* $\Vert$ *could be used. The precise definition is*

$$(\alpha; \beta) \rightleftharpoons_{\text{def}} (\alpha \models_{\text{in\_parallel}} \beta)$$

*Thus, operator ';' can represent any of operators* $\models_{\text{in\_parallel}}$, $\&$, $\wedge$, $\Vert\!\models$ ($\models\!\Vert$ *for an alternatively parallel case) and* $\Vert$. □

Circularly parallel operators describe circularly perplexed parallel cases.

### 2.2.4 Operator of Informational Implication

Informational implication differs essentially from the logical implication. As an operator, it appropriates the most general linguistic meaning of the verb *to imply.* For instance [15, 16],

- to enfold, enwrap, entangle, involve;
- to involve or comprise as a necessary logical consequence;
- to involve the truth or *existence* of (something not expressly asserted or maintained);
- to involve as a necessary circumstance: *informer entity implies an informed entity (informational observer);*
- to indicate or suggest as something naturally to be inferred, without express statement;
- to involve by signification or import;

- to signify, import, mean;
- to signify as much as, to be equivalent to, to mean or intend for;
- to express indirectly, to insinuate, hint at;
- to assume, include (synonymously); and
- to ascribe, attribute

are cases of a semantic correspondence. On the other hand, *to imply informationally* can simply appropriate the meanings as

- to interweave, interwine, interlace informationally; and
- to embrace, involve informationally.

**Definition 10** [OPERATOR OF INFORMATIONAL IMPLICATION] *Operator of informational implication, marked by* $\Longrightarrow$, *is a particularized form of the general informational operator* $\models$, *e.g.* $\models_{\Longrightarrow}$, $\models_{\text{implicatively}}$, $\models_{\text{involvingly}}$, *etc. The informationally obvious reading of operator* $\Longrightarrow$ *is 'implies informationally' or 'informs implicatively' (from the left to the right side of formula).* □

Similarly as in the traditional logic, informational implication is one of the keystones of the informational reasoning and inference, by which various informational derivations can come into existence.

### 2.2.5 Informational Operator of Inference

Informational operator of detachment in an inference rule has usually the form of a fraction line and a specific meaning.

**Definition 11** [OPERATOR OF INFORMATIONAL INFERENCE] *In an expression (informational formula) of the form* $\frac{\alpha}{\beta}$, *where formula* $\alpha$ *is called the premise and formula* $\beta$ *the conclusion, the fraction line* ($\frac{\cdots}{\cdots}$) *is an operator of informational inference which reads 'inform(s) inferentially' (or detachably). Thus,*

$$\frac{\alpha}{\beta} \rightleftharpoons (\alpha \models_{\text{inferentially}} \beta)$$

*Premise* $\alpha$ *is marked by* $\mathbb{P}$ *and is a function of at least two operands, e.g.,* $\mathsf{A}$ *and* $\mathsf{B}$, *that is,* $\mathbb{P}(\mathsf{A}, \mathsf{B})$. *Conclusion* $\beta$ *is marked by* $\mathbb{C}$ *and is a function of* $\mathsf{B}$, *that is,* $\mathbb{C}(\mathsf{B})$. *Thus, instead of the inferential rule* $\mathbb{R}$ *in the form*

$$\mathbb{R}(\mathsf{A}, \mathsf{B}) \rightleftharpoons \frac{\mathbb{P}(\mathsf{A}, \mathsf{B})}{\mathbb{C}(\mathsf{B})}$$

*there is*

$$\mathbb{R}(\mathsf{A}, \mathsf{B}) \rightleftharpoons (\mathbb{P}(\mathsf{A}, \mathsf{B}) \models_{\text{inferentially}} \mathbb{C}(\mathsf{B}))$$

□

There are many "standard" forms of inference rules with characteristic premise and conclusion entities; they will be informationally examined in Section 6.

### 2.2.6 Operator of Informational Being-in—Informational Inclusivism

Informational inclusion is a recursive concept which brings to the surface the informational connectedness or interweavement of informational entities.

**Definition 12** [OPERATOR OF INFORMATIONAL INCLUSION] *Operator of informational inclusion or informational Being-in is marked by* $\subset$. *In the context of operands* $\alpha$ *and* $\beta$, *it is defined by the following recursive (circular) informational formula [12]:*

$$(\alpha \subset \beta) \rightleftharpoons_{\text{Def}} \begin{pmatrix} \beta \models \alpha; \\ \alpha \models \beta; \\ \Xi(\alpha \subset \beta) \end{pmatrix}$$

*where for the extensional part* $\Xi(\alpha \subset \beta)$ *of the includedness* $\alpha \subset \beta$, *there is,*

$$\Xi(\alpha \subset \beta) \in \mathcal{P}\left(\left\{\begin{matrix} (\beta \models \alpha) \subset \beta, \\ (\alpha \models \beta) \subset \beta, \\ (\beta \models \alpha) \subset \alpha, \\ (\alpha \models \beta) \subset \alpha \end{matrix}\right\}\right)$$

*The most complex element of power set* $\mathcal{P}$ *is denoted by*

$$\Xi^{\beta,\alpha}_{\beta,\alpha}(\alpha \subset \beta) \rightleftharpoons \begin{pmatrix} (\beta \models \alpha) \subset \beta, \alpha; \\ (\alpha \models \beta) \subset \beta, \alpha \end{pmatrix}$$

*Cases, where* $\Xi(\alpha \subset \beta) \rightleftharpoons \emptyset$, *and* $\emptyset$ *denotes an empty entity (informational nothing), are exceptional (reductionistic).* □

### 2.2.7 Operator of Informational Being-of—Informational Functionalism

Informational function, as defined by Definition 3 (the informational Being-of), is a recursive concept of informational dependence between informational entities and represents a generalization of the concept of a function known in mathematics. Within a functional notation, e.g. $\varphi(\xi)$, the operator of functionality remains hidden, that is, not explicitly visible. That which happens between the functional formula $\varphi$ and its argument formula $\xi$, is ladled by Definition 3. We can understand that informational structure, if instead $\varphi(\xi)$ the notation $\varphi^*\xi$ or even $(\varphi)^*(\xi)$ is used, where both informational parts are clearly operationally distinguished. Thus, operator $^*$ functions as a complex operator according to Definition 3.

On the other hand, operator $\models_{\mathrm{of}}$ is a narrower functional operator, expressing only a part of the functional concept. This operator can be determined into further details, symbolizing the informational dependence of functional entity $\varphi$ on argumentative entity $\xi$.

**Definition 13** [OPERATORS OF INFORMATIONAL FUNCTIONALISM] *Symbols, which mark informational functionality of a broader and a narrower sense, are*

$$\varphi(\xi),\ ^*, \models_{\mathrm{be\_a\_function\_of}}, \models_{\mathrm{of}}, \cdots$$

*They can be variously defined in a concrete informational manner.* □

### 2.2.8 Composition and Decomposition of Informational Operators

Informational operators can be composed and decomposed. Composition is a process of operational design where distinguished informational operators are composed into bigger operator units. Decomposition of an operator means to deconstruct it by means of an adequate formula part introducing the so-called informational gestalts [13] into a formula with certain operands.

**Definition 14** [COMPOSED AND DECOMPOSED INFORMATIONAL OPERATORS] *Two informational operators, $\models_\alpha$ and $\models_\beta$ can be composed into a new operator, applying the special symbol $\circ$, that is, $\models_\alpha \circ \models_\beta$. More complex operator compositions of operators $\models_{\alpha_1}, \models_{\alpha_2}, \cdots, \models_{\alpha_n}$ must be properly parenthesized, e.g.*

$$(\cdots((\models_{\alpha_1} \circ \models_{\alpha_2}) \circ \models_{\alpha_3}) \circ \cdots \models_{\alpha_{n-1}}) \circ \models_{\alpha_n},$$
$$\cdots$$
$$\models_{\alpha_1} \circ (\models_{\alpha_2} \circ (\models_{\alpha_3} \cdots \circ (\models_{\alpha_{n-1}} \circ \models_{\alpha_n}) \cdots))$$

*To decompose an informational operator $\models$, for instance in a formula $\alpha \models \beta$, means to put between operands $\alpha$ and $\beta$ a part of formula, that is an informational frame ([13], Definition 12), where the original formula $\alpha \models \beta$ becomes $\Subset \alpha \Rrightarrow \beta \Supset$ or, formally,*

$$(\alpha \models \beta) \models_{\mathrm{by\_decomposition}} (\Subset \alpha \Rrightarrow \beta \Supset)$$

*There exist infinitely many possibilities of an operator $\models$ decomposition.* □

### 2.2.9 Other Informational Operators

Other informational operators can be introduced pragmatically considering a language convention and the appropriateness of operator symbols. In this sense, direct (clearly symbolical), particularized and universalized operators can be introduced. For example, $\models$, $\in$, $\rightarrow$,$^*$ in $\varphi^*\xi$, $\subset$, $\Longrightarrow$, $\rightleftharpoons$, etc. belong to the class of direct informational operators. Particularized operators, e.g. $\models_{\mathrm{inferentially}}$, express a special, narrower properties of informing entities, while universalized operators express broader properties of entities which inform and are informed. There is a hierarchy of operators in the sense of the particular towards the general, which is particular-universal-general.

## 3 Concept of Informational Formula

Informational formula is a well-formed sequence of informational operands, operators and parenthesis pairs. The well-formedness of informational formulas is determined recursively. A formula represents an informationally arising informational entity and behaves by itself as an arising informational entity. From the philosophical point of view, a formula is nothing else than a result of an observer's informational process, which represents the observed entity at the site and through the view of the observer.

Informational formula is a model of the informing entity which is being analyzed, deconstructed and decomposed. This process of the informational identification of an entity through an informational formula or formula system can be continued to new forms, facts, constructions, designs, etc. according to the abilities of the observing entity. The observing entity can observe itself and perform informational changes on itself, so, this principle leads to the circular informing of an entity, that is, to the circular structure of an entity representing formula.

### 3.1 A General Syntax of Informational Formulas (Operands and Operators)

Informational formula is a general term including also the system of informational formulas. A well-formed informational formula acts as an informational operand. E.g. informational markers are formulas which mark complex, composed formulas.

