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Language, information and the culture of science (part 2)[1]

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Abstract

The article describes the possibilities and restrictions faced in the process of the creation of an actual culturological area of the sciences about the nature and man. The elimination of the polysemantic limitation and hypothetical humanitarian discourse (from the point of view of chromatism, computer science and semantic logic) has been reached thanks to the construction of information models for those systemic functional communications of ontologically ideal predicates that are connected with their material denotations in the system. Information models of radiation and light absorption enable, firstly, to identify the semantics of the concepts "quantum" and "photon", secondly, to show the metaphysical character of representations about the wave function and, thirdly, to demonstrate the universal character of reflexion by tangential functions of characteristic properties of the absorbed (perceived) information. This leads to the construction of a meta-language that quite unequivocally establishes functional communications between diverse plans of difficult analysis systems, which are characteristic of the studied phenomenon, under boundary conditions. Intensional semantics of this meta-language (due to the universals of the created information models) enables to add known techniques and/or theories with the intrinsic additions based on experience. As a result, the author presents a possible area of a uniform science about the subject-objective relations of psychophysical culturanthropology.

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Information models of the language

As already mentioned, IM is understood as a metalanguage set of information about the state and functioning of the analyzed system, organized according to certain rules. On the one hand, language is considered to be a set of funds necessary for processing and transferring information. At the same time, language can be viewed not only as a means of communication, but also as an object of study. Thus, the language with which the formalization of the ordinary language begins can be called a metalanguage of the first degree. When a formalized language is defined, this language can be called the second-degree metalanguage, since it will with a certain interpretation reflect the structure of the first language, some other languages, to the extent that the metalanguage structure of these languages is the same [Zhinkin, 1965, 12].

The difference between meaning and sense in semantic logic is based on the principle of abstraction: for abstraction one should speak of the name of the denoter, which calls this denotation. If the utterance about names is a metalanguage utterance, then, according to Frege, the relation of a name to what it calls or denotes is the relation of the name, and the thing that is called is the meaning of the name. One should not think that a thing is a value regardless of name, any thing is simply a thing and there can be unnamed things. But every name always names something, and this something is a certain thing. Thus, value is a property of a name that is realized in naming things. According to Frege, the sense is the difference in the method of designating objects by names [Frege, 1984, 210].

In other words, actions with names can be considered equivalent to operations with denotata (things), which, when the senses are not distinguished, allows these operations to be performed automatically, that is, regardless of the understanding of the information received, namely, passing to the field of pure semiotics and formal ontology. If it is possible to separate the channels through which meaning and sense pass, the problem arises of putting the values of names behind the brackets with the analysis of ways that form the meanings of names. Here we move into the field of pure semantics and specific ontology. Schematically, the names of semantic and formal logic are compared in Table 3.

Since different expressions can have the same denotation with different meanings, and some expressions can make sense even in the absence of denotata, then the denotation and meaning are two interrelated parties of the significance of any formalization.

Table 3. Predicates of semantic and formal logic

Logics	Denotata	Name	Value	Meaning
Semantic	object, relation, property, denoted by name (language expression)	formalization of the denotata in a given language of expression	name property, implemented in naming objects, properties, relations	the concept of a denotata, i.e., assimilated in ontogeny the way of understanding and directing a name on a denotata
Formal	'volume'	'content'		

When constructing logical systems, the naming relation must satisfy three principles.

1. The principle of uniqueness: the name must have one and only one denotation.

2. The principle of objectivity: any sentence speaks only of the denotata of the expressions entering into it, but not about the sentence itself and / or its meanings.

3. The principle of interchangeability: if two names have the same denotata, then one of them can be replaced by another so that the second sentence remains true if the following principles are observed:

3a) the principle of extensionality: specific denotata with single names are interchangeable only in an extensional context;

3b) the principle of intensionality: denotata with common and / or empty classes of names are interchangeable only when taking into account the degree of their abstraction.

If a common language is intended for naming objects (object language), then in the semantic analysis there is also a metalanguage, which already speaks of the language itself as an object. In the natural language, the object and metalanguages are practically inseparable and form a semantically closed space, whereas the construction of formalized languages is determined by the obligatory separation of the object and metalanguages in order to eliminate paradoxes (for example, "The Cretan declared that all Cretans are liars").

Therefore, it is considered that the subject area that theoretically connects and / or generalizes heterogeneous objects is a logical abstraction requiring the establishment of ex / intensionality of their names under given boundary conditions for the existence of this region. So, according to Locke's rule, if some property belongs to any single name of the studied subject area, i.e., it is its parameter, then this property can belong to all names of the given region when fixing their denotata in a given class. If the name does not have a denotata in the domain, it is referred to an empty class of names that can acquire a multiple (probabilistic concrete-abstract) meaning.

From the standpoint of epistemology, of course, there are some peculiarities here. The natural language always and in everything is based on the semantic laws of the combination of the conceptual and sensory-figurative languages so the sensory channels of perception directly (automatically) influence the formation of a linguistic, and, therefore, subjectively conceptual picture of the world inherent in the intellect. And although the methodology of the natural sciences eliminates any subjectivity in constructing an objective picture of the world, it can not prevent multiple interpretations of the multivalence of such names belonging to empty classes in the history of science as heat, ether, wave function, etc. For example, for the author of this message who is a spectroscopist the wave function ψ always related to the same names as the centaur for an anthropologist, that is, to an empty class of names. Though, despite having a multiple (probabilistic) meaning and in the absence of a denotata, ψ has always had a multivalued concept. Natural sciences have never been characterized by this attribute, as since the beginning of the XX century they almost denied the sensory components of the perception of not only denotata, but also concepts, which translated the language into purely formal logic.

