

Semiotic models in museum communication

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This article proposes a way of formalizing the description of various types of relations between the elements of museum communication based on the semiotic approach and the concepts introduced by F. de Saussure, C.S. Pierce and C.W. Morris. Semiotic models can be used to explain the specifics of museum communication for museum studies and as a methodological basis for developing various versions of databases or other software for museum affairs.

Key words: semiotic model, exposition, museum collection, syntagma, paradigm, connotation, denotation

The purpose of the semiotic models of communicative processes is firstly, to clarify the very process of implementing different active forms of communication, and secondly, to simplify, if necessary, the construction of new types of communications related to the development of museum collections, technical equipment and changes of discourse practices in modern culture.

The specificity of museum communication involves the integration of a museum object into the communicative process and, moreover, its dominance among other means of communication. A museum item, be it a relic, a rarity, a typological sample or a collection element, is the reason, the occasion and the means of museum communication. Unlike “ordinary” non-museum communication, where the main means is language, in museum communication, natural language has the status of an auxiliary (however necessary) communication tool. A museum exposition is a multicomponent form of communication where there are simultaneously three-dimensional objects and planar images, both static, in the form of photographs, illustrations, and dynamic - video materials, writing in original documents and annotations, labels, titles of exposition complexes. Some modern museum expositions allow for tactile contact with things. In such expositions, a visitor can participate in the exhibited events - try to make a vessel out of clay, work with a spinning wheel or a printing press. These activities are also elements of museum communication.

In studies of museum communication, it is also necessary to take the direction of a communicative action into account. Since the museum engineers meanings through the consciousness of the museum staff, the first kind of museum communication is the messages coming to the museum specialist from the outside world. Depending on the museum's mission, goals and themes, cultural attitudes, the qualification of the museum specialist and the entire museum community, items from the outside world become museum pieces for certain reasons. The status of an item taken from an everyday "secular"¹ space changes, for it ends up in a symbolic "sacred" space or more precisely - pseudo-sacred. The item acquires a new status in the context of a museum collection. It becomes a sign of some past events or phenomena. During the museum life, the object can participate in the design of different meanings and museum images, repeatedly changing its status: becoming more rare and valuable or losing relevance and, accordingly, value. Thus, the first type of communication — the outside world – a museum specialist.

The second type of communication — a museum specialist – a museum collection (thesaurus). It means that an object accepted into a museum collection must undergo scientific processing — description and fixation of the maximum amount of information about it. A detailed record of all available information on an object will ensure its use as a museum valuable in the future. The more features taken into account, the wider the possibilities of using the artifact in different themes. It should also be noted that the proprietary information about an object should ensure its safety and accessibility when searched for — this is a problem of intra-museum service communication.

The third type of communication is realized when creating an exposition: a museum specialist (exhibitor) — an exposition. The author creates the writing. As a writer realizes the possibilities of language in a literary work, an author of an exposition realizes the potential of a museum item in an exposition, addressing the visitor. An exposition expresses the concentrated meaning and image of a museum collection. Naturally, the author of an exposition strives for clarity and expressiveness of the message. Theoretically, it is reputed that an exposition will be successful if the value of dominant exhibits will increase in a new expositional context. Just as a common word can become a great deal more expressive in a poetic context, an exhibit item can become a bearer of an important meaning or a powerful aesthetic, ethical message in a properly selected combination with other expositional means.

The fourth type of communication: a museum exposition - a visitor. The exposition can and must be perceived, "read". Of course, the visitor - "the reader" must have the necessary cultural background. Moreover, this background goes beyond the knowledge of language, history, events, and scientific, social, cultural, religious or other problems. The viewer's reading of a museum exposition is only possible if he has the ability to tie dissimilar sign systems together, combine items, inscriptions and their arrangement into a common sense or image, both in a separate showcase complex and in an exhibition hall. The difficulty of such a connection-reading is that objects do not co-exist in a living space as in a museum showcase. To make a museum space (museum halls, expositions) understandable, a viewer needs to learn the code of the museum language. This is where semiotics comes in.

From the point of view of semiotics, human communication, whether ordinary, day-to-day or specific in the spheres of science, art, religion, etc., is realized as the combined action of several sign systems. In other words, the whole complex of cultural elements of an environment,

¹ In terminology of Mircea Eliade.

everything that “matters” to communicants - the addresser and the addressee, participates in the communication process, affects the meaning of the main message, and therefore everything that is taken into account and affects meaning, is signs.