**Definition 15** [INFORMATIONAL FORMULA SYNTAX] *Let $\alpha$ mark different informational operands $\alpha$, $\beta$, $\cdots$, $\omega$, $\mathcal{A}$, $\mathcal{B}$, $\cdots$, $\mathcal{Z}$, $\mathfrak{A}, \mathfrak{B}, \cdots$, $\mathfrak{Z}$, $\Gamma$, $\Delta$, $\cdots$, $\Omega$, $\mathbb{A}$, $\mathbb{B}$, $\cdots$, $\mathbb{Z}$, $\cdots$ and let $\models$ be the most general informational operator which can represent any operational particularization and universalization. Then, an informational formula (IF for short) is informationally well-formed, if it is constructed by the following syntactic rules, where operator $\leftarrow$ has the meaning 'becomes (gets, is replaced by)':*

1. *Operand $\alpha$ (as a marker) is IF.*
2. *Rule $\alpha \leftarrow (\alpha)$ says that operand $\alpha$, representing a marker, formula or formula system, can be put into parentheses. Expression $(\alpha)$ is IF.*
3. *Rule $\alpha \leftarrow (\alpha_1, \alpha_2, \cdots, \alpha_n)$ permits the replacement of $\alpha$ by a list (of mutually non-informing) operands $\alpha_1$, $\alpha_2$, $\cdots$, $\alpha_n$. Such list of operands is IF.*
4. *Rule $\alpha \leftarrow \begin{pmatrix}\alpha; \\ \alpha\end{pmatrix}$ says that $\alpha$ can be parallelized by $\alpha$ where $\alpha$'s can represent different entities informing in parallel. The parentheses can be omitted. Expression $\begin{pmatrix}\alpha; \\ \alpha\end{pmatrix}$ is IF.*
5. *Rule $\alpha \leftarrow (\alpha \models)$ allows the replacement of $\alpha$ by $\alpha \models$. Expression $\alpha \models$ is IF.*
6. *Rule $\alpha \leftarrow (\models \alpha)$ enables the replacement of $\alpha$ by $\models \alpha$. Expression $\models \alpha$ is IF.*
7. *Rule $\alpha \leftarrow (\alpha \models \alpha)$ says that operand $\alpha$ can be replaced by $\alpha \models \alpha$ (where the parentheses are omitted), and the first and the second operand $\alpha$ can differ arbitrarily. Expression $\alpha \models \alpha$ is IF.*

*This list of syntactic rules can be broadened if necessary.* □

Other syntactic structures are already deduced by the defined list of syntactic rules. For instance, function $\varphi(\xi)$ is nothing else than an expression $\varphi{}^*\xi$, where $^*$ is informational operator, that is, $\varphi(\xi) \rightleftharpoons (\varphi \models_{\text{functionally\_on}} \xi)$.

**Definition 16** [INFORMATIONAL OPERATOR COMPOSITIONS] *Compositions of informational operators (IO for short), where $\circ$ marks the operator composition, underlie the following operator syntactic rules:*

1. *Symbol $\models$ represents the general IO.*
2. *Operator rule $\models \leftarrow (\models_\alpha \circ \models_\beta)$ says that operator $\models$ can be replaced by a meaningly adequate composition $\models_\alpha \circ \models_\beta$ of operators $\models_\alpha$ and $\models_\beta$. An operator composition is IO.*
3. *If in an operator composition there are more than two operators, they must be adequately parenthesized, e.g.*

   $$\models_\alpha \circ (\models_\beta \circ \models_\gamma) \quad \text{or} \quad (\models_\alpha \circ \models_\beta) \circ \models_\gamma$$

   *etc., where complex compositions are IO's.*
4. *Operator rule*

   $$\models \leftarrow (\models_{\text{particularly}} \vee \models_{\text{universally}} \vee \models_{\text{directly}})$$

   *where $\vee$ means 'is alternative to', says that IO $\models$ can be replaced by operators $\models_{\text{particularly}}$ or $\models_{\text{universally}}$ or $\models_{\text{directly}}$ which are IO's. Operator $\models_{\text{directly}}$ represents the so-called directly expressed operators, e.g. $\subset$, $\rightleftharpoons$, $\Longrightarrow$, $^*$, $\leftarrow$, etc.*

*Operator compositions follow a conceptual semantics of the designing and designed entity and their syntax (parenthesizing) is determined by Definition 14.* □

The presented informational syntax is in no way a final case. The syntactic concepts can be refined or detailed according to informational circumstances.

### 3.2 Equivalence of Informational Formulas

There does not exist an informaional equivalence of different informational formulas. But, equivalence relations between different formalized expressions can be introduced on an abstract and reductionistic level, e.g. in mathematics. Within GIT, it is possible to observe different formulas with similar informational meaning (semantics, pragmatics). Thus, for example, formulas $\alpha$ and $\alpha \models \alpha$ are not equivalent because the second formula is a derivation of the first formula in the sense of a consecutive application of modus ponens. The meaning of $\alpha$ is a marker, the meaning of $\alpha \models \alpha$ points to an inner circular (metaphysical, deconstructive, decompositional) structure of entity represented by $\alpha$.

### 3.3 Implicitness and Explicitness of Informational Formulas

In concern to the discussion in the previous subsection, formula $\alpha$ as a marker is entirely implicit as long as its meaning is determined on some other place by some other formula. We say, that irrespective of the existence of such other, meaningly determined formulas, formula $\alpha$ hides the implicitness of its informational potentiality. This means that $\alpha$ as any other, regular informational entity, can be decomposed into more details, determining its structure which, through decomposition, becomes more and more complex, e.g. serially as well as in a parallel manner. For example, $\alpha \models \alpha$ is the first (although formally trivial) step on the way of informational decomposition. In this sense, formula $\alpha \models \alpha$ informs more explicitly than does formula $\alpha$. The possibility for a further explicitness of a formula does always exist.

### 3.4 Formula Parallelism

The possibilities of parallelism of informational formulas do always exist. The syntactic rule

$$\alpha \leftarrow \begin{pmatrix} \alpha; \\ \alpha \end{pmatrix}$$

is simultaneously a regular principle of an entity parallel decomposition. By this rule, parallel formulas, concerning entity $\alpha$ can be generated ad infinitum.

Informational parallelism is straightforward and cyclic, depending on the structure of parallel formulas.

### 3.5 Formula Serialism

The possibilities of serialism of informational formulas do always exist. The syntactic rule

$$\alpha \leftarrow (\alpha \models \alpha)$$

assures the arising of serial formulas, which can be straightforward, circular or metaphysical [10]. A straightforward serial formula is, for example,

$$(\cdots(\alpha \models \beta) \models \cdots \psi) \models \omega$$

and all other formulas obtained by the well-formed displacement of the parenthesis pairs. A cyclical serial formula is, for instance,

$$((\cdots(\alpha \models \beta) \models \cdots \psi) \models \omega) \models \alpha$$

and all other formulas obtained by the well-formed displacement of the parenthesis pairs. A metaphysical serial formula is, for example,

$$(((((\alpha \models \mathfrak{I}_\alpha) \models \mathfrak{C}_\alpha) \models \mathfrak{c}_\alpha) \models \mathfrak{E}_\alpha) \models \mathfrak{e}_\alpha) \models \alpha$$

where $\mathfrak{I}_\alpha$ is informing, $\mathfrak{C}_\alpha$ is counterinforming, $\mathfrak{c}_\alpha$ is counterinformational entity, $\mathfrak{E}_\alpha$ is informational embedding, and $\mathfrak{e}_\alpha$ is embedding informational entity of informational entity $\alpha$. All other metaphysical formulas concerning $\alpha$ can be obtained by the well-formed displacement of the parenthesis pairs.

### 3.6 Parallel and Serial Circularity of Informational Formulas

The circularity of formulas can become very complex, for example, parallel-serial and serial-parallel.

A parallel-serial circularity is given by a set of parallel formulas which are structured in such a manner that a certain transitivity of occurring operands through these parallel formula takes place. A trivial example of a parallel-serial scheme would be a formula system, marked by $\psi^{\|}$, that is,

$$\psi^{\|} \rightleftharpoons \begin{pmatrix} \alpha \models \alpha_1; \\ \alpha_1 \models \alpha_2; \\ \cdots \\ \alpha_{n-1} \models \alpha_n; \\ \alpha_n \models \alpha \end{pmatrix}$$

A serial-parallel circularity is obtained if in a serial formula parallel subformulas appear, for instance, in the form

$$(\cdots((\alpha \models \alpha_1^{\|}) \models \alpha_2^{\|}) \models \cdots \alpha_n^{\|}) \models \alpha$$

where $\alpha_1^{\|}$, $\alpha_2^{\|}$, $\cdots$, $\alpha_n^{\|}$ are parallel arrays of formulas.

The reader can imagine how this basic example can become more and more complicated.

### 3.7 The Case of Formula $\alpha \models \beta$

The case of formula $\alpha \models \beta$ offers a unique opportunity for clarification of the problem existing between $\alpha$ as informer and $\beta$ as observer of $\alpha$

**Definition 17** [THE INFORMER AND OBSERVER PROBLEM CONCERNING FORMULA $\alpha \models \beta$] *Considering the concept of operator composition in Definition 14, one has the following definition:*

$$(\alpha \models \beta) \rightleftharpoons_{\mathrm{def}} (\alpha \models_\alpha \circ \models_\beta \beta)$$

*Operator composition $\models_\alpha \circ \models_\beta$ performs as an informational transition filter between entities represented by operands $\alpha$ and $\beta$.* □

This definition explains how observer $\beta$ can be informed about $\alpha$ only to the extent within which $\alpha$ informs in an $\alpha$'s specific way and $\beta$ is capable to be informed in a $\beta$'s specific way.

It seems senseful to explain the nature of informingness $\alpha \models$ and informedness $\models \beta$ additionally. The first case belongs to informational externalism and means that entity represented by an operator marked by $\alpha$ informs strictly within the informing abilities of $\alpha$, that is, $\alpha$-characteristically, or

$$\alpha \models_\alpha \circ \models$$

The occurring operator composition $\models_\alpha \circ \models$ demonstrates that the informing of $\alpha$ happens openly to the entire informational domain (field, space, also realm) through operator $\models$ at the right end of the operator composition.

In the second case we have to do with informational internalism, which means that entity represented by operator marked by $\beta$ is informed (in fact, can be informed) strictly in the framework of the informing abilities (informedness) of $\beta$, that is, $\beta$-characteristically, or

$$\models \circ \models_\beta \beta$$

The occurring operator composition $\models \circ \models_\beta$ demonstrates that the informedness of $\beta$ happens openly to the entire informational domain through operator $\models$ at the left beginning of the operator composition.

