Фоносемантика и возможности ее современной интерпретации

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Аннотация. В статье представлены результаты экспериментального изучения фоносемантики. Фоносемантическое исследование включало в себя два эксперимента: опрос информантов и анализ фоносемантических особенностей молитв *«Отче наш»* и *«Богородице Дево...»* на русском, сербском и греческом языках на основе специальной программы на языке программирования Python 3. Была установлена четкая связь между планом выражения и планом содержания языка. Результаты исследования православных молитв позволяют судить об осознанном использовании определенных приемов для создания эмоционального воздействия на слушающего, что особенно прослеживается в греческих молитвах. В исследовании звук определяется как устно-речевой коррелят фонем того или иного языка.

Ключевые слова: фоносемантика, звукоцветовые соответствия, ассоциации по сходству, звуковые ассоциации, ассоциации с геометрическими формами, язык программирования Python 3, звукоцветовой анализ православных молитв на русском, сербском и греческом языках

Original article

Phonosemantics and Its Possible Modern Interpretation

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Abstract. The article presents the results of an experimental study of phonosemantics. The phonosemantic study included two experiments: a survey of subjects (informants) and an analysis of the phonosemantic features of the prayers "Our Father" and "Hail Mary..." in Russian, Serbian and Greek based on a special program in the Python 3 programming language. A clear connection was established between the plane of expression and the plane of content for the languages under study. The results of the study of these Orthodox prayers make it possible to suggest the conscious use of certain techniques to create an emotional impact on the listener, which is especially evident in Greek prayers. In the study, sound is defined as a spoken-language correlate of the phonemes of a particular language.

Keywords: phonosemantics, sound-color correspondences, similarity associations, sound associations, associations with geometric shapes, Python 3 programming language, sound-color analysis of Orthodox prayers in Russian, Serbian and Greek

Языкознание

Despite the fact that phonosemantics was formed not so long ago as a separate field of knowledge, the phenomena and principles it considers have been observed and applied by priests, scientists, speakers, philosophers and poets for many centuries. Relevant supporting is found in the oldest surviving written texts: in the Vedas, in the works of ancient Greek authors (for example, the Stoics); the property of sound representation (tone-painting) has been especially widely used in poetry (see, for example, [Вишневская, Егорова, 2009]), and most often it is used by the authors unconsciously.

The issue of the relationship between a phonetic sound and the meaning of a word has been discussed by scientists for a long time; however, even in our time the proper answer still has not been received, and the issue continues to cause numerous disputes. Phonosemantics, as a science, studies the connection between the sound of a word and the emotional sensations that it causes in the mind of a person who is a native speaker. Phonosemantics pays attention not so much to the lexical meaning of a word as to the totality of its phonetic elements and their *psychological impact* [Лурия, 1975] on the recipient. Research in this field of knowledge indicates the presence of some possible patterns in the perception of sounds associated with a particular color (see, for example, [Плахова, 2018]).

At the end of the 19th century, *musical-color synesthesia* [Simner, Hubbard, 2006; Dael, Sierro, Mohr, 2013; Price, Mattingley, 2013] was considered by scientists a variety of *chromesthesia* or "colored hearing", that is, a feature in which musical sounds evoke certain color associations in a person (see, for example, [Greenwald, McGhee, Schwartz, 1998]). Many musicians had "colored hearing": Russian composers N.A. Rimsky-Korsakov, A. A. Kenel and B. V. Asafiev, Lithuanian artist and composer M. K. Čiurlionis, French composer O. Messiaen and Austrian composer A. Schoenberg. Each musician "perceived" the keys as differently colored ones. For example, B. V. Asafiev, D-major took on an emerald hue, and for N. A. Rimsky-Korsakov it was golden. A. A. Kenel visualized D flat as lemon yellow, while for B. V. Asafiev it was red, flaming – a kind of fiery glow[1].

The system of intuitive connection between a musical work and the perception of color was very specific for each composer. So, N. A.

Rimsky-Korsakov created very pictorial music, endowing it with "graphic sound writing", based on his own feelings and ideas, while A. Schoenberg correlated colors with the musical timbres of various instruments of a symphony orchestra.