For the construction of museum communication models, we need semiotics terms like the ones put forth by F. de Saussure and C.S. Peirce - C.W. Morris, as well as the elementary concepts of the set theory, for museum collections and expositions can be considered as sets in a highly formalized form.

Semiotic models

The relation of the sign to signified objects can be historically viewed from the time of antiquity, which is beyond the scope of this article. We turn our attention only on some examples to display the difference in approaches and the explanatory potential of semiotic models.

The simplest model of the linguistic sign was presented by F. de Saussure as a seamless whole of the signified and the signifier. It should be noted that both elements in Saussure's concept represent “psychic entities” and belong to the communicant's consciousness domain ². In the framework of Saussure's theory of the sign and L. Hjelmslev's connotative theory, R. Barthes represents semiotic models of metalanguage and myth ³.

C.W. Morris proposed the concept and model of “semiosis” — a process in which something is used as a sign and value is born. The essence and originality of Morris's proposal was that the subject of the communicative process (the interpreter) was also included into the model of semiosis ⁴.

Baudrillard talks about the need to criticize the fetishism of the signifier. The formula $EcEV / UV = Sr / Sd$, in which the ratio of exchange and use values is equal to the ratio of the signifier and the signified, is used ⁵.

A.J. Greimas, when determining the concept of sememe, uses the formula $S_m = N_s + C_s$. This means that the sign has a certain constant minimum value, which Greimas calls the “the nuclear seme” (N_s), and the semantic variants are formed in relation to the context. Contextual seme is denoted as C_s ⁶. There are many such examples.

The use of semiotic terms and categories in the analysis of museum communication, the study of the museum phenomenon in the linguo-semiotic aspect has its own history and deserves a separate study. Furthermore, the sphere of museum activity itself is bountiful for the development of semiotics, since it includes the simultaneous functioning and interaction of several heterogeneous sign systems.

Semiotics for a museum

Without claiming to present a comprehensive analysis of the works devoted to the semiotic aspects of a museum as a cultural phenomenon (for that deserves a separate study by itself),

² SAUSSURE, Ferdinand de. *Course in General Linguistics*. Edited by Charles Bally and Albert Sechehaye. Philosophical Library. New York. 1959. pp. 114-115.

³ BARTHES, Roland. *Myth Today*. Mythologies. The Noonday Press — New York. Farrar, Straus & Giroux Manufactured in the United States of America. Twenty-fifth printing, 1991. p.113

⁴ MORRIS, Charles W. *Foundations of the theory of signs*. International encyclopedia of unified science, vol. 1, no. 2. The University of Chicago Press, Chicago, 1938, Morris, Charles. Writings on the General Theory of Signs. The Hague: Mouton, 1971.

⁵ BAUDRILLARD, Jean. *For a Critique of the Political Economy of the Sign*. St. Louis, Mo: Telos press Ltd., 1981 pp. 128-129.

⁶ GREIMAS, A. J. *Structural Semantics: An Attempt at a Method*; M. Published by University of Nebraska Press, 1984.

we shall mention only those of them that either consider the sign-oriented essence of museum exhibits, directly use semiotic concepts or refer to semiotics as analytical tools that can be accessed due to their availability in a cyberspace.

Articles that present the problem of the specificity of the museum language and consider the significant nature of a museum object and the formation of an object's meaning in the context of a museum exposition start appearing in the last quarter of the twentieth century. The works of Duncan Cameron become best known during the 1970s⁷. One of the first works that featured the semiotic analysis of a museum method was an article by R. Hodge and W. D'Souza "*The Museum as a Communicator: A Semiotic Analysis of the Western Australian Museum Aboriginal Gallery*"⁸. The problem of studying the language of a museum as a universal modeling system was posed by the museologist Nikolai Nikishin in 1988⁹. In the article "*Postmodern/Postmuseum: New Directions in Contemporary Museological Critique*," R. Duclos explains the need of using a set of scientific approaches, including semiotics for productive research activities in museology¹⁰. The need to use the semiotic approach when studying a museum visitor is discussed in the works of E. Hooper-Greenhill¹¹ and J. Umiker-Sebeok¹². The recent studies of museum communication using a semiotic approach include the works of Salim Ferwati M., Khalil Rania "Semiotics aspects of the museum landscape ...", in which the authors express their confidence in the need of using the methodological foundations of philosophy, linguistics, phenomenology and semiotics in the analysis and design of museum landscapes. Vitaly Ayaniev's article "*Structural-semiological approach to museum and museum subject: towards analysis of theory by E. Taborsky*" also supports that claim¹³.

