# Being and Systemacy

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*Current thoughts consider being as one of the property of systemacy.*
*Having introduced the 'assembling' operation ('making sth. to a system'), we could show that the complementarity principle (by N. Bohr [1]) results from the existence and applicability of this operation; furthermore, categorially complementary terms (e.g. {being, nonbeing}, {structure, function}) generated by application of this operation relate to the resulting system as a whole, but not to its single parts.*
*Further considerations have shown that*
*- existing objects/processes can only be systems and nothing else;*
*- basically, 'the very elementary bricks' of nature, i.e. those, which could not be represented as an ensemble of other entities do not exist.*
*Moreover, it has succeeded in closing the question, whether complementarity is immanent in objects themselves or a property of the consciousness of contemplator, namely: this question is principally undecidable.*
*In the second part, we also discuss the notions of being, nonbeing, infinity and time. It is shown that being, time and finiteness are tightly linked to each other.*
*Current thoughts may attract attention of an audience who is interested in philosophical topics in general and in the complementarity principle and the system approach in particular.*

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# 1 Rationale for the complementarity principle

## *1.1 Definitions*

**Def. 1:**
Let there exist a confined population (set) of terms comprising more than one term. Terms out of the population are called *categorially complementary* to each other if:

1) These terms can exist exclusively together, in concert, i.e. the existence of a term necessarily causes the existence of all other terms of the population, and
2) A term out of the population cannot be defined by using any subset of other terms of the population.

**Def. 2:**
Let there exist a confined population (set) of properties comprising more than one property. Properties out of the population are called *attributive opposites* if each item of the population represents merely a specific extreme value of one and the same attribute, and, hence, can be defined by using another item of the population.

Distinguishing between *attributive opposites* (e.g. {high, low}) and *categorial complementarities* (e.g. {form, content}), let it be said that attributive opposites are basically not categorial complementarities because each item of an attributive pair can be defined by using another member of the pair. For example, the attribute 'size' can take extreme values {big, small}; these values can be expressed by each other.
Attributive opposites always describe properties/qualities, i.e. values of an attribute, but never – terms. Thereby, changing the value of this attribute at the transition from one to another extreme occurs without 'jumps', i.e. without a change of symmetry degree (without 'second-order phase transitions'). Attributive opposites often imply the presence of an etalon, i.e. a 'norm', what the estimation of the value of the respective attribute relates to (e.g. {expensive, cheap}, {good, evil}).
Attributive opposites almost always are reflected in language by antonymous pairs, whereas categorial complementarities are by no means always representable by them.

## *1.2 Philosophy and Algebra: Assembling Operation*

The properties of categorial complementarities in **Def. 1** have induced a working hypothesis about a possible parallel between categorial complementarities and certain algebraic structures, namely – linear symmetric operators.

Linear symmetric operators:

1) possess only real eigenvalues,
2) their eigenvectors related to different eigenvalues are orthogonal to each other (i.e. they are linearly independent and, hence, cannot be mutually defined).

Thus, a linear symmetric operator induces a basis (i.e. a population) of linearly independent (i.e. not mutually definable using each other) eigenvectors.

This property of linear symmetric operators exactly coincides with the properties of categorial complementarities in **Def. 1**.

If this parallel is a substantial one, the following question arises: ‘Is there a ‘philosophic’ analogy to the linear symmetric operator? I.e. does an operation (or operations) exist inducing single pairs (or greater sets, e.g. triples) of categorial complementarities?’

If such an operation does exist, it, in analogy to a linear symmetric operator,

1) shall induce a set of categorial complementarities, and
2) its application to each single term out of this set shall not change this term, i.e. shall retain it.

A first attempt to answer this question is to introduce the operation of ‘assembling’ of something, i.e. ‘making sth. to a system’, ‘organising single items into a system’.

The term *system* is defined according to Uemov (see [2], chap. 4, § 1):

**Def. 3:**
A *system* (ensemble - IF) is any given entity, at which a relationship, possessing an arbitrarily taken certain property, is implemented.
Or equivalent:
A *system* (ensemble) is any given entity, at which some properties, being in an arbitrarily taken certain relationship, are implemented.

Let us define now the *assembling* operation:

**Def. 4:**
The *assembling* operation with regard to an entity is that this entity is considered not disconnectedly, but as part of a system (ensemble) with a suitable ‘system-constituting concept’[1].