Within formula $\alpha \models \beta$ the described informational openness of the left and the right operand is blurred (however, implicitly present). Thus, possible complete meanings of the formula would be

$$\begin{array}{ll} \alpha\,(\models_\alpha \circ \models) \circ (\models \circ \models_\beta)\,\beta & \text{or} \\ \alpha\,((\models_\alpha \circ \models) \circ \models) \circ \models_\beta \beta & \text{or} \\ \alpha \models_\alpha \circ (\models \circ (\models \circ \models_\beta))\,\beta & \end{array}$$

where in the basic form $\alpha \models \beta$ the characteristic operator parts $\models_\alpha$ and $\models_\beta$ are implicit (invisible) and in the compositional form $\alpha \models_\alpha \circ \models_\beta$ the general operator (joker) $\models$ is superfluous.

### 3.8 Inferential Informational Formulas

An inferential informational formula or inference in short has a general form

$$\frac{\alpha}{\beta} \quad \left(\text{or } \frac{\mathbb{P}}{\mathbb{C}}\right)$$

where $\alpha$ marks the *premise* (marked also by $\mathbb{P}$) and $\beta$ the *conclusion* (marked also by $\mathbb{C}$). Thus, by $\frac{\alpha}{\beta}$ (or $\mathbb{P}/\mathbb{C}$), there is an *inferring* (informing in an inferential manner) from $\alpha$ to $\beta$ (or $\mathbb{P}$ to $\mathbb{C}$). What stands under the inferential line (informational operator of inference) is always a conclusion (operand marker, formula or formula system) and above of it, a premise (operand marker, formula or formula system). Premise means assumption, postulate, hypothesis, axiom, principle, and the like. E.g., a postulate is something (informational formula) taken as self-evident or assumed without proof as a basis for reasoning. Thus, a postulate within a premise performs as an axiom or as an already derived operand, theorem, formula, formula system, etc.

E.g., one cannot say that $\alpha$ infers $\beta$; but, one can always observe that $\alpha$ *informs inferentially* $\beta$, for instance in the sense, that the occurrence of $\alpha$ calls for an inference to $\beta$ or that from $\alpha$, there can be inferred to $\beta$, etc. In this manner, the informing of something expresses the capability or characteristics of the informing entity in respect to the informed entity.

In case $\frac{\alpha}{\beta}$ we have the situation which must not be forgotten:

$$\left(\frac{\alpha}{\beta}\right) \rightleftharpoons (\alpha \models_{\alpha,\,\mathbf{inferentially}} \circ \models_{\beta,\,\mathbf{inferentially}} \beta)$$

If $\alpha \models_{\alpha,\,\mathbf{inferentially}}$, there can be not only $\models_{\beta,\,\mathbf{inferentially}} \beta$, but any other kind of conclusion, say, $\models_{\gamma,\,\mathbf{inferentially}} \gamma$, with another, informationally different (logical) structure of $\gamma$ in comparison to $\beta$. Rules of inference can arise as any other regular informational formula. If one proceeds from standard inferential rules (e.g., tertium non datur, modus ponens, modus tollens, etc.), it does not mean that arbitrary inferential rules cannot come to the theoretical surface or cannot emerge during the theoretical discourse.

Further, it must be clarified what can the application of an inferential rule $\rho$ (or $\mathbb{R}$) upon an informationally approved formulas $\alpha$ and $\beta$ (acting as a premise $\mathbb{P}$ and conclusion $\mathbb{C}$) mean, for instance, in the form of the informational Being-of or functionalism $\rho(\alpha, \beta)$ [or $\mathbb{R}(\mathbb{P}, \mathbb{C})$]. In this case, inferential rule $\rho$ becomes an informational function over formulas (formula systems) marked by $\alpha$ and $\beta$.

# 4 The Propositional and the Predicate versus the Informational

## 4.1 Traditional and Informational Logic

Theory of logical propositions and predicates (for instance, [5, 8]) introduces propositions and predicates (logical functions concerning elements as functional arguments belonging to arbitrary sets) in the value domain of truth and falseness (untruth). Informational entities and informational functions concern formulas which, within them and in parallel, can produce formulas as results or "values". Let us demonstrate the difference between both approaches on the level of existence of something, truth of predicates, and informing of something.

Something, marked by $\alpha$, certainly has the property of existence. The framed expression $\boxed{\text{something exists}}$ is a formula which transits in a predicate form $\boxed{\boxed{\text{something exists}}\ \text{is true}}$. In a formalized way, the predicate form

$$\boxed{\boxed{\alpha\ \text{exists}}\ \text{is true}}$$

corresponds to the predicate $E(\alpha)$. A predicate is always understood to be a matter of the observer, e.g. mathematician. On the other hand, informational formula which expresses the fact '$\alpha$ exists' or, more precisely, '$\alpha$ informs to exist', or '$\alpha$ informs existingly', that is, $\alpha \models_{\mathbf{exist}}$, belongs not to the observer, but to the informer $\alpha$ as a property of its informing. The predicate form $E(\alpha)$, expressed in an informational form, would be

$$(\alpha \models_{\mathbf{exist}}) \models_{\mathbf{true}}$$

The truth of a predicate concerns the predicate and not the entity as an argument of the predicate. Thus, the framed expression

$$\boxed{\boxed{\text{entity exists}}\ \text{informs true}}$$

can be understood as a predicate $E(\alpha)$ with an implicit (assumed) faculty of trueness on one side and as an informational formula $(\alpha \models_{\mathbf{exist}}) \models_{\mathbf{true}}$ which transparently (expressively) informs the faculty of the entity itself, for example, in the form as: *entity is, as it does exist, and as it does exist in a true way.*

The other (contrary) case is

$$\boxed{\boxed{\text{entity does not exist}}\ \text{informs true}}$$

which corresponds to the predicate form $\overline{E(\alpha)}$ and to the informational form

$$(\alpha \not\models_{\mathbf{exist}}) \models_{\mathbf{true}}$$

In this point, one has to clarify how does entity $\alpha$ (in German, das Seiende $\alpha$) not exist. The answer is: *in a certain way!* Informational operator $\not\models_{\text{exist}}$ is in respect to operator $\models_{\text{exist}}$ nothing else than a particularized operator of the type $\models_{\text{exist}}$. This is uniquely not clear in case of $\overline{E(\alpha)}$.

The difference which can now be drawn between the predicate view and the informational one is the following: the predicate view concerns implicitly the observer of an entity while, on contrary, the informational view concerns explicitly the informer and the observer and where both can perform in one and/or another way, that is, informer as informer and observer, and observer as informer and observer, simultaneously. In the informational case, the observer must be explicitly present (marked) and must inform and be informed explicitly, through concrete, particularized or universalized informational operators. While the predicate case concentrates on the observer and the informer (the argument or variable of the predicate) is only an object of the observer, the informational view distributes the informing between both the observer (the informedness) and informer (the informingness).

Axiomatically, the informer stands before the observer and the observed (the informing entity, that is, informer) can only be that which informs. Both are informationally active and passive entities (subject and object, simultaneously) and explicitly present (informationally determined).

Propositional and predicate logic stress the observer's view, that is, the so-called *informational internalism.* Informational logic unites the so-called *informational externalism* and *internalism* in the framework of informational metaphysicalism and phenomenalism. And, in this kind of view lies the novelty and the power of informational arising as a spontaneous and circular phenomenon, within the discourse which is on the way and which follows.

## 4.2 The "Value" of an Informational Formula

The concept of value belongs to the basic mathematical concepts. In mathematics [15, 16], value is the precise number or amount represented by figure, quantity, etc. For instance, numbers, elements of sets, truth and falsity, magnitude, a point in the range of a function, the value of a word, etc. are values for variables and functions. A similar question can be reasonably put to the surface in case of the informational: which are the values of informational operands as variables, markers, formulas and formula systems? How can informational values be achieved (accessed) and what do they represent as informational formulas?

In music, value is the relative length or duration of a tone signified by a note. In painting, it is due or proper effect or importance; relative tone of colour in each distinct section of a picture; a patch characterized by a particular tone. In philosophy, value means axiology.

An informing formula produces formula-like results. A result can be understood as a part, piece of formula, as an arising parallel formula or formula system, which value is a semantically and pragmatically converted, transverse sort of information, e.g. text, picture, voice, signal, etc. The same principle can be used for the domain of input operands, that is, informational variables, formulas, etc. as informing entities.

Informational formulas are, in respect to the natural means (languages, pictures, voices, signals, etc.), adequately informationally encoded entities which, in any state or position, can be understandingly decoded as values, in a "natural" form. Informational encoding and decoding can use any formalized (mathematized, systemized, procedural, etc.) means, methods, concepts, algorithms, apparatuses, approaches, formulas, etc. as well as those of the informational view, science, theory, systems, etc.

## 4.3 Logical and Informational Examples

Tautology and (informational) circularity are the focal problems of traditional mathematical and informational logic. We will show how a syntactically circular formula in mathematical logic is never comprehended as a circular (tautological) scheme while within an informational logic just this type of syntactic expression is considered to be circular. Thus, traditionally, the formula circularity (tautology) is pushed off the conscious horizon, while informationally circularity is considered as a cyclically operating kind of informing. To get a clear picture of such phenomenalism, we will use examples concerning the so-called foundations of mathematics, that is, its metatheory.

**Example 1** [IMPLICATIVE AXIOMS FOR PROPOSITIONAL CALCULUS] *Formalizing the logical reasoning (inference) in propositional calculus ([5] p. 66), Hilbert lists a (geometrical) group of his axiom formulas of implication:*

$$\begin{array}{rcl} A & \rightarrow & (B \rightarrow A), \\ (A \rightarrow (A \rightarrow B)) & \rightarrow & (A \rightarrow B), \\ (A \rightarrow B) & \rightarrow & ((B \rightarrow C) \rightarrow (A \rightarrow C)) \end{array}$$

*Informationally, these implicative formulas exert a sort of circularity regarding propositional operands $A$, $B$ and $C$.* □

The first formula says that proposition $A$, if not an axiom, has its logical cause in a proposition $B$. It simply means the following: *Something implies that it is implied by something other.* The second formula stresses that if proposition $A$ implies an implication $A \rightarrow B$, then $A$ implies $B$. It can be interpreted as: *If something implies that it implies something other then something implies something other.* The third formula says: if $A$ implies $B$ then the implication $B \rightarrow C$ implies also the implication $A \rightarrow C$. Said by other words, there is: *Something implies something other implies the following: if something other implies something third then something implies something third.*

The listed axioms are in a certain accord with common sense. All of them are identically true logical formulas, which can be easily verified by

$$\begin{array}{rcl} \overline{A} & \vee & \overline{B} \vee A, \\ (A \wedge \overline{B}) & \vee & \overline{A} \vee B, \\ (A \wedge \overline{B}) & \vee & (B \wedge \overline{C}) \vee \overline{A} \vee C \end{array}$$

respectively.