On the other hand, the existence of concepts that are not the concepts of any real thing, and the existence of names that express meaning, but do not have denotata, led A. Church to the remarkable conclusion: "If the name has a denotata, then this denotata is a function of meaning name". By function in this case, Church understands an operation that, when applied to the meaning of a name as an argument, gives some thing as the value of a function for a given argument [Church, 1960, 19-24]. The inference for a name displayed in an empty class, that is, without a denotata, returns us to the quantum theory in its realism mentioned at the beginning of the article – as a real success in modern physics.

Concept of the wave function

Grothrian diagrams also speak of this realism, which are still very popular among spectroscopists. "At the same time, it is noteworthy that, in the course of quantum mechanics, the Grotrian diagrams are not used," the researchers emphasize. Apparently, in such courses the theory of the atom is presented as an illustration to the general quantum mechanics, and the Grotrian diagrams are burdened with information that is superfluous from the point of view of high science" [Rautian, Yatsenko, 1999, 217-220]. This fact undoubtedly testifies to the selective, practical orientation of the Grotrian system and its focus on in-depth studies of specific atoms, molecules, and ions.

Grotrian diagrams are disliked not only by theorists. The verge of their "wordplay" is the "uncertainty principle", which was elevated to the rank of the higher laws of quantum mechanics, because it "explained" the fact that theoretically, when solving the wave equation (1), anything could turn out. They do not like quantization and spectral analysis, which, like Grotrian's diagrams, gives strictly reproducible results. However, theorists take the rule that after solving equation (1), agreement with the results of the experiment is required. And the quantum engineer goes to the spectroscopist, who says that from the vast number of calculated electronic states only 2-3 values are observed (in the experiment). Further, the theoretician issues these values for accurate calculation, keeping silent about the remaining hundreds of "extra" terms[2] obtained by him according to equation (1), and / or stipulating that they are not "superfluous" but "forbidden" by the selection rules that were created to justify the truth of the calculations.

Apparently, belonging of the name of the wave function to the empty class explains this "dislike" of theorists to Grotrian diagrams and / or to spectral analysis, in which only real (measurable) denotata are called. The description of the state of a microobject with the help of the wave function ψ has a probabilistic character, since the square ψ gives the value of the probabilities of those quantities on which ψ depends. Since the probability is determined by the square ψ, the latter is also called the probability amplitude. It follows that the wave function belongs to the empty class (the class of missing denotata, since only its square has meaning) and simultaneously forms a semantically closed space only as an amplitude of probability [George et al., 2013].

2 Within the framework of quantum mechanics, an unlimited number of invaluable assumptions are allowed in the course of the calculation, which is always more than sufficient to bring the calculation results closer to the experimental results [Gankin, Gankin, 2011, 261].

Table 4 presents examples of distinguishing semantic-logical degrees of abstraction in languages of different areas of knowledge. The first column shows the principle of separating meta-languages by the example of the second and third columns. In the fourth, fifth and sixth graphs, the main stages of abstraction are given in constructing the relevant dimensional theories [LIT], the wave function ψ and the quantum numbers TF, respectively, from the bottom up, that is, from the denotata to its meaning and sense. In the seventh column, the χ-plans relevant to each row are indicated.

Table 4. Semantics of metalanguages with different approaches to meaning

Languages	Semantic logic	Computer science	[LIT] language system	ψ	TF	χ
Metalanguage II	Sense of meaning	Sense of meaning	LIT sense of dimensions	(ψ2) 1/2	[LIT]	Id-
Metalanguage I	Meaning of the denotata	Meaning of funds	Dimensions of the language in SI	Ψ2	φ, E, Z	Mt
Language	Name of the denotata	Switching means	Language of object formula	f (ψ)	f (E, λ)	S-
Things	Denotata	Properties, relationships	Object of nature / language	E (ψ)	ΔE (Δλ)	Ma

Table 4 clearly shows the possibilities of transition from the languages of different areas of knowledge to the single criteria for their relevance both in terms of χ-plans and in dimensions [LIT] when correlating dissimilar concepts. In other words, a possible transition to a unified system of representation of humanitarian and natural-science values is shown here.

Sense as the meaning of the name, acquired in the process of ontogenesis (learning), can exist even in the absence of a denotata determined by this meaning, that is, finding a name in an empty class, as shown by the dependence of the potentially measurable energy values on the fundamentally unmeasurable ("amplitude-probabilistic") quantities $(\psi 2)^{1/2}$. This is confirmed by a comparison of the correlated meanings and senses of the languages.

Thus, from the position of constructing chromatic models (i.e., MI in the ontology of the relative determinism of denotata and names), it can be shown that when denoting as material (the bottom line of Table 4) its name will be material with respect to the value, but ideal with respect to the denotata. In turn, meaning is material with respect to the name, but material with respect to meaning. And, finally, the meaning is ideal in relation to all the components of this ontology.

On the other hand, if the transformation of signals from one ideal and / or material nature into signals of another material and / or ideal nature, respectively, can be called a transition to another code, then, from the thing to the second-order metalanguage, we have a double recoding, which also characterizes the "realism" of experimenters in the language formulas, and the "instrumentalism" of theoreticians in the languages of I and II orders.