Composer Alexander Scriabin's attempts to combine several types of art into a single whole resulted in creation of *color music*. In the history of world musical culture, Alexander Scriabin became the first to combine *sound*, *color* and *light* in one work[2].

To perform the poem "Prometheus", an orchestra, choir, organ, piano and a special light apparatus were needed. The latter was assigned a special role – to reproduce the part of the light "Luce", in which the symbols of colors were recorded with ordinary notes. In the score of the work, A. N. Scriabin wrote the "light line" for performance in two voices. The upper voice was more mobile and was responsible for changing the harmony. The lower voice was responsible for the philosophical component. The light line was also dominated by two colors, purple and red. The first was associated with the realm of the spirit and the non-material principle, the second acted as its opposite and denoted matter. According to the composer's idea, at the end of the part of the light, it traveled beyond the material world, so the finale of the work was presented in purple. And the system of the "Prometheus" was generally represented by the musician in the form of a ring "spirit-matter-spirit"[3] [Бальмонт, 1917].

The method of *phonosemantic analysis* (PhSA) is based on numerous facts of tone-painting accumulated during the development of linguistics [Марухина, 2013]. Studying linguistic and speech material, linguists recorded phenomena that required theoretical understanding. Moreover, as it turned out, it was impossible to explain the obtained data solely within the principles of phonetics or semantics, and this served as one of the factors in the creation of the "interdisciplinary" science of *phonosemantics*.

Its founder S. V. Voronin contributed to the development of the main research method [Воронин, 1982]. The method of PhSA consists in the analysis of a word through interrelated operations aimed at establishing the presence / absence of tone-painting in a word and identifying its nature.

S.V. Voronin composed glossaries of tone-painting words in various languages of the world. Then the material was analyzed, resulting in classifications of language units (a division into two large sub-classes

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[1] Как Александр Скрябин открыл миру светомузыку // Audiomania. URL: https://www.audiomania.ru/content/art-6285.html (дата обращения: 03.05.2022).

[2] Там же.

[3] Там же.

of words was adopted: onomatopoeic (onomatopes) and sound-symbolic).

M. V. Ivanova notes that at present, the following types of analysis are distinguished within the PhSA: determining the presence of sound expression in a word; definition of emotionality (expressiveness of the word); etymological analysis; acoustic-articulatory analysis; typological generalizations [Иванова, 1990].

RESEARCH METHOD

In our study, sound is defined as a spoken-language correlate of the phonemes of a particular language. Within this study, an experiment was conducted, the purpose of which was to determine the "phonosemantic color" of the vowel sounds of the Russian language in the mind of a modern Russian-speaking person. The difference between this experiment and the experiment by A. P. Zhuravlev [Журавлев, 1974] is that, in addition to conducting a color and emotional evaluation of sounds, the subjects were asked to give sound and geometric associations. Repeated color and emotional evaluation seems necessary, since the language is constantly evolving over time, which can lead to a change in the perception of individual sounds by its speakers. Having studied these changes, it will be possible to evaluate the influence of various factors on the course of some intralinguistic processes and to identify the most stable phonosemantic characteristics of sounds.

Due to objective reasons (Covid-19), the experiment was conducted online and included a survey of subjects. The survey involved 52 subjects born in 1946–2002 (49 out of 52 subjects under the age of 35); more than 14,500 responses were received. Russian was the native language of all listeners. In the first part of the survey, the subjects were asked to choose a color with which they associate sound-letters. In the second part, the vowels of the Russian language and 25 antonymous features from the theory of A. P. Zhuravlev were presented, according to which it was necessary to evaluate these sounds. The third part of the survey was aimed at identifying associations with natural sounds. In the fourth part, the subjects were asked to provide associations with geometric shapes.

Sound-color correspondences represent a special aspect of the symbolism of sounds. According to R. Jakobson, only vowels have "color coloring", that is, in his opinion, vowels evoke color representations, while consonants are black and white [Jakobson, 1941; Jacobson, Fant, Halle, 1961].

A. P. Zhuravlev consistently investigated the "color" of vowel sounds in three ways: free choice of color correspondences; choice from six colors; choice from a fixed set of colored cards [Журавлев, 1974].