Reading the original formulas, a mathematician does not observe the circular structure of the listed axiomatic formulas. Implication seems to be such a kind of the logical operator which does not evoke the 'feeling' of circularity although the markers of one and the same kind are used several times in the implicative expression (e.g. in implication of implication). This fact becomes informationally true if in original formulas the logic implication operator is replaced (universalized) by the informational joker and operands are adequately marked by $\alpha_A$, $\beta_B$ and $\gamma_C$ that is,

$$\begin{array}{l} \alpha_A \models (\beta_B \models \alpha_A); \\ (\alpha_A \models (\alpha_A \models \beta_B)) \models (\alpha_A \models \beta_B); \\ (\alpha_A \models \beta_B) \models ((\beta_B \models \gamma_C) \models (\alpha_A \models \gamma_C)) \end{array}$$

The first formula is circular in $\alpha_A$, the second one in $\alpha_A$ and $\beta_B$, and the third one in $\alpha_A, \beta_B$ and $\gamma_C$. All together form a parallel informational system (operator ';').

**Example 2** [IMPLICATIVE AXIOMS FOR INFORMING OF INFORMATIONAL ENTITIES (OPERANDS)] *An instructive, now informational case with informational implication operator $\Longrightarrow$ is*

$$\begin{array}{rcl} \alpha & \Longrightarrow & (\beta \Longrightarrow \alpha); \\ (\alpha \Longrightarrow (\alpha \Longrightarrow \beta)) & \Longrightarrow & (\alpha \Longrightarrow \beta); \\ (\alpha \Longrightarrow \beta) & \Longrightarrow & ((\beta \Longrightarrow \gamma) \Longrightarrow \\ & & (\alpha \Longrightarrow \gamma)) \end{array}$$

*which leads to the basic informational axioms, for example, of the form*

$$\begin{array}{rcl} (\alpha \models) & \Longrightarrow & (\alpha \Longrightarrow (\alpha \models)); \\ (\alpha \Longrightarrow (\alpha \Longrightarrow (\alpha \models))) & \Longrightarrow & (\alpha \Longrightarrow (\alpha \models)); \\ (\alpha \Longrightarrow (\alpha \models)) & \Longrightarrow & (((\alpha \models) \Longrightarrow \\ & & (\models \alpha)) \Longrightarrow \\ & & ((\alpha \Longrightarrow (\models \alpha))) \end{array}$$

*The last example shows how the "global" Hilbert's implicative axioms can reasonably be applied in the informational case where the traditional* Truth of Propositions *is replaced by the* Informing of Informational Formulas. □

## 5 Phenomenalistic Axioms of the Informational

> Zur Erleichterung soll bei den ersten Axiomen die sprachliche Fassung hinzugefügt werden.
>
> —D. Hilbert und P. Bernays [5] 5

The so-called phenomenalistic axioms of the informational are meant to be the axioms of the object and metatheory, and the inference axioms (initial rules for informational inference) underlie the general informational phenomenalism. General informational theory is, namely, a unit of the formal object theory and the formal metatheory, that is, the theory of informational inferring (proving, causing, concluding—deriving). As stated in the quotation of this section, the natural language comprehension cannot be avoided at the very beginning of the presented informational axiomatization.

In this section the basic axioms will be presented in an aprioristic and postprioristic manner. The independence of axioms will not be considered. Later on, it will become clear that only one informational axiom can be chosen, however, by the use of informational inference rules, other axioms can be derived (deduced).

## 5.1 Informational Externalism

Let us try to state which sort of axiom could be quite on the top of the informational. Already in Example 2 we have applied Hilbert's axioms [5] for the informational case.

**Axiom 1** [INFORMATIONAL EXTERNALISM] *Aprioristically (commonsensically, trivially, intuitively [6]) at the top of the informational (system) has to be something which deepeningly (most essentially) concerns an informational entity $\alpha$. So, let it be an informational implication of the form*

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

*This axiomatic formula says: "If informational entity (represented by operand $\alpha$) implies that it implies its informing(ness), then the entity implies that it informs." The next, substantial axiomatic rule of informational externalism (according to Example 2 [5]) is*

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

*Informing(ness) of $\alpha$ implies that $\alpha$ itself is the cause of its informing(ness).* □

According to the last axiomatic formulas, everything informational, irrespective of its informational structure or complexity, informs. Both formulas are informationally (and traditional-logically) consistent, that is, informationally (logically) noncontradictory. In traditional logic, pertaining to truth, it would mean, that both formulas are true (even identically true) or, expressed informationally, $(\alpha \Longrightarrow (\alpha \models)) \models_{\text{true}}$.

**Example 3** [EXTERNALISM OF NON-INFORMING] *Informing and non-informing of an entity $\alpha$ are parallel phenomena. Non-informing may be comprehended as a particular phenomenon of informing. Thus, operator $\not\models$ which reads 'does not inform', is a particular case of operator $\models$.*

*$\alpha \models$ means that $\alpha$ informs in a specific manner, that is $\alpha$-characteristically. $\alpha \not\models$ means that $\alpha$ does not inform in a certain way, that is, it informs $\alpha$-non-characteristically. Thus,*

$$(\alpha \models) \rightleftharpoons (\alpha \models_\alpha) \quad \text{and} \quad (\alpha \not\models) \rightleftharpoons (\alpha \not\models_\alpha)$$

*Operator $\models_{\neq\alpha}$ would mean informs differently in comparison to $\alpha$-characteristically.*

*According to Axiom 1, for a particular case concerning $\alpha$, there is $\alpha \Longrightarrow (\alpha \models_{\text{particularly}})$. According to this principle, also*

$$\alpha \Longrightarrow (\alpha \not\models)$$

*holds. This implication will become significant in our further discussion.* □

## 5.2 Informational Internalism

Informational internalism is a dualistic concept in regard to informational externalism. Axiomatically, the question arises, which of both phenomena is the primary one and which is the consequence of the other. Thus, quite at the beginning of axiomatization, the next axiom could also be accepted.

**Axiom 2** [INFORMATIONAL INTERNALISM] *Aprioristically (commonsensically, trivially) at the top of the informational could also be something which deepeningly (most essentially) concerns an informational entity $\alpha$ in the sense of its informedness. So, let introduce an informational implication of the form*
$(\alpha \Longrightarrow (\alpha \Longrightarrow (\models \alpha))) \Longrightarrow (\alpha \Longrightarrow (\models \alpha))$
*This axiomatic formula says: "If informational entity (represented by operand $\alpha$) implies that it implies its informedness, then the entity implies that it is informed." The next, substantial axiomatic rule of internalism is, for instance,*

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

*Informedness of $\alpha$ implies that $\alpha$ itself is the cause of its informedness.* □

According to the last axiomatic formulas, everything informational, irrespective of its informational structure or complexity, is informed. Both formulas are informationally (and traditional-logically) consistent, that is, informationally (logically) noncontradictory. In traditional logic, pertaining to truth, it would mean, that both formulas inform true (are identically true), or expressed informationally, $(\alpha \Longrightarrow (\models \alpha)) \models_{\text{true}}$.

### 5.3 Informational Metaphysicalism

Informational metaphysicalism is a general and entity specific way of circular informing. In general, it proceeds from the initial circular form $\alpha \models \alpha$ which is trivially circular, but becomes structurally circular by decomposition. Specifically, the decomposition of this form can be standardized to some extent, introducing explicitly the components of informing, counterinforming and informational embedding as entities which inform within an informational entity [10].

**Axiom 3** [INFORMATIONAL METAPHYSICALISM] *Aprioristically (commonsensically, trivially, intuitively) at the top of the informational could also be something which deepeningly (most essentially) concerns an informational entity $\alpha$ in itself, as its inner informing or informational arising, called metaphysicalism. So, we can introduce an informational implication of the form*

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

*This axiomatic formula says: "If informational entity (represented by operand $\alpha$) implies that it implies its metaphysicalism, then the entity implies that it informs and is informed circularly." The next, essential axiomatic rule of metaphysicalism is, for instance,*

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

*Circular informing within $\alpha$ itself implies that $\alpha$ itself is the cause (phenomenon) of its metaphysicalism.* □

According to the last axiomatic formulas, everything informational, irrespective of its informational structure or complexity, informs and is informed in a metaphysical manner.

### 5.4 Informational Phenomenalism

Informational phenomenalism means a parallelism of informational externalism and internalism regarding an informational entity $\alpha$. By this, an entity is open as an informer and observer to its environment and to itself (metaphysicalism). Informational phenomenalism is the most general concept of informing of entities. This belief can lead to the axiom which follows.

**Axiom 4** [INFORMATIONAL PHENOMENALISM] *Aprioristically (intuitively, commonsensically, trivially) at the top of the informational could also be something which deepeningly (most essentially) concerns an informational entity $\alpha$ toward the outside (outward, externally), toward the inside (inward) and in itself, as its entire informing or informational arising, called phenomenalism. So, we can introduce an informational implication of the form*

$$\left(\alpha \Longrightarrow \left(\alpha \Longrightarrow \begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix}\right)\right) \Longrightarrow \left(\alpha \Longrightarrow \begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix}\right)$$

*This axiomatic formula says: "If informational entity (represented by operand $\alpha$) implies that it implies its phenomenalism, then the entity implies that it informs externalistically and is informed internalistically." The next, essential axiomatic rule of phenomenalism is, for instance,*

$$\begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix} \Longrightarrow \left(\alpha \Longrightarrow \begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix}\right)$$

*Phenomenal informing of $\alpha$ implies that $\alpha$ itself is the cause (phenomenon) of its phenomenalism.* □

According to the last axiomatic formulas, everything informational, irrespective of its informational structure or complexity, informs and is informed in a phenomenal manner.

It will be shown how Axioms 2, 3 and 4 can be derived form Axiom 1 if the axiomatic inference rule of informational modus ponens is adopted.

## 6 Axioms Related to Informational Rules of Inference

Inference rules of a theory pertain to the theory's metatheory, which performs as a theory of theory. In this function, a metatheory concerns the proving, founding, logicism and formalism of a theory, that is, in regard to metatheory, the object theory. Separation between the object and metareasoning is traditional and roots in mathematics, in its platonistic (tautological) approach with the intention to make theories function in a non-contradictory, logically consistent and reductionistic way.