So, Table 4 clearly showed that physicists have a tool of formulas (metalanguage of the first order) and dimensions (metalanguage of the second order), whereas in the humanities it is "mixed" due to the combination of these languages in the chromatic (x) plans. In other words, a physicist who deals with the concept of ψ is in the virtual world because of differences in the representation of reality[3]. And since ψ belongs to the empty class of names, man has nothing else to do but to include formal logic, which is clearly represented in the center of Fig. 1 in comparison with the everyday (left) and creative (right).

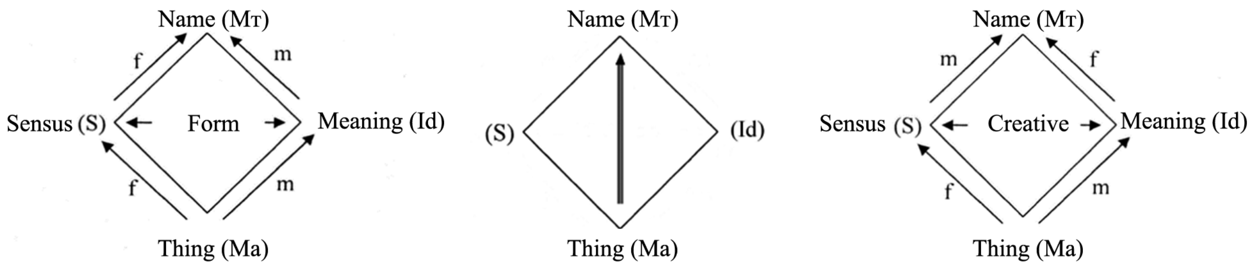

Figure 1. Chromatic schemes of everyday, formal and creative thinking

Since ψ as a thing is absent, formal logic leads the scientist to an increasing and larger number of virtual paradoxes, the negative connotations of which have recently increased in geometric progression [Briggs, Butterfield, Zeilinger, 2013, www; Fine, 1986; George et al., 2013; Lefebvre-Brion, Field, 2004; Sansonetti, Martin, 2005, 2141-2156]. We can't talk here about any creative thinking until there is a genius living in the ideal world of virtual reality – between the sensation (S) and the meaning (Id-) of the thing.

One of the most important Oxford issues [Briggs, Butterfield, Zeilinger, 2013, www], in my opinion, was the following: what can we learn about quantum physics using the concept of information? We will try to answer it using the created methodology and information models of radiation and matter.

The corpuscular-wave dualism of light is characterized by the following attributes. On the one hand, the photon demonstrates the wave properties in the phenomena of diffraction and interference at scales comparable to the photon wavelength. For example, single photons, passing through a double slit, create an interference pattern on the screen. At the same time, experiments show that a photon behaves as a particle that is radiated or absorbed entirely by objects whose dimensions are much smaller than its wavelength (Compton effect, etc.).

From the standpoint of the information approach it can be treated through known scientific acceptance "idealization" of complex systems and / or their relationship. For example, in mathematics concept of "ideal" for point indirectly relates to Id-up of chromatism in the same way as in physics there is a vacuum and / or chemistry there is an ideal gas, etc. It is the system of eliminating complexities, through which the analysis can be based only on the essential properties of the remaining parameters of a complex system.

Since ontology considers impossible to identify such interdependent parameters of being as ideal and material, we use their semantic correlates in the form of chromatic plans (χ ∩ Id-, S-,

3 For example, despite the fact that such concepts as "hybridization", "resonance of structures", "orbitals", etc. have nothing to do with reality (except for purely mathematical calculations), in many monographs and / or textbooks they are referred to the actual processes of interaction of atoms in a molecule and try to force students to "understand this" [Gankin, Gankin, 2011, 39].

Ma- and Mt-plans). Of course, χ-plans have a relative character and can not be absolutized in any way, regardless of the analysis system. Thus, when a particle (id-) meets more material objects (a crystal, an atom, etc.), the particle manifests its ideal ("wave") properties, when it meets less material objects (microparticle, light atom, electron, and etc.) – their material properties. The criterion of ontological "ideality / materiality" can be the amount of information, for example, a crystal has more information than a particle, whereas in the system "heavy particle – light atom" – on the contrary, as it is schematically presented in Table 5.

The correspondence between the value of the information I and its dimension can be expressed [I]. The smaller λ is, the more m_e is, that is, it is the boundary Id / Ma. If the physical quantities with dimensions of the quantum of action (h) are much higher than h (h is a negligibly small quantity), then in the boundary conditions of the given problem the classical approach is completely applicable, where it is possible to introduce the concept of optical, or more accurately, the spectroscopic equivalent Z / E = 1,272.

From these positions, the dimensional correspondences of the energy and the angle of incidence of radiation (1 eV = 1 rad) were also explainable, since not all the absolute values of energy appeared in all the TF formulas, but the relative values, i.e., their changes with respect to changes in the wavelength. Experimental data were presented above, according to which the change in the radiation energy ΔE and / or its absorption by the IP atom at values that, on the one hand, are multiples of Δπ and, on the other, Δλ, is the criterion for the manifestation of emission maxima / minima in octaves.