Each of these methods has its pros and cons. The first method allows the subject to freely choose a color, without limitations, but the downside is that different people can call the same shade differently. The second and third methods strictly limit the subject in decision-making; thus, we get not so much data on the correspondence between the sound and the color of the spectrum, but data on the compatibility of sounds and the proposed colors, which may not always reflect the real perception of the sound by the subject. Despite the differences in approaches, the main identified color and sound correspondences coincided in all three experiments conducted by A. P. Zhuravlev.

Based on this, in this study, it was decided not to limit the subjects in the choice of colors; they had options of nine colors (7 colors of the spectrum + black and white) or could give their own answer.

Also, at the beginning of the survey, instructions had been given in which it was advised to exclude distractions for the duration of the experiment, focus on internal sensations, do not think, do not make unnecessary associations and respond intuitively. In case of difficulties or uncertainty, the subjects were advised not to answer the question.

The data obtained as a result of the experiment clearly indicate the presence of some stable patterns in the perception of the color designation of sounds. The most "brightly" colored sounds were [**a**] and [**я**]. More than half of the listeners called them "red". Their assessments coincided with the assessments obtained in the experiments by A. P. Zhuravlev and G. N. Ivanova-Lukyanova [Журавлев, 1974; Иванова-Лукьянова, 1966].

RESULTS OF THE STUDY
ASSOCIATIONS BY SIMILARITY

The free choice of color options increased the scatter of answers; however, the definition of the color of sounds was the same for many subjects. The most frequent responses were selected that give an idea about the color of sounds.

Basic colors of sound-letters: **a** – 59.6 % red, 21.2 % white; **e** – 26.9 % green, 17.3 % yellow, 13.5 % orange, 13.5 % red, 9.6 % blue; **ё** – 23.1 % green, 13.5 % red, 11.5 % blue, 9.6 % yellow, 7.7 % orange, 7.7 % blue, 7.7 % purple; **и** – 21.2 % green, 17.3 % yellow, 17.3 % blue, 15.4 % blue, 11.5 % white; **o** – 30.8 % white,

19.2 % orange, 9.6 % blue, 9.6 % blue, 6 % yellow; **у** – 32.7 % yellow, 15.4 % blue, 15.4 % purple, 13.5 % orange, 13.5 % green; **ы** – 28.8 % black, 11.5 % yellow, 11.5 % purple, 9.6 % blue; **э** –25 % orange, 21.2 % purple, 7.7 % yellow, 7.7 % green, 7.7 % black, 7.7 % white; **я** – 52 % red, 12 % white; **ю** – 28.8 % purple, 11.5 % blue, 9.6 % orange, 5.8 % blue, 7.7 % pink / raspberry.

When comparing the results of the survey with the research data obtained by A. P. Zhuravlev, an observation was made that the primary colors and the proportional ratio of colors in the assessments of many vowels almost did not change [Журавлев, 1974]; however, some vowels began to be colored noticeably more often in those colors that were not characteristic of them before.

According to the results of the study, it can be judged that the sounds [**а**], [**я**], [**ю**], [**и**], [**е**], [**о**], [**ы**] practically did not change their color. There are some minor changes, but they are not so unambiguous. The sound of [**о**] became a little darker; the orange color was replaced by yellow. The sound [**ы**] has become a little lighter, yellow color has appeared in the estimates. The sound of [**ё**] became a little darker.

Further studies are needed for a more precise assessment. Much more noticeable changes can be observed in the color of the following sounds: [**э**] - the subjects almost did not evaluate this sound as "yellow" or "green", although in past experiments these were its main colors. A fairly large proportion of the subjects called it "purple", which is not found in previous studies. A very interesting correspondence is observed when comparing the format frequencies of the sound [**э**] with the note row and colors. The first formant (440 Hz) corresponds to A of the first octave; it is correlated with the orange color. According to the results of the experiment, it is indeed clear that most often [**э**] was painted in orange. The second formant (1800 Hz) is between A and A-sharp of the third octave, they also correspond to the orange color, but also to the yellow color, in which this sound was most often painted previously. The third formant (2550 Hz) is between D-sharp and E of the fourth octave; they correspond to the violet color observed in the results of the experiment.