### 6.1 The True versus the Informational

Truth is the central concept of any mathematical theory and of mathematics as such. Everything derived from axioms by rules of inference must be true. Through mathematical proofs, the truth of theorems or derived consequences must be verified. Otherwise, the derived results are not mathematically correct. The basic question is how this traditional approach could be diversified in such a way that the mathematical truth becomes only a particular informational entity (operand) or an entity's property (operator)?

In Subsection 4.3 we have shown a possible difference between the true and the informational. The difference can exist in the following different manners:

| $N$ | The true | The informational |
|---|---|---|
| 1 | Logicism | Informationalism |
| 2 | Particularization | Generalization |
| 3 | Tertium non datur | Various informing |
| 4 | $A$ is true or false | $\alpha$ is informational |
| 5 | $A$ informs true | $\alpha$ informs |
| 6 | $A \models_{\text{true}}$ | $\alpha \models$ |
| 7 | $A$ informs false | $\alpha$ does not inform in a way |
| 8 | $A \models_{\text{false}}$ or $A \not\models_{\text{true}}$ | $\alpha \not\models$ |
| 9 | $A$ is informed true | $\alpha$ is informed |
| 10 | $\models_{\text{true}} A$ | $\models \alpha$ |
| 11 | $A$ is not informed true | $\alpha$ is not informed |
| 12 | $\not\models_{\text{true}} A$ or $\models_{\text{false}} A$ | $\not\models \alpha$ |

The last list of differences illustrates only the initial possibilities; so the reader can continue to list further imaginable differences.

#### 6.1.1 Identical Truth of Propositions and Predicates

Propositional formulas (which are propositions representing logically connected propositions) can be constructed in such a way that they do not depend on the true and false values of their operands. Such formulas are said to be *identically true* or identically false. For instance, propositional formula $A \rightarrow (B \rightarrow A)$ is identically true, while formula (its negation) $\overline{A \rightarrow (B \rightarrow A)}$ is identically false.

The triviality of logical axioms and rules of inference lies in their identical trueness. For instance, the pure implicative axioms of logic ([5], p. 66) are identically true, that is, they do not depend on the values of their propositional arguments. The same is valid for the derivation (deduction) rules of the type modus ponens and modus tollens, which can be logically transcribed into $(A \wedge (A \rightarrow B)) \rightarrow B$ and $((A \rightarrow B) \wedge \overline{B}) \rightarrow \overline{B}$, respectively. In this way, something hidden (unrevealed, intuitive and, also, tautological) remains in the background of these rules of inference.

#### 6.1.2 The Value Domain of the Logical

Following the principle of tertium not datur, there are only two values of propositions and predicates in traditional logic, that is—true and false. In multivalued logic, more than two values are permitted and gradations between true and false value are possible. But the nature of the principles of trueness remains preserved in various manners (e.g., probabilistically, modally [2], etc.). A *valuation* is an assignment of truth values ($\top$ and $\perp$) to the proposition sentences after their semantic analysis.

#### 6.1.3 The Formula Value Domain of the Informational

The informational formula value domain is formula-like. Arguments and values of informational formulas are formulas as inputs and outputs. The difference to the traditional-logical is that arguments can influence the entity in question to an informational extent (in trivial cases also to an 'entire' extent) and that the so-called values (results) are 'produced' (influenced) only to some informational extent (trivially, to a full extent).

Informational formulas simply absorb the propositional and predicate power of a traditional-logic apparatus (calculus).

'To influence to an informational extent' means to impact something informationally not as a product but as an already existing entity; and the similar concerns the informational impactedness, where something performs its influence on the entity impacted by it.

### 6.2 Mathematical Implication versus Informational Implication

As the mindful reader can observe, the mathematical implication is not only logical. In fact, the implication is a metamathematical (philosophical, intuitive) connective of arguments, closely tied to the semantics of each argument and the implication as a semantic structure in particular.

Informational implication approaches to various dictionary (informational) concepts of the word 'implication'. It certainly absorbs the concept of mathematical implication.

### 6.3 Rules (Axioms) of Informational Modus ponens

*Modus ponens* (MP for short) belongs to the most popular rules of inference as a mechanism for mathematical deduction of formulas from an object theory axioms and already deduced particular formulas, called theorems. Simultaneously, modus ponens is the main instrument in the proof procedures which are nothing else than just deduction processes as described. It considers the conveyance (an old law) and is the way in which anything deduced is obtained. MP is a mode of deductive operation (e.g. modus operandi or modus agendi).

The Latin verb *pono* (posui, positum) means to set down, before; to lay out, put out at interest in the sense to lay down as true, assert, assume, etc. MP is a mood that affirms (in German, bejahender Modus). It is a rule by which from *if* $p$ *then* $q$ together (and) with $p$, the operand $q$ may be inferred. The full meaning in Latin is modus ponendo ponens or law of detachment (in German, Abtrennungsregel), written in the form $(p, p \rightarrow q) \longrightarrow q$. The meaning is: if, simultaneously (in German, sowohl), $p$ and also 'if $p$ then $q$' is valid (true), then also $q$ is valid (true). Because MP is a rule, the rule arrow $\longrightarrow$ has to be used as a communication sign for an action (operation) instruction.

#### 6.3.1 Interpretation of Logical Modus ponens

In traditional logic, modus ponens (the rule of detachment) has the form

$$\frac{p, p \rightarrow q}{q}$$

where the inferring line is the operator of detachment. As already shown, this rule (when neglecting its communication role) represents an identically true formula in the form $(p \wedge (p \rightarrow q)) \longrightarrow q$.

The uttermost informational interpretation of the above formula regarding the truth as the only relevant logical value could be the following:

$$\left(\frac{(p \models_{\text{true}}; (p \rightarrow q) \models_{\text{true}}) \models_{\text{true}}}{q \models_{\text{true}}}\right) \models_{\text{true}}$$

In the last case, by the entering into formula of MP, the truth of $q$ has to be verified. If $q$ is a true theorem, then in the premise, $p$ and $p \rightarrow q$ are assumed to be valid, that is, true. Such an understanding of MP seems to be commonsensical. However, MP informs true without regard to the truth of the constituting components ($p$ and $p \rightarrow q$).

#### 6.3.2 Informational Modus ponens and Its Possible Interpretations

Together with the fundamental axiom of the object informational theory, that is, $\alpha \Longrightarrow (\alpha \models)$, we need a fundamental inference axiom, by which from the initial informational entity $\alpha$ the result $\alpha \models$ can be derived (deduced).

**Inference Axiom 1** [INFORMATIONAL MODUS PONENS] *We adopt the following basic inference axiom for informational derivation:*

$$\frac{\alpha; (\alpha \Longrightarrow \beta)}{\beta}$$

*By this rule, marked by* $\mathbb{R}_{\text{mp}}(\alpha, \beta)$, *where 'mp' in the subscript stands for 'modus ponens', operand (formula, formula system)* $\beta$ *will be derived from operand* $\alpha$ *(formula, formula system), that is,*

$$\alpha \twoheadrightarrow_{\mathrm{mp}} \beta \quad \text{or, simply,} \quad \alpha \twoheadrightarrow \beta$$

*Formula $\alpha \twoheadrightarrow \beta$ is called derivation (by modus ponens) from $\alpha$ to $\beta$.* □

By means of the last inference axiom from the first object axiom (e.g., Axiom 1) a theorem can be proved which follows.

**Theorem 1** [EXTERNALISTIC INFORMING OF AN INFORMATIONAL ENTITY] *If $\alpha$ is an informational formula, then $\alpha \models$ is an informationally regular ($\alpha$-equivalent, $\alpha$-replaceable) formula. It means that in decompositions of $\alpha$ (serial, parallel, circular, metaphysical or whichever deconstruction), formula $\alpha \models$ performs as another phenomenon of formula $\alpha$. There is, certainly, $\alpha \twoheadrightarrow (\alpha \models)$.* □

**Proof 1** [FORMULA $\alpha \models$ AS A REGULAR OCCURRENCE OF $\alpha$] *The initial 'axiom' of an informational operand $\alpha$ is the operand itself. We must prove, that formula $\alpha \models$ is derivable from $\alpha$. Axiom 1 offers the informational validity of formula $\alpha \Longrightarrow (\alpha \models)$. In this way, we dispose with elements of the premise necessary for modus ponens. Finally,*

$$\frac{\alpha; (\alpha \Longrightarrow (\alpha \models))}{\alpha \models}$$

*In fact, this is a trivial (aprioristic) proof of the informational existence of $\alpha \models$ if the existence of operand $\alpha$ was axiomatized. Thus, the existence of derivation $\alpha \twoheadrightarrow (\alpha \models)$ is proved.* □

**Theorem 2** [INTERNALISTIC INFORMING OF AN INFORMATIONAL ENTITY] *If $\alpha$ is an informational formula, then $\models \alpha$ is an informationally regular ($\alpha$-equivalent, $\alpha$-replaceable) formula. It means that in decompositions of $\alpha$ (serial, parallel, circular, metaphysical or whichever deconstruction), formula $\models \alpha$ performs as another phenomenon of formula $\alpha$. There is, certainly, $\alpha \twoheadrightarrow (\models \alpha)$.* □

**Proof 2** [FORMULA $\models \alpha$ AS A REGULAR OCCURRENCE OF $\alpha$] *We must prove, that formula $\models \alpha$ is derivable from $\alpha$. Axiom 2 offers the informational validity of formula $\alpha \Longrightarrow (\models \alpha)$. Let us show cases of proving the derivability of $\models \alpha$.*

*The first possible case (Axiom 2) is*

$$\frac{\alpha; (\alpha \Longrightarrow (\models \alpha))}{\models \alpha}$$

*The second possible case considers the axiomatic fact $(\alpha \models) \Longrightarrow (\models \alpha)$ as a necessity which says that if something informs, something must be informed. Thus,*

$$\frac{(\alpha \models); ((\alpha \models) \Longrightarrow (\models \alpha))}{\models \alpha}$$

*At the end of the proof, let us show informationally three axiomatic implications which follow according to Example 1, the third rule:*

$$\begin{aligned}
&(\alpha \Longrightarrow (\alpha \models)) \Longrightarrow \\
&\qquad (((\alpha \models) \Longrightarrow (\models \alpha)) \Longrightarrow (\alpha \Longrightarrow (\models \alpha)));\\
&(\alpha \Longrightarrow (\models \alpha)) \Longrightarrow \\
&\qquad (((\models \alpha) \Longrightarrow (\alpha \models)) \Longrightarrow (\alpha \Longrightarrow (\alpha \models)));\\
&((\alpha \models) \Longrightarrow (\models \alpha)) \Longrightarrow \\
&\qquad (((\models \alpha) \Longrightarrow \alpha) \Longrightarrow ((\alpha \models) \Longrightarrow \alpha))
\end{aligned}$$