Table 5. Chromatic metalanguage of spectroscopy and quantum optics

χ	Predicates of a photon (IMR)	Spectrum characteristics (IMAP)	Formulas	[LIT]
Mt	Formal recording of all photon characteristics (below)	The formalized notation E = mc2, E = hν, E = ch / λ, E = Zφ / q	$E = h\nu$ $E/Z = ¼\pi$	L2I T-2
Id-	Wave predicates of a photon propagating in a field with a potential U at E = eU ~ Id, where Id = 0 for I ≠ 0, U = 0	The wave component of a photon propagating in an electromagnetic field with a potential U = c2 (diffraction of de Broglie waves $\lambda = h/p$, $\nu = E/h$	$\lambda = ch/E$ $\lambda = qch/Z\varphi$	L
S-	Corpuscular predicates of a photon in a field with a potential U (Compton effect) E> 10 eV	The corpuscular component (electrons, ions) of the projection of a photon in a field with a potential U (photoelectric effect)	$Im = E/U$ $(p = h/\lambda)$	I*e*
Ma	The particle-wave predicates of the photon hν at the encounter with the M-object (lattice, ESCA), E <10 eV	Corpuscular-wave manifestations of a photon (diffraction, interference, photoelectron emission) $ch = const$	$\lambda = h/p$ $(\nu = E/h)$ $ch = \lambda Z\varphi/q$	L3I T-2

So, the given data allow to believe that the characteristic property of the information should consider exactly the content of the message with adequate methods of its processing. This property has the recursive functions of the TF, which include simultaneously the semantics of the self-consistent source and receiver (information) source codes. Due to these properties, it was shown that the discretization of the light continuum as the self-consistency of the interpreter's codes, i.e., the discretization method (n, q, Z, φ) and continuum data (E = hν) allowed quantization of both light and matter.

Since these theses can be verified in the experiment with photons polarized at angles of 0, 45, 90, 135 degrees, the Popper principle will also be compatible with the requirements of D.N. Klyshko, convinced of the need to distinguish between quantum physics, which is characterized by a continuous fruitful interaction between experiments and mathematical models, and a barren, mostly verbal, quantum metaphysics that is not controlled by experiments but claims a profound description of quantum phenomena. "Physics, as an experimental science, can apparently do without criteria such as the principle of Popper's falsifiability or the operational definition of Bridgman (at least for some key concepts)" [Klyshko, 1994, 1189].

If such concepts are the above operational definitions for the quantum numbers of TF, which may be relevant in the description of many-electron atoms, they undoubtedly must undergo the principle of falsifiability, as shown below.

Languages of spectroscopy

The term "spectroscopy" usually includes an analytical method based on the separation of electromagnetic radiation over the wavelength λ and / or the energy of radiation / absorption $E = ch/\lambda$. If the product $\lambda E = ch = \varphi Z = const$, then the product $\lambda at(Z)\cdot E\varphi(Z)$ should show a linear dependence on *Zn* as the characteristic value of TF: $Zn = f[\lambda nat(Z), En\varphi(Z)]$, where *Zn* is the sequence number of the term in the Lyman series, including the number of photons, that is, observed in the absorption; λ^{n}_{at} is the transition wavelength corresponding to *Zn* of the relevant energy of the TF $E^{n}_{\varphi}(Z)$.

Since the function $E\varphi(Z)$ was determined by the self-consistent photon data code $E\varphi(Z)$ and the method of processing them in the atom by the product $\lambda at(Z)\cdot E\varphi(Z)$, information on the group of terms relevant to the quantum numbers according to equation (2) was observed: $Zn = 1 + (\lambda nat\cdot En\varphi - b) / a$, where a and b are the empirical coefficients, which in the modern version of the Bohr model correlate with screening constants σ and quantum defects Δs in the LS scheme [Elyashevich, 2001, 197, 217] because they also increase proportionally with increasing Z in each PSE group, as shown in Fig. 2.

We call attention to the dimensions $\lambda at(Z)\cdot E\varphi(Z)$ [L3IT-2] and $\lambda at(Z)/\lambda\varphi(Z)$ [L0I0T0], corresponding to the dimensions *ch* and the optical equivalent *Z / E*, respectively. It follows that the detected TF in the form $tg2E\Delta\lambda/\Delta E$ turned out to be, if one may say so, "optical DNA", whose "genes" (*E, q, Z, φ*) carry integral volumes / fragments of information about the photon and / or interacting with it substance. It is curious that the radiation of a natural light source has a polarization "twist" analogous to DNA spirals, so that *E, q, Z and φ* are the functional units of discrete photon information. Of course, this analogy claims only to an idea of the semantic unity of the biological and physical laws of the universe, but not to their formal and logical equalization.

This, in turn, allowed us to consider it reasonable to carry out a correlation between the properties of TF and atomic terms, which was confirmed by experimental data. In particular, the IMAP turned out to be consistent with the well-known description of a one-electron atom, but, essentially, detailed it in terms of φ 8 times with an adequate preservation of the properties of atomic systems. Similar dependences for the elements of Ia and VIII of the PSE groups are shown in Fig. 2 from the positions of optical equivalents $\lambda at / \lambda\varphi$ with the possibility of extrapolating terms up to ionization potentials.

The discovery of regularities hidden in structured and unstructured data has shown that this type of information can be related to information, which correlates with functions, but not with structure, that is, not with the composition of components and intercomponent interactions of the system related to the ontologically material plan. The latter in this approximation can be referred to free. Since the semantic definition of information is related to matching the distribution of source codes with relevant codes of bound and free states of the receiver, and the information volume of the linear aggregate event is determined by the information volume of the dependent and independent events, the total amount of information is equal to the relative amount of information *[Is]* as the product of the coefficient *Ki* as a function of the information about the dependent events *[Id]* on the sum of information about the independent *[ΣIn]* $[Is] = Ki([Id])\cdot\Sigma[In]$,, where $Ki = [Is]/[\Sigma In]$ is a coefficient correlation between different volumes of information, numerically equal to the slope of the given regression. Hence, it is possible to obtain the value of the associated type of information about the dependent events *[Id]* taking into account the constant *C*, due to the value of information about independent events: $[Id] = [Is] - \Sigma[In] + C$.