For the sound [**у**]**,** there were more associations with a "yellow tint", which were not observed before, and there were fewer associations with a "black tint". When studying the formants of the sound [**у**], it was found that they all correspond to D, D-sharp and E from the second to the fourth octave. These notes correspond to the range of colors from blue to violet, that is, the colors that have always been the main ones for the sound [**у**]. However, during the experiment, a fairly large percentage of the subjects called this sound "yellow". According to A. P. Zhuravlev, many linguists before him considered the sound [**у**] to be bright yellow.

CONCLUSIONS ON COLOR-SOUND ASSOCIATIONS

The results showed that less frequent sounds changed their "color" more intensively.

The front mid-vowel [**э**] has become darker. This may be caused by the large number of borrowings of vocabulary and pronunciation norms that have entered the Russian language in recent years. The sound [**э**] is used mainly in borrowed words, which is confirmed by the fact of its appearance in Russian words of foreign origin.

Despite a fairly stable idea of the sound [**у**] as a "dark and gloomy" sound in previous studies, now more than half of the listeners associated it with light tones of color.

More accurate results require further additional experiments. It is necessary to repeat the survey with a large number of subjects. Possible reasons for such changes may be: the influence of foreign languages, the mixing of dialects, a change in articulation and a change in the picture of the world.

In the second part of the survey, the informants were asked to take an emotional assessment of the vowel sounds of the Russian language. The purpose of the survey was to identify changes in the assessment of the emotional characteristics of vowel sounds. As an indicator of the central tendency in the distribution of informants' answers, the arithmetic mean estimate attributed to each sound was taken. The obtained results were compared with A. P. Zhuravlev's results obtained in 1974 (50 informants).

Based on the results of the survey, it can be assumed that there are indeed partial changes in the perception of sounds by native speakers. The following general trends can be established: 26 vivid emotional assessments were lost, 11 new ones were acquired. Some assessments are almost the same as those of the 1974 study, but many assessments have changed dramatically, some differing by more than 1 and 2 points. For example, the sound [**у**], which has undergone strong changes in its color assessment, has indeed become brighter, happier, faster, and its mobility assessment has increased by almost 2 points. One can also observe averaging of assessments.

SOUND ASSOCIATIONS

In the third part of the experiment, the informants were asked to find a sound association from the natural world with the vowels of the Russian language. The subjects were not given answer options; they had to offer their own options. Despite this, general trends in the construction of some associations were observed.

The main associations with sounds were as follows: **ё**: forest, rustling, crackling, plants, nature; **е**: forest, rustling, crackling, plants, nature; **а**: sounds of animals (mainly birds), the space of the Earth, sounds made by human; **о**: light, sky, clouds, water, space; **у**: howling wind, gloomy sounds, sounds of animals; **ю**: howling wind, prolonged sounds, rustling, plants; **э**: echo, wind, rustling / noise, rumble, murmur of water, repeated and iterative sounds; **я**: sounds of animals, many associations are made with words containing this sound; **и**: associations with murmuring sounds, creaks, rustling, "squeaking" sounds of animals; **ы**: sounds of animals, gloomy sounds associated with nature.

Based on the results of the survey, it can be concluded that native speakers have well-established and regular associations of sound-letters with the natural world. It is interesting that most of the associations reflect the main color of the sounds in one way or another.

ASSOCIATIONS WITH GEOMETRIC SHAPES

In the next part of the experiment, the beholders in the experiment were asked to find associations of geometric shapes with Russian vowels. The subjects were not given answer options; they had to offer their own options. Despite this, general trends in the construction of associations were observed.

The main associations with shapes were as follows: **ы** (47 responses; quadrilaterals: 46.8%; lines: 23.4%); **я** (47 answers; acute-angled: 49%; lines: 29.7%); **ю** (45 responses; rounded: 51%); **ё** (48 answers; quadrilaterals: 41.6%; rounded: 27%); **и** (48 responses; lines: 56.2%; quadrilaterals: 22.9%); **е** (48 answers; lines: 41.6%; quadrilaterals: 33.3%); **а** (48 responses; triangular: 45.8%; lines: 22.9%); **о** (48 responses; rounded: 93.7%); **у** (48 responses; lines: 33.3%; triangular: 35.4%); **э** (47 responses; rounded: 68%).