*The implicative circularity of entities $\alpha$, $\alpha \models$ and $\models \alpha$ is complete.*

*Thus, the existence of derivation $\alpha \twoheadrightarrow (\models \alpha)$ is proved.* □

**Theorem 3** [PHENOMENALISTIC INFORMING OF AN INFORMATIONAL ENTITY] *If $\alpha$ is an informational formula, then formula system $\alpha \models; \models \alpha$ is an informationally regular ($\alpha$-equivalent, $\alpha$-replaceable) formula. It means that in decompositions of $\alpha$ (serial, parallel, circular, metaphysical or whichever deconstruction), formula system $\alpha \models; \models \alpha$ performs as another phenomenon of formula $\alpha$. There is, certainly, $\alpha \twoheadrightarrow (\alpha \models; \models \alpha)$.* □

**Proof 3** [FORMULA SYSTEM $\alpha \models; \models \alpha$ AS A REGULAR OCCURRENCE OF $\alpha$] *A consequence of the previous axioms and theorems is formula*

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

*By informational modus ponens, there is,*

$$\frac{\alpha; (\alpha \Longrightarrow (\alpha \models; \models \alpha))}{\alpha \models; \models \alpha}$$

*This proves $\alpha \twoheadrightarrow (\alpha \models; \models \alpha)$.* □

**Theorem 4** [METAPHYSICALISTIC INFORMING OF AN INFORMATIONAL ENTITY] *If $\alpha$ is an informational formula, then formula $\alpha \models \alpha$ is an informationally regular ($\alpha$-equivalent, $\alpha$-replaceable) formula. It means that in decompositions of $\alpha$ (serial, parallel, circular, metaphysical or whichever deconstruction), formula $\alpha \models \alpha$ performs as another phenomenon of formula $\alpha$. There is, certainly, $\alpha \twoheadrightarrow (\alpha \models \alpha)$.* □

**Proof 4** [FORMULA $\alpha \models \alpha$ AS A REGULAR OCCURRENCE OF $\alpha$] *A consequence of the previous axioms and theorems is formula*

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

*By informational modus ponens, there is,*

$$\frac{(\alpha \models; \models \alpha); ((\alpha \models; \models \alpha) \Longrightarrow (\alpha \models \alpha))}{\alpha \models \alpha}$$

*(See Definition 15 for $\alpha \models \alpha$.) This proves $\alpha \twoheadrightarrow (\alpha \models \alpha)$.* □

**Consequence 1** [REPLACEMENT POSSIBILITIES FOR AN INFORMATIONAL OR INFORMING ENTITY] *Let us have*

$$\mathfrak{a}, \mathfrak{b} \in \{\alpha, \alpha \models, \models \alpha, \alpha \models \alpha, (\alpha \models; \models \alpha\}$$

*Then, for $\mathfrak{a} \neq \mathfrak{b}$, there is $\mathfrak{a} \twoheadrightarrow \mathfrak{b}$ and, so, $\mathfrak{a} \leftarrow \mathfrak{b}$.* □

**Consequence Proof 1** [PROVING $\mathfrak{a} \leftarrow \mathfrak{b}$ FOR ENTITIES AND THEIR INFORMING] *The last consequence means the possibilities of replacements in decomposition (deconstruction) procedures, that is,*

$$\alpha \leftarrow \begin{pmatrix} \alpha \models, \\ \models \alpha, \\ \alpha \models \alpha, \\ \begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix} \end{pmatrix}; \ (\alpha \models) \leftarrow \begin{pmatrix} \alpha, \\ \models \alpha, \\ \alpha \models \alpha, \\ \begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix} \end{pmatrix};$$

$$(\models \alpha) \leftarrow \begin{pmatrix} \alpha, \\ \alpha \models, \\ \alpha \models \alpha, \\ \begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix} \end{pmatrix}; \ (\alpha \models \alpha) \leftarrow \begin{pmatrix} \alpha, \\ \alpha \models, \\ \models \alpha, \\ \begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix} \end{pmatrix};$$

$$\begin{pmatrix} \alpha \models; \\ \models \alpha \end{pmatrix} \leftarrow \begin{pmatrix} \alpha, \\ \alpha \models, \\ \models \alpha, \\ \alpha \models \alpha \end{pmatrix}$$

*The consequence can be proved by considering the previous axioms and theorems.* □

According to Subsubsection 6.3.1 where the logical modus ponens was informationally interpreted, we can interpret the informational modus ponens in several informational manners. The first possible and informationally consequent interpretation of MP is externalistic and yields

$$\frac{(\alpha \models; (\alpha \Longrightarrow \beta) \models) \models}{\beta \models} \models$$

where $\alpha$ and $\beta$ can be arbitrarily complex formulas. As we see, its components (three of them in the premise, one in the conclusion) and the entire rule of MP inform in an externalistic manner. The exact meaning of this interpretation could be the following: if $\alpha$ informs its informational existence and, in parallel, the implication $\alpha$ implies $\beta$ informs its informational existence, then $\beta$ informs its informational existence. Under these conditions, the respective formula of MP informs its informational existence.

Other interpretations of informational MP could be internalistic, metaphysicalistic and phenomenalistic. The consequent internalistic interpretation of MP is

$$\models \frac{\models (\models \alpha; \models (\alpha \Longrightarrow \beta))}{\models \beta}$$

The consequent metaphysicalistic interpretation becomes pretty cumbersome, that is,

$$\frac{\begin{matrix}(\alpha \models \alpha; (\alpha \Longrightarrow \beta) \models (\alpha \Longrightarrow \beta)) \models \\ (\alpha \models \alpha; (\alpha \Longrightarrow \beta) \models (\alpha \Longrightarrow \beta))\end{matrix}}{\beta \models \beta} \models$$

$$\frac{\begin{matrix}(\alpha \models \alpha; (\alpha \Longrightarrow \beta) \models (\alpha \Longrightarrow \beta)) \models \\ (\alpha \models \alpha; (\alpha \Longrightarrow \beta) \models (\alpha \Longrightarrow \beta))\end{matrix}}{\beta \models \beta}$$

where metaphysicalism must be considered on all five components of the inference rule (metaphysicalism of two components of the premise; the premise as a whole; the conclusion; and the rule as a whole).

The consequent phenomenalistic interpretation is cumbersome too, which becomes evident from the two equivalent inference rules, where the first one informs and the second one is informed:

$$\frac{\left(\begin{array}{l}(\alpha \models; \models \alpha);\\ \left(\begin{array}{l}((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta)) \models;\\ \models ((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta))\end{array}\right)\end{array}\right) \models; \quad \models \left(\begin{array}{l}(\alpha \models; \models \alpha)\\ \left(\begin{array}{l}((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta)) \models;\\ \models ((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta))\end{array}\right)\end{array}\right)}{\beta \models; \models \beta} \models;$$

$$\models \frac{\left(\begin{array}{l}(\alpha \models; \models \alpha);\\ \left(\begin{array}{l}((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta)) \models;\\ \models ((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta))\end{array}\right)\end{array}\right) \models; \quad \models \left(\begin{array}{l}(\alpha \models; \models \alpha);\\ \left(\begin{array}{l}((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta)) \models;\\ \models ((\alpha \Longrightarrow \beta) \models; \models (\alpha \Longrightarrow \beta))\end{array}\right)\end{array}\right)}{\beta \models; \models \beta}$$

The reader can imagine how mixed externalistic, internalistic, metaphysicalistic and phenomenalistic interpretations are possible. In this way an informational explosion of MP possibilities exists.

### 6.4 A Generalization of Informational Inference Rule Interpretation

The case of informational MP interpretation calls for a generalization principle in the following sense.

**Inference Axiom 2** [INFERENCE RULE PHENOMENALISM] *An inference rule*

$$\mathbb{R}(\mathsf{A},\mathsf{B}) \rightleftharpoons \frac{\mathbb{P}(\mathsf{A},\mathsf{B})}{\mathbb{C}(\mathsf{B})}$$

*is by itself an informational formula which underlies the principles of informational phenomenalism. Cases of the externalistic, internalistic, metaphysicalistic and phenomenalistic forms of inference rules, respectively, can be understood as permissive replacements, that is as transformations of the initial rule* $\mathbb{R}(\mathsf{A},\mathsf{B})$. *Thus,*

$$\mathbb{R}(\mathsf{A},\mathsf{B}) \leftarrow \left(\begin{array}{l}\mathbb{R}(\mathsf{A},\mathsf{B}) \models,\\ \models \mathbb{R}(\mathsf{A},\mathsf{B}),\\ \mathbb{R}(\mathsf{A},\mathsf{B}) \models \mathbb{R}(\mathsf{A},\mathsf{B}),\\ (\mathbb{R}(\mathsf{A},\mathsf{B}) \models; \models \mathbb{R}(\mathsf{A},\mathsf{B}))\end{array}\right)$$

*Concerning premise* $\mathbb{P}(\mathsf{A},\mathsf{B})$ *and conclusion* $\mathbb{C}(\mathsf{B})$ *of a rule* $\mathbb{R}(\mathsf{A},\mathsf{B})$, *the following double-phenomenal cases are convenient, called* ex-externalism, in-internalism, meta-metaphysicalism *and* pheno-phenomenalism *of inferential rules, respectively:*

$$\frac{\mathbb{P}(\mathsf{A},\mathsf{B}) \models}{\mathbb{C}(\mathsf{B}) \models} \models;$$

$$\models \frac{\models \mathbb{P}(\mathsf{A},\mathsf{B})}{\models \mathbb{C}(\mathsf{B})};$$

$$\frac{\mathbb{P}(\mathsf{A},\mathsf{B}) \models \mathbb{P}(\mathsf{A},\mathsf{B})}{\mathbb{C}(\mathsf{B}) \models \mathbb{C}\mathsf{B})} \models \frac{\mathbb{P}(\mathsf{A},\mathsf{B}) \models \mathbb{P}(\mathsf{A},\mathsf{B})}{\mathbb{C}(\mathsf{B}) \models \mathbb{C}\mathsf{B})};$$

$$\left(\begin{array}{l}\dfrac{\mathbb{P}(\mathsf{A},\mathsf{B}) \models; \models \mathbb{P}(\mathsf{A},\mathsf{B})}{\mathbb{C}(\mathsf{B}) \models; \models \mathbb{C}(\mathsf{B})} \models;\\ \models \dfrac{\mathbb{P}(\mathsf{A},\mathsf{B}) \models; \models \mathbb{P}(\mathsf{A},\mathsf{B})}{\mathbb{C}(\mathsf{B}) \models \mathbb{C}\mathsf{B})}\end{array}\right)$$

*Phenomenalism of arguments* $\mathsf{A}$ *and* $\mathsf{B}$ *depends on the structure of premise* $\mathbb{P}$ *and conclusion* $\mathbb{C}$. □

### 6.5 Rules of Informational Modus tollens

*Modus tollens* (MT for short), in full modus tollendo tollens, belongs to the mood that denies and is the rule that from *if p then q* together with *not-q, not-p* may be inferred. An inference in modus tollendo tollens yields the contrary of the original contrary hypothesis. It is the principle that, if a conditional holds and also the negation of its consequent, then the negation of its antecedent holds [15]. MT is a mode of deductive operation.