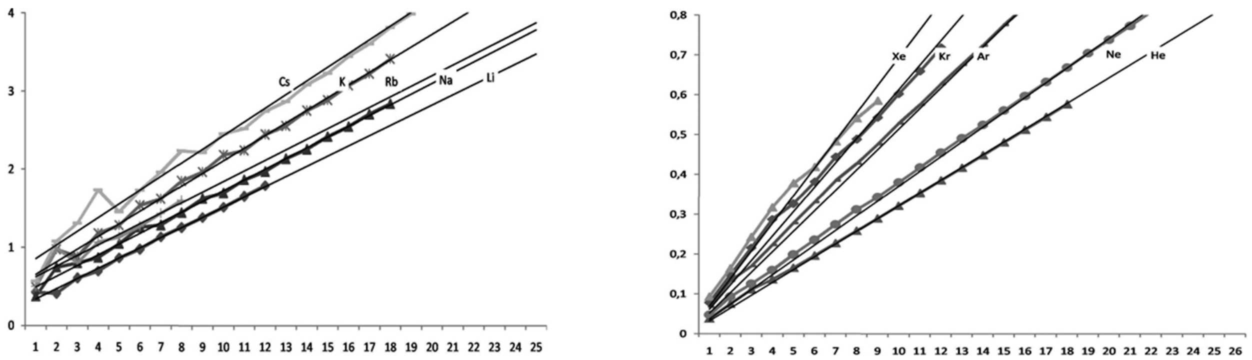

Figure 2. Regressions λat(Z)/λφ(Z) for Ia and VIII groups of the PSE[4]

Since the angles, terms and dependencies of the radiation parameters on the quantum numbers *n* and *l* can be determined with the help of the quantum numbers *E, q, φ, Z*, an information model of the additivity of terms (IMAT) can be used to verify the assumptions about the principles of constructing MI in molecular spectroscopy [Serov , 1982; Serov, 1984, 390].

4 The abscissa is the ordinal number of the term Z = n-1, the ordinate is the values of the function λat (Z) / λφ (Z)-b. The values of the terms for Na, K, Cs and elements of Group VIII of the PSE group are given by: [Striganov, Sventitskii, 1966]; for Rb and Fr: [Kikoin, 1976, 654; Sansonetti, Martin, 2005].

The technology of constructing IMAT follows from these definitions, according to which the electron term *T abe* of the molecule *ab* correlates with the relative sum of the terms *Tn* of atoms *a* and *b* for their minimal difference in magnitude: $abe = Ki\ \Sigma a,b\ T\ abn,l \mid \Delta\ T\ abn,l \rightarrow min\ (\Delta n=0;1;\ \Delta l=0;1)$, where *Ki*- is the correlation coefficient of IMAT, and *Δn* and Δl are the states of atoms forming atoms in the main *n* and orbital *l* quantum numbers.

The classification of molecular terms in IMAT is determined by the Rydberg series of electronic states found today in most diatomic molecules [Elyashevich, 2001]. According to the notations adopted for the Rydberg states, it allows to introduce *nlnl* – quantum numbers to classify the states obtained. Indeed, since the quantum numbers characterizing electrons in separated atoms describe part of the binding electron density of the effective atoms that make up the molecule, it is possible to classify *Te* by effective quantum numbers *nalanblb* for the transition to the many-electron classification *Λ(Te)* in IMAT. Strictly speaking, by effective quantum numbers we mean the quantum numbers characterizing such states of electrons in effective atoms, whose difference from their states in free atoms is given by the coefficient *Ki* of the latter's participation in the chemical bond.

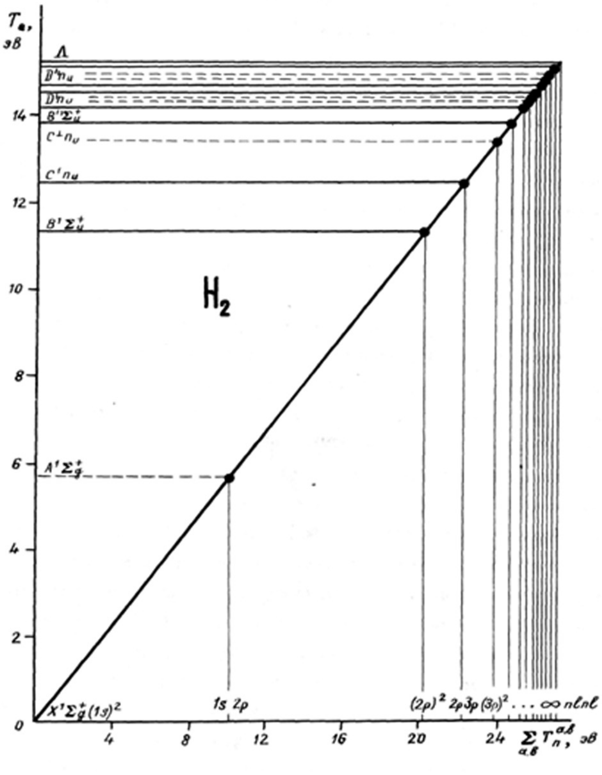

Figure 3. Correlation between terms H_2 and sums of terms H[5]