Note that a system according to **Def. 3** is always self-consistent, i.e. properties (attributes) and relationships implemented in the system correspond to each other.

There is also an inverse operation – *disassembling*:
‘*assembling*’ * ’*disassembling*’ = ‘*identity*’.

**Def. 5:**
The *disassembling* operation with regard to a system (ensemble) with a given system-constituting concept is that one distinguishes isolated entities in this system, which possess the properties (attributes) and are able to enter into relations corresponding to the constituting concept of this system.

Note that entities themselves can also be systems.

[1] the original term by Uemov in Russian: ‚системообразующий концепт’

Returning to algebra and linear symmetric operators, let us remark that if an operator **A** is invertible, then all its eigenvalues are non-zero, $\lambda_i \neq 0$; thereby, the eigenvalues of the inverted operator $\mathbf{A}^{-1}$ are numbers $(\lambda_i)^{-1}$, and the corresponding eigenvectors both of the operators are identic.

Since eigenvectors both of such operators are identic, the *disassembling* operation, similarly to inverted operator,

1) shall retain the entire set of the categorial complementarities being inherent to the initial system, and
2) its application to each single term out of this set shall not change this term, i.e. shall retain it.

## 1.3 Assembling Operation and Complementarity Principle

Let us consider now the pair {properties, relations} as an example. It is really generated by the assembling operation applied to any entity: whatever is included in a system shows within the latter certain properties and enters into the corresponding relationships with other elements of the system.
A dedicated application of the assembling operation to the term ‘property’ does not change this term: it does not become a ‘relation’ and, moreover, does not bear any characteristics of ‘relations’. This is due to the fact that a system is always already self-consistent, i.e. all the relations necessary for this system exist already and the system does not need any additional ‘relations’ because they would be superfluous.
A similar reasoning is also valid concerning the application of assembling operation to the term ‘relation’.

Thus, the assembling operation (= ‘making sth. to a system’) generates the pair of categorial complementarities {properties, relations}, and its application to each of these terms retains them.

This pair of categorial complementarities obviously relates to the system, which has evolved as a result of the ‘assembling’, as a whole, but not to each single entity of the system.

Considering other categorial complementarity {cause, effect} similarly, we come to a conclusion that the assembling operation generates also this pair if one means here by system a process unifying cause <-> effect. Also, this pair of categorial complementarities relates to the system, which has evolved as a result ‘assembling’ (i.e. to the process as a whole), but not to each single entity of the system.

That is, one may speak of a static (without a development over time) and dynamic ‘assembling’.

It is interesting to consider the relationship of the assembling operation to the pair {matter, information}[2]: here, this operation – applicable to an entity – means that the entity is

[2] Aristotle understood matter as the opposite to form

considered as an element of nature (the system = nature). Matter shapes itself according to the related information, and the existence of this information is only perceptible due to the matter possesses a shape, i.e. it is inhomogeneous, asymmetric. That is, matter and information become observable, see [7], sec. 2.4.
This means that the assembling operation, if applied to the elements of nature, is equivalent with the operation 'making observable', 'making existent', see also sec. 2 below. The pair {matter, information} generated by ‚making observable' relates to nature as a whole[3].

**In this regard, the complementarity principle is a result of the existence of the *assembling operation* and its applicability to different entities. Categorial complementarities being generated by this operation relate to the resulting system as a whole, but not to the single entities constituting the system.**

Since the pair {being, nonbeing} represents categorial complementarities, and since the latter always relate to a system as a whole, the pair {being, nonbeing} also relates to any system as a whole, but not to its single elements. Thus, **if it is possible to claim the mere existence (= being) of an object/process, then this object/process can only be a system**. That is, **existing objects/processes can only be a system, but nothing else**.

It can directly be inferred from this knowledge, among others, that there cannot be non-disassemblable, 'elementary' entities. A non-disassemblable entity does not represent any system (else, one could disassemble it) and, hence, it is impossible to ascribe to it any categorial complementarities including {being, nonbeing}[4].

One of the practical consequences of this inference is that there are no 'very elementary bricks' of nature, i.e. those, which cannot be represented as an ensemble of other entities (in other words, which cannot be disassembled anymore).
In this sense, the search for 'the very elementary particle' seems to be without prospects: it just cannot exist.