The museum specialist who studies the problems of communication will also undoubtedly benefit from articles not directly related to museum subjects, but related to the problem of an object's significance in culture, semiotics of space, architecture, art, etc. There are many such texts, but we will only point out some of them for example: Works of the Tartu-Moscow School of Semiotics under the direction of Y.M. Lotman, culturological studies of other schools and areas of focus¹⁴.

⁷ CAMERON, D. *Problems in the language of museum interpretation*. in: *The museum in the service of man: today and tomorrow*. The papers of the Ninth General Conference of ICOM (Paris), 1971, pp. 89-99.

⁸ HODGE, R. and D'SOUZA, W. *The Museum as a Communicator: A Semiotic Analysis of the Western Australian Museum Aboriginal Gallery*, Perth, Museum 31/4, 1979, pp. 251-266

⁹ NIKISHIN, Nikolai A. "*The Language of a Museum*" as a universal modeling system of museum activity. *Museology. Problems of cultural communication in museum activities*. Moscow, 1988. (Collection of scientific research institutes of culture). pp. 7 – 15. (in russian)

¹⁰ DUCLOS, Rebecca. *Postmodern/Postmuseum: New Directions in Contemporary Museological Critique*. *Museological Review*, V1, № 1, 1994, pp. 1-13.

¹¹ HOOPER-GREENHILL, Eileen *Museums and their Visitors*, Routledge. Taylor & Francis Group. 1994. pp. 3-4.

¹² UMIKER-SEBEOK, Jean. *Behavior in a Museum: A Semio-Cognitive Approach to Museum Consumption Experiences*. *Signifying Behavior* Vol. 1, No. 1, 1994 (Toronto: Canadian Scholars' Press) Indiana University-Bloomington.

¹³ ANANIEV Vitaliy G. *Structural-semiological approach to museum and museum subject: towards analysis of theory by E. Taborsky*. *Bulletin of the St. Petersburg State University of Culture and Arts* No.4 (29) December 2016. (in russian).

¹⁴ LOTMAN, Yuri M. Still life in the perspective of semiotics. In: LOTMAN, Yuri M. *Articles on semiotics of culture and art (series of the world of arts)* Comp. R. G Grigorieva, Prev. A. From Daniel. St. Petersburg : Academic project 2002, pp. 340-348 (in Russian); KEANE, Webb. *Semiotics and the social analysis of material things*. *Language & Communication* 23, 2003, pp. 409–425; HAMMAD, Manar. *La sémiotisation de l'espace Esquisse d'une manière de faire*. *Actes Sémiotiques* n°116, 2012.

It is necessary to note the editions of collected works from Leicester University edited by Professor G. Kavanagh¹⁵ and the Swiss Association of Semiotics under the editorship of D. Apotheloz, U. Bahler, and M. Schulz¹⁶ devoted to the study of the language of a museum and the relation between a word and an object. Dissertations on the problems of museum's semiotics have been held and defended since the 1990's¹⁷. In his monograph, J. Dolak implemented the semiotic approach when covering many issues of museum communication¹⁸.

The aim of modelling different types of museum communication is to present the multidimensionality of the value and meaning generation process in a museum space. It is necessary to know and take into account value and meaning formation mechanisms for almost all categories of museum researchers, from a curator of a collection, who manages the acquisition and scientific processing of a collection and an exhibitor, who selects material for a museum exposition, to a guide, revealing additional depth layers of an exposition and the history of a studied subject. (The distinction between "meaning" and "value" of a museum item is an interesting topic for a separate study.)

A museum specialist is offered a simple method of modelling the main museum structures - collections and expositions based on basic semiotic concepts and categories.

First off, let us specify in what conceptual boundaries it is possible to use semiotic terms and ideas when describing museum communication.

Signifier / signified are terms that date back to the ancient "semiotics" - the Stoics; they were further developed by F. de Saussure in the context of linguistics, and by R. Barthes in the semiotic context, in the "Elements of Semiology"¹⁹. For Saussure, the inseparability of the connection between the "signifier" (the mental image of the word) and the "signified" (the mental image of the object pointed to by the word) is the most important characteristic of the linguistic sign, which aroused controversy among linguists. Let us emphasize that this inseparable connection exists in the mind of the language user - the communicant.