The Latin verb *tollo* (sustuli, sublatum) means to lift or take up; to take away, remove, take or carry off, make away with, destroy; to annul, cancel, abolish. MT is a mood that denies (in German, verneinender Modus).

#### 6.5.1 Interpretation of Logical Modus tollens

In logic, modus tollens has the form

$$\frac{p \to q, \overline{q}}{\overline{p}}$$

where the inferring line is the operator of detachment. This rule (when neglecting its communication role) represents an identically true formula in the form $((p \to q) \land \overline{q}) \to \overline{p}$.

The uttermost informational interpretation of the above formula regarding the truth as the only relevant logical value is the following:

$$\left(\frac{((p \to q) \models_{\mathrm{true}}; \overline{q} \models_{\mathrm{true}}) \models_{\mathrm{true}}}{\overline{p} \models_{\mathrm{true}}}\right) \models_{\mathrm{true}}$$

### 6.5.2 Informational Modus tollens and Its Possible Interpretations

Together with the fundamental axioms of the object informational theory, we need an inference axiom, by which from the initial informational entity $\alpha$ the result $\alpha \not\models$ can be derived (deduced).

**Inference Axiom 3** [INFORMATIONAL MODUS TOLLENS] *We adopt the following basic inference axiom for informational derivation:*

$$\frac{(\alpha \Longrightarrow \beta); \beta \not\models}{\alpha \not\models}$$

*By this rule, marked by $\mathbb{R}_{\mathrm{mt}}(\alpha, \beta)$, where 'mt' in the subscript stands for 'modus tollens', operand (formula, formula system) $\alpha \not\models$ will be derived from operand $\alpha$ (formula, formula system), that is,*

$$\alpha \twoheadrightarrow_{\mathrm{mt}} (\alpha \not\models) \quad \text{or, simply,} \quad \alpha \twoheadrightarrow (\alpha \not\models)$$

*Formula $\alpha \twoheadrightarrow (\alpha \not\models)$ is called derivation from $\alpha$ to $\alpha \not\models$ (by informational modus tollens).* □

By means of the last inference axiom from the first object axiom (e.g., Axiom 1) a theorem can be proved which follows.

**Theorem 5** [EXTERNALISTIC NON-INFORMING OF AN INFORMATIONAL ENTITY] *If $\alpha$ is an informational formula, then $\alpha \not\models$ is an informationally regular ($\alpha$-equivalent, $\alpha$-replaceable) formula. It means that in decompositions of $\alpha$ (serial, parallel, circular, metaphysical or whichever deconstruction), formula $\alpha \not\models$ performs as another phenomenon of formula $\alpha$. There is, certainly, $\alpha \twoheadrightarrow (\alpha \not\models)$.* □

**Proof 5** [FORMULA $\alpha \not\models$ AS A REGULAR OCCURRENCE OF $\alpha$] *The initial 'axiom' of an informational operand $\alpha$ is the operand itself. We must prove, that formula $\alpha \not\models$ is derivable from $\alpha$. Example 3 explains the informational validity of formula $\alpha \Longrightarrow (\alpha \not\models)$. In this way, we dispose with elements of the premise necessary for both modus ponens and modus tollens. Firstly, by MP,*

$$\frac{\alpha; (\alpha \Longrightarrow (\alpha \not\models))}{\alpha \not\models}$$

*and secondly, by MT,*

$$\frac{(\alpha \Longrightarrow (\alpha \models)); \alpha \not\models}{\alpha \not\models}$$

*In fact, these are trivial (aprioristic) proofs of the informational existence of $\alpha \not\models$ at the given (already derived) formula $\alpha$. Thus, the existence of derivation $\alpha \twoheadrightarrow (\alpha \not\models)$ is proved.* □

We can join the theorems concerning the internalistic, phenomenalistic and metaphysicalistic non-informing in the following manner.

**Theorem 6** [INTERNALISTIC, PHENOMENALISTIC AND METAPHYSICALISTIC NON-INFORMING OF AN INFORMATIONAL ENTITY] *If $\alpha$ is an informational formula, then $\not\models \alpha$, $(\alpha \not\models; \not\models \alpha)$ and $\alpha \not\models \alpha$ are informationally regular ($\alpha$-equivalent, $\alpha$-replaceable) formulas. It means that in decompositions of $\alpha$ (serial, parallel, circular, metaphysical or whichever deconstruction), these formulas perform as distinguished phenomena of formula $\alpha$. There is, certainly, $\alpha \twoheadrightarrow (\not\models \alpha)$, $\alpha \twoheadrightarrow (\alpha \not\models; \not\models \alpha)$ and $\alpha \twoheadrightarrow (\alpha \not\models \alpha)$.* □

**Proof 6** [FORMULAS $\not\models \alpha$, $(\alpha \not\models; \not\models \alpha)$ AND $\alpha \not\models \alpha$ AS REGULAR OCCURRENCES OF $\alpha$] *The initial formula (axiom, theorem) of an informational operand $\alpha$ is represented by the operand itself. We must prove, that formulas $\not\models \alpha$, $(\alpha \not\models; \not\models \alpha)$ and $\alpha \not\models \alpha$ are derivable from $\alpha$. Adequately as in Proof 5 we can infer by MP and MT for the internalistic case,*

$$\frac{\alpha; (\alpha \Longrightarrow (\not\models \alpha))}{\not\models \alpha}; \frac{(\alpha \Longrightarrow (\models \alpha)); \not\models \alpha}{\not\models \alpha}$$

*for the phenomenalistic case,*

$$\frac{\alpha; (\alpha \Longrightarrow (\alpha \not\models; \not\models \alpha))}{\alpha \not\models; \not\models \alpha};$$

$$\frac{(\alpha \Longrightarrow (\alpha \models; \models \alpha)); (\alpha \not\models; \not\models \alpha)}{\alpha \not\models; \not\models \alpha}$$

*and for the metaphysicalistic case,*

$$\frac{\alpha; (\alpha \Longrightarrow (\alpha \not\models \alpha))}{\alpha \not\models \alpha}; \frac{(\alpha \Longrightarrow (\alpha \models \alpha)); (\alpha \not\models \alpha)}{\alpha \not\models \alpha}$$

*Thus, the existence of derivations $\alpha \twoheadrightarrow (\not\models \alpha)$, $\alpha \twoheadrightarrow (\alpha \not\models; \not\models \alpha)$ and $\alpha \twoheadrightarrow (\alpha \not\models \alpha)$ is proved.* □

Cases of (with, through, in, by) *informational arising* can be illuminated through simultaneous informing and particular non-informing of an informational entity. These cases may be seen as phenomena belonging to the realm of informational spontaneity. So, the following mixed externalistic, internalistic, metaphysicalistic and phenomenalistic occurrences are possible:

$$(\alpha \models; \alpha \not\models);\ (\models \alpha; \not\models \alpha);\ (\alpha \models \alpha; \alpha \not\models \alpha);$$
$$(\alpha \models; \not\models \alpha);\ (\alpha \not\models; \models \alpha);\ (\alpha \not\models; \models \alpha; \not\models \alpha)$$

etc., infinitely.

### 6.6 Rules of Informational Modus rectus

*Modus rectus* (MR for short) represents a direct inference orientation to an experienced reality (e.g. intention). It is a hidden, yet unrevealed informational impacting governing an informing entity in an informingly specific manner (e.g., ideologically, cynically, demagogically, sociologically). The informational hidenness of something $\beta$ in something $\alpha$ concerns the so-called informational Being-in (includedness) [12], that is $\beta \subset \alpha$. By modus rectus, the yet-hidden component $\beta$ in $\alpha$ is inferred, that is, derived in the form $\alpha \twoheadrightarrow_{\mathrm{mr}} \beta$.

In music, in a fugal composition, rectus has the meaning of the version of a theme performed in the basic or original, as opposed to the reversed or inverted, order [15].

In Latin, *rector* means controller, director, governor, steersman, tutor, etc. By MR the controlling, directing, governing, steering, tutoring informational component is detached out of some informing entity. The Latin adjective *rectus* means straight; upright, erect; right, correct, proper, appropriate, suitable, due; plain, simple, natural, etc.

**Inference Axiom 4** [INFORMATIONAL MODUS RECTUS] *We can adopt several inference axioms for informational modus rectus:*

$$\frac{(\alpha; (\iota \subset \alpha)); \iota}{\iota}; \quad \frac{(\alpha; (\alpha \Longrightarrow \iota)); (\iota \subset \alpha)}{\iota};$$

$$\frac{(\alpha; (\alpha \Longrightarrow \iota); (\iota \subset \alpha)); \iota}{\iota}; \quad \frac{\iota \subset \alpha}{\iota}$$

*etc. By these rules, marked by $\mathbb{R}^{i}_{\mathrm{mr}}(\alpha, \iota)$, where 'mr' in the subscript stands for 'modus rectus', operand (formula, formula system) $\iota \rightleftharpoons$ $(\iota \models_{\mathrm{intentionally}}; \models_{\mathrm{intentionally}} \iota)$ will be derived from operand $\alpha$ (formula, formula system), that is,*

$$\alpha \twoheadrightarrow^{i}_{\mathrm{mr}} (\iota) \quad \text{or, simply,} \quad \alpha \twoheadrightarrow \iota$$

*Formula $\alpha \twoheadrightarrow \iota$ is called derivation from $\alpha$ to $\iota$.* □

Formula $\iota \subset \alpha$ is recursively defined in [12]. Various theorems concerning modus rectus can be derived according to concrete situations.