## *1.4 Complementarity: the Property of Object or Observer?*

The assembling operation can be applied an unlimited number of times. I.e., it is being applied to any entities the first time. As the result of this application, the system of first order arises. Then the assembling operation is being applied to these systems of first order representing now entities for the assembling operator. As a result, the system of second order arises, and so on.

According to **Def. 4** and **Def. 5**, a multiple application of the assembling or disassembling operation to an arbitrary term out of a population of categorial complementarities does not change this term, as such a term is an eigenvalue of these operations.
In this regard, categorial complementarities as notions could have aspired to the role of 'elementary entities' if the latter had existed. As often as the assembling or disassembling operations are being applied to them, it does not change categorial complementarities.

[3] assembling operation has here statically-dynamic character, as the system (= nature as a whole) in this case encompasses objects and processes, as well
[4] Categorial complementarities in themselves represent a special case: concerning a pair from among them, it is impossible to ascribe to it other categorial complementarities.

On the other side, any other than categorial complementarities entities[5] definitely change by the application of assembling or disassembling operations, as such entities are not the eigenvalues of these operators.

Is it possible to take an entity in and of itself, separately, i.e. is it feasible to isolate an entity[6]?
We proceed from the assumption that entities exist and are observable. The operation 'observation' necessarily presumes an interaction between the observer (actual, participant) and the observable (here: entity). An interaction, in turn, necessarily presumes including the object of observation in an observation system. Thus, the fact of observation itself makes the observation object – in our case assumed 'isolated entity' – part of the system with the system-constituting concept 'observation'. Please note that the system-constituting concept 'observation' exists even then, when there are no other system-constituting concepts, as the system-constituting concept 'observation' is immanent, by definition, in any observable entity.
That is, the observation operation itself assembles any observation object (including any observable entity) in a system, and, thus, enables ascribing categorial complementarities to the system.

Therefore, **any observation process – as an observation system – can be described by categorial complementarities**.
Since categorial complementarities relate to the arisen system as a whole, it is **principally impossible** to discern, whether the pair of categorial complementarities being perceived by observer is an **attribute of the observable or an attribute of the observer**, as the latter represent merely single entities of the observation system.

If the observer is, in particular, a human being, this inference is commensurate with the existential *Dasein* by Heidegger: the human being (Dasein) is such a specific being, for whom in its being it deals with the very being itself, i.e. understanding of being is itself a determination of being of human being. That is, the human being as Dasein perceives all the existing about itself being part of it[7].

That is, **the long-standing question, whether complementarity is immanent in objects themselves or it is attributed to the process of cognition by observer, is closed, namely in such a way that this question is basically undecidable**.

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[5] which can only be systems, see chap. 1.3

[6] In the sense Ding an sich (thing in itself) of Kant, см. [3], I. Transzendentale Elementarlehre, Erster Teil, Transzendentale Ästhetik, Zweiter Abschnitt, Von der Zeit, § 8, Allgemeine Anmerkungen zur transzendentalen Ästhetik

[7] see [4], § 4: „Das Dasein ist ein Seiendes, das nicht nur unter anderem Seienden vorkommt. Es ist vielmehr dadurch ontisch ausgezeichnet, daß es diesem Seienden in seinem Sein *um* dieses Sein selbst geht. ... *Seinsverständnis ist selbst eine Seinsbestimmtheit des Daseins.“*

# 2 Being, Nonbeing, Infinity and Time

As already mentioned in chap. 1.3 and being discussed in more detail in [7], sec. 2.4, *being* and *nonbeing* are obviously connected with *symmetry/asymmetry*. Being of material objects is observable, only if they possess at least one asymmetry, as absolutely symmetric objects cannot react to any action. In order to react to an action, a material object must be asymmetric with respect to this action, i.e. this interaction shall somehow modify this object. If an object is absolutely symmetric, no action can change it, hence, also no interaction is possible with such an object.

Is it possible to define the notions of *being* and *nonbeing* on a less abstract level than their relation to symmetry and asymmetry?
Yes, it is possible based on the ideas set forth in [7]. Here, we merely briefly depict the corresponding results.

In each moment, nature is in a 'state'[8]. These microstates can be indeterministic (probabilistic) and deterministic, cf. sec. 3.1, table C) above; a detailed statement is given in sec. 2.1.3, [7].
Only probabilistic microstates are principally *observable* and *differ from each other* ([7], ibid). These 'microstates' of nature are being assembled in its 'macrostates', see sec. 1.4 in [7], and, thus, can constitute objects.