Denotation / connotation indicate either a normative (basic) meaning, or a contextual one. In a museum exposition, as in any communicative practice, creativity, interest, intrigue,

¹⁵ KAVANAGH, Gaynor. *Museum languages: Objects and texts*: [Based on the prog. of the Conf. staged by the Dep. of museum studies at the Univ. of Leicester in Apr., 1990]. Ed. by. — Leicester etc.: Leicester univ. press, 1991, VIII., 180 p.

¹⁶ APOTHELOZ, D. – BÄHLER, U. – SCHULZ, M. (eds.), *Analyser le musée*. Actes du colloque international organisé par l'Association Suisse de Sémiotique (ASS/SGS), Lausanne 21-22 avril 1995. Travaux du Centre de Recherches Sémiologiques № 64, Aout 1996.

¹⁷ HORTA, Maria de Lourdes, P. *Museum semiotics: a new approach to museum communication*. Thesis submitted for the degree of Ph.D. Department of Museum Studies University of Leicester, Faculty of Arts. 1992. <https://ira.le.ac.uk/bitstream/2381/35304/1/U632526.pdf> ; VOLKOVICH, Anna Y. *Museum exposition as a semiotic system*. The dissertation author's abstract on competition of a scientific degree of the PHD. St. Petersburg. 1999. (in russian) <http://cheloveknauka.com/muzeynaya-ekspozitsiya-kak-semioticheskaya-sistema#ixzz4pLZcohHB> ; PLOKHOT-NYUK Vladimir S. *Semiotic Problems of Historical Knowledge and Museum Communication*. Abstract of the thesis for the degree of PHD. Rostov-on-Don. 2000. (in russian) <http://cheloveknauka.com/semioticheskie-problemy-istoricheskogo-znaniya-i-muzeynoy-kommunikatsii>; GHARSALLAH-HIZEM, Soumaya. *Le rôle de l'espace dans le musée et l'exposition*. // *Muséologies*. Volume 4, numéro 1, Automne 2009; MISHUROVSKAYA Olga S. *The museum as a semiotic phenomenon*. Abstract of the thesis for the degree of the PHD. St. Petersburg 2012. <http://cheloveknauka.com/muzey-kak-semioticheskij-fenomen#ixzz4pLbjYVw0>

¹⁸ DOLÁK, Jan. *Múzeum a prezentace*. Muzeológia a kultúrne dedičstvo, o.z. 1. vydání, Bratislava, 2015.

¹⁹ BARTHES, Roland. *Elements of Semiology*. Hill and Wang, New York. A division of Farrar, Straus and Giroux. First American edition, September 1968. Eleven printing, 1986. pp. 67 syntagm and system, 89-93 metalanguage and connotation.

and artistic image are created precisely by connotations. However, to understand connotative meanings it is necessary to have denotative meanings as the basis of the language code.

Syntagma / system (syntagm / paradigm) - ways of combining signs into a conceptual chain or a classification system. Brightly manifested in museum collections: a furniture set in which things are combined by contiguity - a syntagmatic collection, and a collection of coins - a paradigmatic one. If it is a collection of coins and bills belonging to one monetary system, then it is a syntagma.

Synchrony / diachrony are important for resolving the problems of temporal correspondence. If a collection or exposition has a purpose of showing the development of an object over time, then it is necessary to carry out a division of the time continuum. Historians have already done this by defining the epochs of world history. In the conformity with individual events, special periodization may be necessary. If the task of a museum exposition is to show a complex of interacting elements, then, in some cases, the actual chronology can be neglected for the sake of a holistic image. For example, if an ethnographic complex from the XIX century is exhibited, then items of later production may be present in it, but only if their analogues were characteristic of the indicated epoch.

In the semiotics of C.S. Peirce – C.W. Morris, the concepts of “the sign vehicle”, “the interpreter”, “the interpretant” and “context” are used.

The sign vehicle - the material substance of a sign. It is important to distinguish between “sign” and “sign vehicle”, for they are not synonymic. In a language system, the material quality of the sign vehicle does not matter: a phoneme or a word can be either pronounced, written or motioned - this does not affect the codes, the semantics or the syntactics of a language. In museum practice, the material of the sign can be of crucial importance in some cases, but not in others. So, for example, if it is necessary to denote, using auxiliary means, an epoch or an event, in the context of which the exhibit needs to be interpreted, then it can be a photograph, a poster, or some other material. The problem of the uniqueness of an item belonging to a historical person or its presentation as a typical object from a certain era or a social group can be described with reference to the concept of “representamen”.