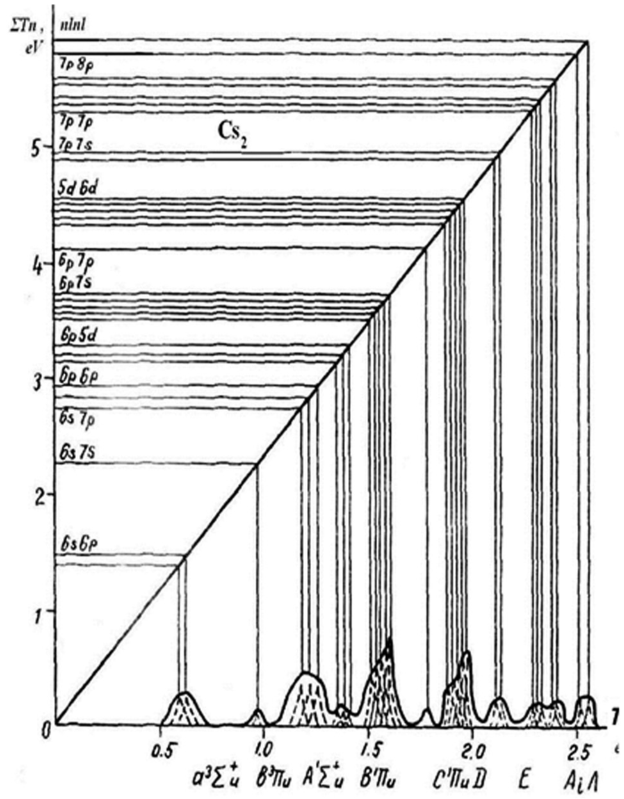

Figure 4. The correspondence of the IMAT to the spectrum of the cesium molecule[6]

5 Abssissa – the sum of atomic terms; ordinate – the electronic term of a hydrogen molecule. [Serov, 1984; Ionov, Kuznetsov, 2005].

6 Abscissa – electronic terms and rovibronic spectrum of the cesium molecule; ordinate – the sum of these atomic terms. The spectrum is presented according to the data: [Constants of diatomic molecules ..., www].

The analytical dependence of IMAT shown in Fig. 2 and 3 (dispersion σ = 0.0025 over all states up to the ionization potential) clearly and accurately describes the electronic terms of the H_2 molecule through the quantum numbers and terms of the atoms forming the molecule. The accuracy obtained in many respects exceeds the accuracy of calculations achieved in the model assumptions of quantum chemistry on the one-electron excitation of a two-electron H_2 system. The clarity of the interpretation of the molecular spectrum of cesium, presented in Fig. 4, does not require comments.

The main role in IMAT is played by the property of relative additivity as a generalization of the known rule of classical additivity for K = 1 inherent in a number of chemical compounds [Brown et al., 2012]. Thus, the additivity of the energies for the compounds of homologous series extends to the values of the whole object formed by the sum of the values of the quantities corresponding to its decomposition into atoms, which, for example, is determined in thermochemistry by the additivity of the calorific values of these compounds in the same way that the mass of any substance is equal to the sum of the masses of its components . From the point of view of informatics this is due to the fact that information about material plans (mass, heat of combustion, etc.) is strictly additive, whereas weakly structured (ideal) plans (information, refraction, etc.) of the same compounds are subject to the IMAT property in the formation of chemical compounds involving dependent and independent events.

Schematic agreement of certain attributes of atomic and molecular terms according to the Russell-Saunders scheme (LS-link) with the parameters of MI is presented in Table 6.

Correlations presented in Table 6 between the values of the IM and the LS scheme for a one-electron atom made it possible to compare the previously known relationships. It followed that the dimensions [*E*] and [*Z*] are identical, but *Z* could indicate the number of photons numerically comparable in the IMAP with the main quantum number n in the one-electron LS approximation.

Light, color and man

Going back to the goal, as well as answering the permanent question of the opponents of chromatism ("Does a humanitarian and / or virtual quantum theory really want to become a science?"), we tried to substantiate the following points. First of all, in the prospects for constructing a natural picture of the world (not divided by formal logic), the thesis of the need to present at least the area of a unified science of a developing personality in the whole world of subject-object relations of psycho-physical culture-anthropology becomes more and more relevant. What was required for this? And what have we achieved?

It turned out that the ideal plan of light can be expressed through the product of related information *I* and the potential of the field *U*. Since the well-known theses about the noospheric character of mankind's knowledge could be compared with the civilization level of culture, the inclusion in the field potential of humanitarian aspects of knowledge allowed to assume that the value of *U* can influence the amount of information at the energy values given by the epochs of the New

Table 6. Modeling the correlation between the LS scheme and the MI parameters

	LS[7]	IMC	PSE	IMAP	IMAT
n[8]	Main quantum number $n = 1, 2, 3,\ldots, \infty$	Octave number $n = Z_{2\pi} / q_{2\pi}$	Period number (number of shells) 1(K), 2(L)…	No. of the atomic term $n = Z_n + 1$	The minimal difference in terms of $\Delta n = 0; 1$
L	Orbital quantum number l = 0, 1, 2, 3, ...	№(.) TF in the whole region $l = n - 1 = Z_n$	Group number (number of valence electrons)	Characterization of valence electrons	The minimal difference in terms of $\Delta l = 0; 1$
Z	Element number (total number of electrons)	Number of photons $Z_\gamma = q{\cdot}E / \varphi$	Element number (total number of electrons)	Number of terms Number of electrons $Z_e = E_\varphi / \varphi_1$	The electron density $s_e = 1/ K_i$
q	*L, S, J* – quantum numbers of the atom *0 (S), 1 (P), ...*	No(.) TF in octave Quality of photons $q = 4\varphi{\cdot}/ \pi$	No(.) in each period $q = \varphi_n / \varphi_1$	The meaning of the term in the atom Quality of electrons $q = \lambda_n{\cdot}\varphi{\cdot}Z / ch$	*nlnl* are the quantum numbers of a molecule (according to Rydberg states)
φ	$\hbar = h / 2\pi$ *(360°)*[9]	$\varphi 1 = \varphi / q$ *(45°)*	$\varphi 1 = \pi / 4$ *(45°)*	$h = \pi{\cdot}\lambda_n{\cdot}Z / 4c$ *(45°)*	$\varphi_m = arctg\, K_i$
E	$E = hv$	$E = Z{\cdot}\varphi / q$	$E_\varphi = \varphi_1 {\cdot}Z$	$E_n = ch / \lambda_n$	$E_m = K_i \Sigma E_n$