### 6.7 Rules of Informational Modus obliquus

*Modus obliquus* (MO for short) represents an oblique, devious, indirect, evasive (winding) inference orientation which appears simultaneously with a direct orientation (e.g. intention). It is a hidden, also contradictory, yet unrevealed informational impacting governing the background of an informing entity in an informingly specific manner (e.g., obliquely, trickily; cunningly, slyly, guilefully, artfully; craftily; astutely; wile-likely).

The informational obliquity (divergence, perversity) of something $\beta$ in something $\alpha$ concerns the so-called informational Being-in (includedness) [12] and Being-of (functionalism) [13], that is $\beta \subset \alpha$ and $\beta(\alpha)$ or $\beta^*\alpha$. By modus obliquus, the obliquely informing component $\beta$ in $\alpha$ is inferred, that is, derived in the form $\alpha \twoheadrightarrow_{\mathrm{mo}} \beta$.

The figurative meaning of the adjective *oblique* is not taking the straight or direct course to the end in view; not going straight to the point; indirectly stated or expressed; resulting or arising indirectly; deviating from right informing or thought; informationally one-sided or perverse.

In Latin, *obliquo* means to turn sideways or aside, turn awry. *Obliquus* means slanting, sideways, oblique; indirect, covert; envious.

**Inference Axiom 5** [INFORMATIONAL MODUS OBLIQUUS] *We can adopt several inference axioms for informational modus obliquus:*

$$\frac{(\alpha; (o \subset \alpha)); o}{o}; \quad \frac{(\alpha; (\alpha \Longrightarrow o)); o(\alpha)}{o};$$

$$\frac{(\alpha; (\alpha \Longrightarrow o); (o \subset \alpha); o(\alpha)); o}{o}$$

*etc. By these rules, marked by $\mathbb{R}^{j}_{\mathrm{mo}}(\alpha, o)$, where 'mo' in the subscript stands for 'modus obliquus', operand (formula, formula system) $o \rightleftharpoons$*

$(o \models_{\text{obliquely}}; \models_{\text{obliquely}} o)$ *will be derived (detached) from operand* $\alpha$ *(formula, formula system), that is,*

$$\alpha \twoheadrightarrow^{j}_{\text{mo}} (o) \quad \text{or, simply,} \quad \alpha \twoheadrightarrow o$$

*Formula* $\alpha \twoheadrightarrow o$ *is called derivation from* $\alpha$ *to* $o$ *(by informational modus obliquus).* □

Formulas $o \subset \alpha$ and $o(\alpha)$ are recursively defined in [12] and [13], respectively. Various theorems concerning modus obliquus can be derived according to concrete situations. As premises of modus obliquus, various affirmative, negatory, contrary, subalternate, contradictory, absurd and other informational entities can be conjoined. Such a premise structure can cause a parallel set of conclusions by which the so-called zigzag effects of the oblique discourse are coming into existence.

### 6.8 Informing of Informational Inference Rules

Informational inference rules of the form $\mathbb{R}(\alpha, \beta)$ inform as any other regular informational entity, that is, by the entirely possible informational phenomenalism. This principle does not coincide with the traditional metamathematical inference rules which are fixed once for all. Thus, an IIR can become not only as complex as possible but also as unique (individual) as possible. Such a principle enables the emerging of formulas, their informational development in the sense of informational spontaneity and circularity.

## 7 Axioms of Informational Operand Decomposition

Decomposition of informational operands (markers, formulas, formula systems) roots in particular (particularized) inference rules by which informational items (parts, subformulas, informational frames, gestalts) are informationally adequately composed, added, connected [in]to existing formal (symbolically identified) entities.

An operand decomposition applies serialization (deconstruction) of formulas and their parallelization according to some analytical criteria, enlarging the initial formula system. The philosophy of an informational operand decomposition calls for a separate exhaustive presentation since it is one of the main informational phenomena of informational arising in the sense of spontaneity and circularity.

## 8 Axioms of Informational Operator Decomposition

It is possible to make a distinction between the so-called operand decomposition and operator decomposition. It depends from the view of the observer which kind of decomposition will be preferred in a case of analytical investigation. In case of operator decomposition we are primarily confronted with the so-called informational frames, frame pairs or frame triplets (the left-, middle- and the right-positioned frame) which constitute a certain operator decomposition.

The advantage of operator decomposition lies in the independence of an operand position within a formula. This means that between any two, arbitrarily positioned operands in a well-structured formula, an adequate, in a decomposing way structured frame, frame pair or frame triplet can be positioned. We have shown some characteristic possibilities of operator framing in [13].

Informational operator decomposition is a new discipline being not anchored in the traditional mathematics (metamathematics) or elsewhere. The philosophy of an informational operator decomposition calls for an original and exhaustive analysis and discussion since it belongs to the main informational phenomena of informational particularization (and universalization) in the sense of spontaneity and circularity.

## 9 Conclusion

At the end, it is significant to stress that the key to a theoretical and machine-oriented usage lies in the axiomatization of the informational. There are still some philosophical and formal-theoretical obstacles on the way to a well-formed axiomatization, for instance, covering the axiomatic principles already known in metamathematics (see, for example, at [5, 8]).

On the other hand, the contemporary informational mind is aware of the syllogistic, trivial, intuitive, tautological but also contradictory and absurd nature of the mathematical art and philosophy of axiomatization within metamathematics. The author recommends the reading of Lakatos' papers (for instance, [6]). It becomes evident that there do not exist entirely (universally) axiomatized theories being completely free from contradiction and that problems as stated within the different fundamental mathematical programs have been set on an idealistic or Platonic ground through the history from the ancient Greek era on. However, in spite of these philosophical faultinesses and deficiencies, man has constructed computing systems as successful tools in different areas of his methodology and technology.

The time of sobering and disillusion has dawned much prior to the appearance of the consciousness of the informational. Thus, a general informational theory does not search anymore for an idealistic (non-contradictory, decisive, algorithmic) systems of information.

There are certainly substantial philosophical differences existing between metamathematics and GIT. For example, logical quantifiers $\forall$ and $\exists$ reduce in ordinary informational operators. Irrespective of their nature, verbs are treated as operators and the verb *to exist* has not a specific informational advantage as in logic, where it is treated as a quantifying entity. In the informational, the verb to exist means to inform the existence of something informational and nothing else.

The program of the informational axiomatization continues into new directions and the discussion shown in this article is merely a beginning. Finally, informational axioms have to be developed to a satisfactory step of recognition—enabling the general informational theory to become a solid fundament for the development of new informational (intelligent) methodologies, tools, calculuses, apparatuses, machines, etc.

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# MINDS AND MACHINES

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## A Look into the Journal

For the reader, the first look into a journal may be essential and challenging. Such a look into No. 3 (August 1994) discovers the following contents: —CRITICAL EXCHANGE: Intentionality, Qualia, and Mind/Brain Identity (Paul Schweizer); Thought and Qualia (David Cole);

—GENERAL ARTICLES: The Secret Operations of the Mind (Saul Traiger); Representational Trajectories in Connectionist Learning (Andy Clark); Can Computers Carry Content 'Inexplicitly'? (Paul G. Skokowski);

—DISCUSSION REVIEW: James H. Fetzer, *Philosophy and Cognitive Science,* in Jay L. Garfield (ed.), *Foundation of Cognitive Science: The Essential Readings* (Robert L. Causey);

—BOOK REVIEWS: Hubert L. Dreyfus, *Being-in-the-World: A Commentary on Heidegger's* Being and Time (Beth Preston); Daniel C. Dennett, *Consciousness Explained* (Matthew Elton); Andy Clark, *Microcognition: Philosophy, Cognitive Science, and Parallel Distributed Processing* (Michael Losonsky); Leonard Angel, *How to Build a Conscious Machine* (Saul Traiger); Geoffrey Brown, *Brains and Machines* (Randall R. Dipert); David M. Rosenthal (ed.), *The Nature of Mind* (Jerome A. Shaffer).

## Citations from Minds and Machines

Let us show some interesting citations from *Minds and Machines,* vol. 4 (1994), No.3, for the readers of *Informatica.*

—(259, P. Schweizer) The two most important distinguishing characteristics of the mind are often taken to be intentionality and the experience of subjective presentation or 'qualia'. Genuine cognitive states are purported to possess a unique and intrinsic property of 'aboutness' or 'directedness', and, in the tradition of Brentano, this intentional aspect is held to be of central importance in distinguishing the mental from the non-mental.

—(265, P. Schweizer) Subjective experience supplies the starting point from which the objective principles of science are gradually inferred, and the resulting system of inferred principles is not a sufficient basis from which to move in the reverse direction and *deduce* the nature of subjective experience. Only sentences are deducible within the framework of a scientific/mathematical formalism, and the formalism alone cannot yield an interpretation of these sentences.

—(293, D. Cole) The qualia are the internal representations. All of their phenomenal properties, the subjective character of the experience of thinking a thought, may be accounted for by the functional role of the linguistic representation. But it is not primarily the semantic representation that is important here. It is the qualitative representation.

—(300–301, D. Cole) Computationalists such as myself take qualia seriously. Having qualia *is* information processing. So having qualia is not epiphenomenal; it is *essential* for human mentality. It is required to account for human behavior. It seems to me that other accounts *either* treat having qualia as epiphenomenal *or* head off towards a mysterious dualism. Having qualia is a brain process, but it cannot perspicuously be understood at the neural level—one can't see why there are qualia, even given a complete neurophysiological description of their activity (Leibniz's Mill).

—(303, P. Traiger) It is a common practice among philosopher of psychology to trace the origins of functionalism, and cognitive science more generally, to texts deep within the history of philosophy. Plato, for example, is described by Hubert Dreyfus as a "knowledge engineer" for the view he develops in the *Euthyphro* of expertise as the mastery of explicit rules and for the doctrine of recollection in the *Mono* ...

—(319, A. Clark) One way of solving a learning problem is, in effect, to give up on it. Thus it could be argued that certain features are simply unlearnable, by connectionist means, on the basis of certain bodies of training data ...

—(369, M. Elton) ...if you take care of intentionality, consciousness will take care of itself. ...Arguments for reducing the problem of consciousness to the problem of intentionality would be of interest to the many philosophers who have claimed that the phenomenon of consciousness is a special challenge for functionalist theories of mind.

The undersigned believes that information concerning *Minds and Machines* is instructive for the readers and authors of *Informatica* in the sense of a journal aims, scope, possibilities, and contents which concern philosophy, AI, computer science, and information technology.

A.P. Železnikar