The interpreter is the subject in whose consciousness the semiosis is realized. A museum deals with different interpreters: participants of events that have their own interpretation of an event, a museum researcher who interprets events and the interpretation of the participants, a museum visitor who interprets what he sees in a museum, a museologist who interprets museum activities and the interpretation of museum specialists, and etc.

“The interpretant” does not coincide with “meaning” in the semiotics of C.S. Peirce - C.W. Morris. It is a skill or a predisposition of the interpreter to respond to a sign in a certain way. In this sense, the concept also refers to the field of psychology.

For a sign to become possible, a sign situation must emerge; in other words, the explicit (present) object needs to indicate the implicit (absent) object for someone (the interpreter). The explicit object, acquiring the function of the sign, becomes “the signifier”, and the implicit object becomes “the signified.” The grammatical form of the foundation indicates the active role of the first object and the passive role of the second one. This is the simplest semiotic model, showing the possibility that for a cognizing subject (interpreter), the given object *a* can, for several reasons, indicate the missing object *b*. In the science of logic, this is the implication «if *a*, then *b*» or «*a* → *b*».

In the « $a \rightarrow b$ » model, it is only seen that one object of the external world points to the other. For the indication to become possible, a and b must have corresponding images or projections as a' and b' in the psyche of the interpreter - this is what F. de Saussure specifically refers to when he speaks about the unity of the signifier and the signified. The sign model, considering the mental activity of the interpreter, becomes more complicated and takes the form $a \rightarrow (a' \rightarrow b') \rightarrow b$. This model shows that for the given museum object a to indicate the historical event b , the image of this event b' must already exist in the mind of a viewer-interpreter.

The same artifact, placed in different exposition complexes, will be associated with different events and occurrences. If we improve the algorithm for describing an artifact, it is necessary to formalize its two components: the explicit “signifier” – a description of its appearance and all material features (“representamen”), and the implicit “signified” – an index of all its meanings – events and occurrences with which an artifact is connected. As an artifact is studied, the index of meanings may augment, and this will determine, among other qualities, its historical and cultural value.

Signs have different nature and origin, different degrees of distribution. These qualities are also amenable to formalization. The nature of the connection between the signifier and the signified can be of three kinds. If the object a has a natural or causal relationship with the object b , then this is a contiguity connection: “where there is a , there is b ”; these, according to C.S. Peirce’s classification, are indexical signs. In a museum collection, these are personal belongings of exhibitors, relics, material “evidence” of events. Signs-symbols are characterized by a conditional, contractual relationship between the signifier and the signified. In F. de Saussure’s formulation, it is a “naturally unmotivated” or “arbitrary” connection. In the “pure” form, symbols are words and most graphic signs. Sign-symbols are rarely used in a museum, aside from verbal communication. If an exposition uses objects that served as symbols in a non-museum reality, for example, banners, honours, etc., then, while preserving historical symbolism, they acquire the properties of an indexical sign in a collection or exposition, for they have a “contiguity” connection with a historical event. Iconic or signs-images are the third class of signs according to C. S. Peirce. In these signs, there is some similarity between the signifier and the signified. Theoretically, this class of signs is more difficult to formalize. The concept of the “image” mainly refers to visual communication.

The sign-image is the main means of expression for a museum. A museum exposition will turn out to be unsuccessful if it does not represent a certain integral envisioned image. As for visual images – posters, photographs, paintings or graphics, their functionality may vary depending on the history of a piece and its place in a collection or exposition complex.

As in any classification, there are characteristics of “pure” sign types in place. In the real process, most signs have different properties from all three classes.

The museum exposition is usually constructed in the context of a certain scientific discourse. A historical exposition will be dominated by syntagmatic type connections, and ethnographic or archaeological collections – by paradigmatic type ones. If a natural history exposition exhibits taxonomy of minerals, plants or animals – this is a paradigmatic approach; and dioramas, reflecting landscape, plant and animal life, are syntagmas. Collection and exposition models that illustrate types of connections can look like this:

The simplest model of an assemblage of museum collections can be presented in the form of a table, where $abc \dots i$ – collections by functional criteria, and X, Y, Z – more general features

(chronological, ethnic, geographical). Vertical columns combine objects based on functionality, and horizontal rows - based on contiguity.

	a	b	c	d	e	f	g	h	i
X	a _x	b _x	c _x	d _x	e _x	f _x	g _x	h _x	i _x
Y	a _y	b _y	c _y	d _y	e _y	f _y	g _y	h _y	i _y
Z	a _z	b _z	c _z	d _z	e _z	f _z	g _z	h _z	i _z

Fig. 1: The museum collection model, represented by different items with different characteristics.