and Newest Times. The humanitarian aspects of the world and, in particular, the color canons of different cultures (separated by thousands of years and thousands of kilometers) were reproduced independently of any migration influences (K. Levi-Strauss). Reproducibility is the criterion of science. Similarly, the wavelengths and energies of photons forming light were reproduced. Perhaps, the combination of this information will lead to the creation of a new computer architecture, which today is characterized only by natural intelligence, formed for thousands of years under the influence of light.

In fact, the above MI allowed to raise such a question. If the information is the coordinated distribution of source codes by the relevant codes of the receiver, then the formalization of the humanitarian aspects of the world in chromaticity was brought to a certain correspondence with its natural-science correlates. Thus, the wavelengths and energy of photons can be expressed in terms of natural quantum numbers for atoms due to IMAP and for molecules in accordance with the IM additivity of terms (IMAT). The humanitarian parameters of light, according to known MI, were formalized through human (society) / culture chromium plans (χ) and were determined by the relevant wavelength ranges $\Delta\lambda$ and / or the photon energy Δhv represented by the spectrum of sunlight (Table 7).

First, the light, like man, turned out to be so internally oppositional-comparative, which was sufficiently characterized by a well-known idea of the periodic interchange of oppositional χ-plans

7 The Russell-Saunders scheme operates in the Coulomb field of the nucleus of a one-electron atom, that is, with the selection rules for dipole radiation ΔJ = 0, ± 1 and Δm = 0, ± 1 [Elyashevich, 2001, 117].

8 The quantum number n carries a multivalued semantics, in the IMAP, as in LS, it can characterize both the orbit in the Bohr atom, and the ordinal number of the term, and the PSE period itself ($2n^2$).

9 The projections of the vectors L, S, J in the LS scheme are quantized multiples of ħ (angles of 360°) [Schmidt, 2007, 38, 212].

Table 7. Reliability of the languages of science and culture

Color	Δλ, nm	Δhν, eV	χ
Purple	700-790	1.57-1.77	M_f
Red	620-700	1.77-2.00	S_m
Orange	580-620	2.00-2.14	S_a
Yellow	565-580	2.14-2.19	S_f
Green	510-565	2.19-2.43	M_m
Light blue	480-510	2.43-2.58	Id_f
Blue	450-480	2.58-2.76	Id_a
Violet	395-450	2.76-3.14	Id_m

(Id-, Ma, Mt, S) as phenomenally determined dominants (see Fig. 1). Thus, the culture (Id-) and the language (Mt) in their development periodically pass through the dominance of the stages of formation and destruction. Man often acts irrationally (S) in relation to nature (Ma), although he proceeds from pragmatic (Mt) considerations. For example, is a person rational if he acts irrationally? Are the interpretations of the paradoxical (irrational) phase of dreams rational?

Here, we also had to face the fact that the simultaneous operation of χ-planes in a certain relation to both light and man turned out to depend on the boundary conditions for the existence of the system. Both the light and the person essentially include opposition χ-plans, whereas when encountering an unforeseen circumstance (light with matter, a person with extreme conditions, etc.) show their one-sided characteristics.

Secondly, for the chromatic description (strictly speaking, for informational modeling of these phenomena), we had to consciously simplify "too exact" theoretical knowledge in order to bring the accumulated contradictions / paradoxes in line with nature and / or experience. It is the inclusion of approximation in the methodology of chromaticity that made it possible to produce adequate substitutions of complex and / or virtual objects for the relevant χ-plans. The study of the system-functional properties of complex objects at the level of χ-plans led us to achieve this goal.

Thirdly, it should be emphasized once again that the basic principles of relative determinism and system-functional analysis play the main role in the methodology of chromaticity. If information in the information models of spectroscopy deals exclusively with functions and / or related information, then neither structure, nor mechanical particles and / or their interaction can agree on this principle. For in IMI, IMC, IMAP, IMAT there are no probabilities (statistical factor), but there is strict reproducibility (the criterion of science).

Generally speaking, any uncertainty limits the possibilities of knowledge of the world, losing in this respect the classical view of the world. In fact, we saw above that the ideal plan of any macro- and microsystem can not be structured because of the essential function of information, which in turn leads to the construction of their information models exclusively at the system-functional level.

It should be especially noted that the principle of uncertainty is eliminated by rigorous spectroscopy techniques, in which both λ, and E (I) are always and in all strictly reproducible under given boundary conditions. For quantum mechanics, this principle, perhaps, is significant, since the probability correlates with uncertainty and / or polysemy, as we saw above. And this is completely justified for mechanical (structural) parameters as characteristics of the ontologically material plan of microobjects when they are verified in terms of ideal, but can not be adequate for the ideal plan of the characteristic information that the focal points of the ontologically ideal light plan represent. It indicates for centuries that the axiom is being professed, according to which in science one should distinguish the "probability of transitions" from the "probabilistic formalization of their definition."