**Def. 6:** Objects ‚assembled' from *observable* microstates of nature are *existent*; they are in the state of *being*.

**Def. 7:** The distinction of the microstates of nature from each other is the flow of time (= time), see sec. 1.3 in [7].

Thus, only *observable* microstates of nature generate time.

Deterministic, equally as impossible[9] microstates of nature are basically *non-observable*, see sec. 2.1.3 in [7]. Due to their unobservability, it is impossible to judge, whether states of such a type are deterministic 'in fact' or impossible. Therefore, these both types of states – deterministic and impossible – just concur with each other: they are basically indistinguishable.

**Def. 8:** Objects ‚assembled' from *non-observable* microstates of nature are in the state of *nonbeing*.

Since non-observable states are indistinguishable from each other, they cannot generate time.

It is interesting to remark that A. Schopenhauer came to the conclusion about the impossibility of the existence of the different types of *nonbeing*, at least of human nonbeing.

[8] termed ‚microstate of nature' in [7]
[9] creating an ‚impossible' microstate would have required infinitely much resources; impossible states can also be considered as deterministic, as they definitely cannot occur.

He writes: 'After your death you will be what you were before your birth'[10], [6], § 135. Schopenhauer reasons this thought by assuming the contrary: if there had been a form of being after death, then this form would have been another than while being alive; i.e. then there would have been two different types of the being of man. Simultaneously, it would have assumed the existence of two different forms of nonbeing, from the point of view of a living man: before birth and after death. But, if one presumes the existence of only one form of being for a man – its life, then there cannot be two different forms of nonbeing.

**Def. 8** enables only one single form of *nonbeing*, as objects assembled from *non-observable* microstates of nature are principally indistinguishable from each other because they are generally indistinguishable due to their non-observability.

Now, we turn to the question about the connection between finiteness/infinity and being/nonbeing, to be more precise – between the infinite extent of a system and the possibility of its existence.

In a material confined (finite) system being in a thermodynamic <u>dis</u>equilibrium, the entropy is produced in its entire volume and transported to the outside through its surface.
Let us notice that the relation volume/surface area is increasing unlimitedly towards infinity if the system extent is growing unlimitedly.

Let us assume that an infinitely large system is in a state of thermodynamic <u>dis</u>equilibrium. This would lead to an inevitable growth of its entropy, as the production of latter would be bigger than it could be conveyed to the 'outside' of the system. Hence, sooner or later, the entropy would take its maximally possible value for this system. This, in turn, would mean that the system would be in the state of thermodynamic equilibrium. However, this contradicts the initial assumption.

From this it follows that an <u>infinitely large</u> system
- either <u>cannot exist</u> at all
- or can be exclusively in the thermodynamic equilibrium, i.e. possess the maximally possible entropy value.

What can be said about the *observability* of an infinitely large system?

Let us assume the existence of an infinitely large system. Then, it must possess the maximally possible entropy value.
A system can react to a communication attempt with it from 'outside', only if this communication signal elicits a disturbance inside the system. Any such disturbance would mean a thermodynamic disequilibrium of the system, what is impossible in an infinitely large system (its entropy possesses already the maximally possible value). Therefore, any communication attempt with such a system has to go unanswered by the system, cf. [7], sec. 2.2.1.
It means that an infinitely large system, even if it existed, would be basically *non-observable*.

A logically equivalent statement is that **observable**[11] **systems must have a finite extent**.

[10] „Nach deinem Tode wirst du sein was du vor deiner Geburt warst"
[11] observability is a necessary condition of being/existence, see **Def. 6** above.

Infinitely large systems are either basically non-observable, if they existed, or they do not exist at all, what again leads to their non-observability. Due to their principal non-observability, it is impossible to judge, whether infinitely large systems do not exist ‘in fact’ or they do exist, but are non-observable. Hence, these two options just concur: they are principally indistinguishable

There is an absolutely similar situation concerning the *observability* and *existence* of the states of nature, see above in this section and in [7], sec. 2.1.3: the observable states of nature cannot be deterministic; they must be indeterministic (probabilistic).

In this respect, the property of a system ‘to possess a finite extent’ has the same meaning as the property of a state of nature ‘to be indeterministic’.
It is currently difficult to say, whether these properties are unreservedly equivalent to each other, though there is every indication for this.