Suppose a_n, b_n, c_n with numeric notation - depository items, $a_1a_2a_3, b_1b_2b_3, c_1c_2c_3$ – collections of homogeneous objects (paradigm); X, Y, Z and abc – syntagmas.

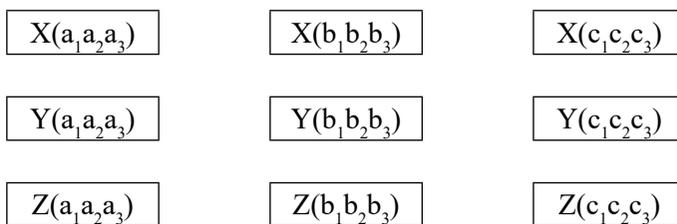


Fig. 2: A model of systematic collections with a predominance of paradigmatic connections. The organization of collections for storage in funds can look like this.

Systematic collections can also be exhibited, for example, for scientific or other special purposes, but it is necessary to compose a syntagma for a message.

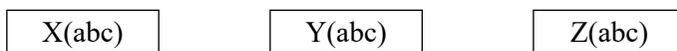


Fig. 3: Exposition model with a combination of syntagmatic and paradigmatic connections.

This is what an ethnographic exposition model can look like, where abc – the cultural syntagma (dwelling, costume, food, production, family, etc.) X, Y, Z – an ethnic characteristic. The paradigmatic connection is visible between the exposition complexes - sets of objects based on functional feature and ethnic division.

The organization and display of archaeological, natural, technical, artistic and other collections can be carried out with due regard to different connection variants. Depending on the communicative tasks, the exhibitor can decide what type of communication will dominate in the exposition and at what level.

The exposition or collection with the presence of only a syntagmatic connection will have this form:

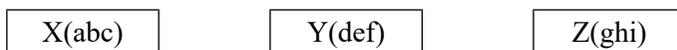


Fig. 4: A syntagmatic type exposition model.

This can be a historical exposition, where each complex has elements that refer to different historical periods and are functionally non-repeating, or ensemble expositions. Here, XYZ

is a sequence of historical periods or events, and abcdefghi — artifacts related to the events reflected in the exposition.

It will be easier for a museum exhibitor to manage material if the difference between the meaning of an artifact and its significance is considered. In language, “meaning”, understood as the sign’s relation to the signified, is formed by two factors: code and context. To distinguish them, the notion of “significance” is introduced. If the meaning is understood as artifact’s relationship to an event fixed by a certain practice of using this artifact, then the significance is the meaning that depends on other surrounding artifacts in an exposition complex or an exposition as a whole. For example, a wooden spinning wheel means home production of knitted clothing in the general, cultural context, but if it is placed in an environment with carpentry tools, it will be perceived as a product of a carpenter’s work.

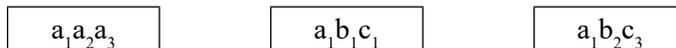


Fig. 5: The significance of the artifact a1 will be different in each complex

These manipulations are made at the signifier level to manifest the signified. The various types of discourse that a museum worker must deal with differ in another way of meaning generation - denotation or connotation. Artifacts of history and culture, collectables or collections can change their meanings over time, acquire new ones. When the signified, appointed to the signifier, acquires stability and is firmly associated with it, it can acquire the signifier’s function for the signified with a different connotation. That is how different kinds of metaphors and allegories arise.

As discussed above, the composition of semiotic models, if necessary, includes objects from the mental sphere of an interpreter. An exposition complex can be perceived adequately or, for various reasons, not adequately. Suppose there is a complex $a_1 b_2 c_3$ in the exposition, and one of the visitors sees it as $a_1^1 b_2^1 c_3^1$ or $(a_1 b_2 c_3)^1$, where the superscript indicates that the objects belong to the subjective world of the first interpreter. The second interpreter for some reason can see-interpret the complex $a_1 b_2 c_3$ as $a_1^2 b_2^2 c_3^2$ or $(a_1 b_2 c_3)^2$, which will not be a correct understanding, a misinterpreted vision of the significant exhibit properties.

Thus, the presented models can be used to design, analyze and evaluate a museum collection, its individual collections and expositions; they can also be used to analyze the perception of exhibited material by researchers and visitors of museum expositions.

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