In this regard, we should compare the ideas of L. Wittgenstein and / or N. Bohr with the truly scientific approach of A. Einstein to the "rules of the game" of "words" and "reality", in particular "one-electron approximation" and many-electron atoms. Of course, the relations obtained above and the empirical correlations of IMI, IMC, IMAP, IMAT require further development and thinking about the way in which the classification of the one-electron approximation can be most painlessly and fruitfully translated into the language of a multielectron atom, etc.

At the same time, it is always necessary to take into account the need to verify the information models obtained so as not to slip into the metaphysical section of quantum mechanics, for "the main criteria for comparing the merits of alternative languages are obviously the ability to predict new effects, the ability to combine, classify and systematize phenomena, universality, compactness, simplicity, clarity" [Klyshko, 1994, 1212].

Conclusion

A new approach for constructing information radiation models (IMI), quantization (IMC), atomic absorption (IMAP) and additivity of terms (IMAT) due to the dependencies between light and trigonometric functions (TF) linked the projection of natural light sources and atoms absorbing this radiation. This position was confirmed by the verification of the information link between the atomic terms and the nodal points of the TF by linear regressions that allow reliable predictions of unknown terms and / or their classification. Thanks to IMC and IMAP, a potential alternative to one-electron classification of many-electron atoms and molecules is presented.

Generally speaking, this alternative fits perfectly into the history of the development of culture. So, for example, in the theory and practice of color, humanity has traveled a centuries-old path from Plato's idealism to Aristotle's realism, from Newton's realism to Goethe's romanticism, from Monet's impressionism and Maxwell's impressionism to the Einstein-Planck and Picasso Cubism, from Sisley's pointillism and the Wasarelli toillism the surrealism of Kafka-Daly-Magritte, from the postmodernism of Warhol to the formalism-paradoxes of the "post-quantum" theory. Examples of formal vs creative thinking in culture and, in particular, in quantum optics quite clearly demonstrate that quantum theory virtually expands our possibilities of cognizing the world, losing in this respect the classical view of the world. On the other hand, classical physics makes it possible to measure quantities, whereas the central uncertainty relation for the quantum theory deprives such an opportunity – similar to the virtual-possible images of Dali or Chirico, as light is not a structured Ma-plan, but a functional ID plan that ontologically manifests and material (with respect to potential), and ideal (with respect to matter) properties.

It can be assumed that further study of IMI, IMC, IMAP, IMAT will create a powerful tool for other optical correlations and / or information models that can lead to the construction of new theories in optics. In combination with the results obtained here, it can contribute to the future development of the information interpretation of the concept of "photon" in bilateral representations of quantum optics and / or in the very vague concept of "man."

The revealed correlation between the optical region continuum and its octaves in IMI allowed to suggest the possibility of developing new principles of quantization, since a quantitative correspondence of the "angles" and energies in the IMC was found between the photon and the energy quantum. In particular, the TF radiation of a natural light source made it possible to refine the limits of the visible region of the spectrum (395-789 nm) with the derivation of a clear boundary between "warm" and "cold" colors, that is, to reveal the natural unity of the laws of physics and psychophysics of color perception of light.

It is here that the subject of the intellectual space of culture turned out to be relevant to the object of the external environment, confirming the unity of the codes of culture and nature in artistic and / or scientific practices. Chromatically common predicates for physical ($h\nu$, φ) and humanitarian (color, χ-planes) practices were found to be related by a single criterion of dimension [LIT] when correlating the relevance of heterogeneous I and II languages, which, with maximum visibility, was justified for the visible region of sunlight.

Thus, man and light represent the information unity of nature and humanity in the contradictory development of languages of culture and science. Since 2017 is declared the year of ecology, we will hope that mankind will be able to find a single language of the nature of its own intellect and its environment for their ecologically harmonious combination.

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Слово, информация и культура науки (часть 2)[10]

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Аннотация

Цель настоящего сообщения – представить возможности и ограничения при создании единого культурологического ареала наук о природе и человеке. На примере квантовой механики и оптики показано, что при формализации гуманитарных проблем с позиций хроматизма, информатики и семантической логики может быть достигнута элиминация полисемантической ограниченности и гипотетичности гуманитарного дискурса культурологов, филологов, психологов и/или социологов путем построения информационных моделей для тех системно-функциональных связей онтологически идеальных предикатов, которые связаны с их материальными денотатами в заданной системе. Поскольку с позиций онтологии информация идеальна относительно данных, но материальна относительно субъекта-интерпретатора, то именно так может характеризоваться и «слово» как «идеальное» относительно своего опредмеченного вида (в фонеме, в лексеме, в символе или в ином знаке), но «материальное» относительно смысла и значения (семантического наполнения, кодов интерпретации и т. п.). Это привело к по-

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строению метаязыка, который вполне однозначно устанавливал функциональные связи между характеристическими для изучаемого явления разнородными планами сложных систем анализа при заданных граничных условиях. Интенсиональная семантика этого метаязыка, благодаря универсалиям созданных информационных моделей, позволила дополнить известные методики и/или теории сущностными дополнениями, основанными на опыте. В заключении представлен возможный ареал единой науки о субъект-объектных отношениях психофизической культурантропологии.

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Ключевые слова

Языки и метаязыки науки, хроматизм, семантическая логика, информационные модели, формализация языка, спектр, квант, фотон.

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