In distinction from the pair <‘to possess a finite extent’|‘to be indeterministic’>, it is possible to make a certain statement about the equivalence of the pair <‘to possess an infinite extent’|‘to be deterministic’>:
These both properties – infinite extent of a system and determinism of a state of nature – signify the *non-observability* of such systems and states, and, hence, their *nonbeing*. In this regard, these properties are strictly equivalent to each other.

# 3 Annexes

## *3.1 Frequently Encountered Categorial Complementarities*

A1) Frequently encountered categorial complementarities being perceived synchronously relating to a certain state of a system:

| | | comments |
|---|---|---|
| information | matter | |
| form (phenomenon [Ger. Erscheinung]) | content (substance [Ger. Substanz]) | |
| stucture | function | |
| purpose | means | |
| cause | effect [Ger. Wirkung] | In fact, cause and effect occur synchronously[12]. It is especially obvious in the case of strong interaction between the participants of cause-effect process, cf. [5]. |
| possibility (choice) | reality (action [нем. Handlung]) | |
| property | relation | |
| quantity [нем. Extensität] | quality [нем. Intensität] | |
| process | state | |
| justice [нем. Gerechtigkeit] | merciness [нем. Barmherzigkeit] | |
| particular, concrete | whole (entirety), abstract | |
| freedom (of choice / action) | responsibility (of action / choice) | |
| misery [Ger. Elend (Unglück), Rus. беда] | guilt [Ger. Schuld, Rus. вина] | |
| analysis (deduction) | synthesis (induction) | |
| knowledge | intuition | |
| rationality | emotionality | |
| immanence | transcendence | |
| practice (empiricism) | theory | |
| ... | … | |

[12] in philosophical sense

A2) A subgroup of categorial complementarities relating to subjects as systems in their environment. They all can be represented as particular cases of the pair {isolation, identification}:

| | | comments |
|---|---|---|
| isolation (of subject from vicinity) | identification/unification/fusion (of subject with vicinity) | |
| individualism (competitivity) of subject | collectivism (cooperativity) of subject | |
| introversion | extraversion | intro: reference point is inside, isolation type: I ≠ world; extra: reference point is outside, identification type: I = world |
| action | contemplation | actor: an active change of world, isolation type: world ≠ me; contemplator: acceptance of world as it is, identification type: world = me |
| fright [Ger. Angst] | love | love = opposite_of_inverse[13] (placidity) |
| hate | placidity[14] [Ger. Gemütsruhe, Rus. безмятежность] | hate = antonym_of_complementary (fright) |
| hybris [Ger. Hochmut Rus. гордыня] | vanity [Rus. тщеславие] | hybris = antonym_of_complementary (eremitism) |
| eremitism (as a property of character) [Rus. отшельничество] | humility [Ger. Demut, Rus. смирение] | humility = opposite_of_inverse (vanity) |
| ... | … | |

B) Categorial complementarities arising in passing to the limit which causes a change of degree of symmetry ('second order phase transition'). These complementarities are perceived diachronously relating to the whole life cycle of a system:

| | | comments |
|---|---|---|
| discreteness | continuity | ‚continuity' corresponds to the limiting value of the attribute 'degree of discreteness' = 0 |

[13] operation opposite_of_inverse is equivalent to operation antonym_of_complementary
[14] ataraxia as by Epicureans

| | | comments |
|---|---|---|
| asymmetrie / inhomogeneity | absolute symmetry (i.e. with respect to all existing properties) / homogeneity | ‘symmetry’ corresponds to the limiting value of the attribute ‘degree of asymmetry’ = 0 |
| being | nonbeing | ‚nonbeing’ corresponds to the limiting value of the attribute ‘degree of being’ = 0 |

C) Categorial complementarities being perceived synchronously as well as diachronously:

| | | comments |
|---|---|---|
| | | **It is the fundamental complementarity being at the basis of the evolution of nature, of the existence and directedness of time** |
| contingency (indeterminism; the probability of an event/state 0<p<1) | necessity (determinism; the probability of an event/state p = 0 or p = 1) | This pair can be perceived diachronously relating to the whole life cycle of a system as well as synchronously relating to a certain state of a system.<br><br>Synchronism, for example, is implemented by nature itself: there is a probabilistic transition from one microstate to the next microstate of nature, but these incidental transitions statistically obey a necessary law: the principal of most entropy (of least action), see [7]. |

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