Based on the results of the survey, it can be concluded that native speakers have well-established and regular associations of sound-letters with geometric shapes. Basically, the associations are similar to the geometric shape of the relevant letter.

ANALYSIS OF THE PRAYERS
SOUND-COLOR ANALYSIS OF THE PRAYER "OUR FATHER" IN RUSSIAN, SERBIAN AND GREEK

In this study, a comparative phonosemantic analysis of two common prayers in Russian, Serbian and Greek was carried out. The aim of the study was to identify and compare the phonosemantic features of prayers in the above languages.

The analysis involved the method of poetic ideography, as well as the method of psycholinguistic experiment using the data obtained as a result of the survey. To count the number of vowels and accented stressed vowels, a program was written in the Python 3 programming language [Palach, 2014]. The prayers studied were colored on the website: http://zvukocvet.ru. The experiment was carried out in the following compositional sequence: analysis of the prayer "Our Father" in Russian, Serbian and Greek (in Russian, the version according to St. Matthew was used, which contained stressed vowels with an emphasis); analysis of the prayer "Hail Mary" in Serbian ("Богородице Дјево" in Serbian); analysis of the prayer "Hail Mary" in Greek ("Θεοτόκε Παρθένε" in Greek).

In the Orthodox Church tradition, much attention is paid to the symbolism of the liturgical color. There are no fixed dogmas in this respect, but there is an established tradition in the Church according to which certain symbols are assigned to various colors used in liturgies. This applies to the robes of the clergy, wall paintings, iconography, the Holy Altar decorations and plants (flowers) used on certain holidays.

Therefore, the next step in conducting a phonosemantic analysis of these prayers was to identify their color perception. According to the results of the analysis, the average color of the Russian prayer "Our Father" turned out to be purple. Violet and purple colors correspond to the group of holidays and days of remembrance of the Cross of the Lord [Православная энциклопедия, 2022]. The color of church clothes (vestments) on these holidays is violet or dark red. The violet color combines two colors: red (the color of the Divine Blood and the Resurrection) and blue (symbolically expressing the idea that the road to heaven opens with the Cross). Also, violet is used in church robes (vestments) during Sundays and feast days of Lent. Purple and violet are primordially sacred colors. They are symbols of life and God himself. Traditionally, only the prelacy, including bishops, wore purple and – later – violet robes.

Языкознание

Purple shades came to Russian icon painting from Byzantium. They are used as signs of the presence of God the Father and when creating the image of the Almighty (Christ Pantocrator). Quite often one can see a lot of purple in the scenes of the Last Judgment [Православная энциклопедия, 2022]. An interesting fact is that the prayer addressed to God the Father, the first prayer that Jesus Christ taught his disciples, is colored precisely in purple endowed with such a deep sacred meaning and, moreover, completely coinciding with the main message of the prayer.

If we carefully consider the sound-color analysis of the prayer, we will see that its average color is formed mainly by mixing green, red and blue colors. In the additive synthesis of colors (mixing color rays), they are the main ones: by mixing them, all the other colors may be obtained. Nowadays, violet and purple colors are often specially used in interiors for psychological comfort.

A sound-color analysis of the Greek and Serbian prayers was also carried out. The results of the sound-color analysis of the Serbian and Greek prayers can be considered reliable only when using the data obtained as a result of a survey of native speakers of these languages. However, the results of this analysis turned out to be very interesting and deserve consideration.

The average color of the Serbian prayer differs little from the color of the Russian one. This result was expected, since Russian and Serbian are related languages, and the phonosemantic analysis of the prayers in these languages revealed many similar phonosemantic markers.

According to the results of the analysis, the Greek prayer received the most uniform and rich coloring. This partly confirms the earlier conclusion that the structure of the Greek prayer is the most homogeneous, filled with phonosemantic markers more than the others, and has a stronger effect on the recipient.

To obtain more reliable results, further research is needed with the involvement of native Greek and Serbian speakers.

SOUND-COLOR ANALYSIS OF THE PRAYER "HAIL MARY"

According to the results of the analysis, the average color of the Russian prayer "Hail Mary", as in "Our Father", turned out to be purple. In the sound-color image of the prayer "Hail Mary", there is much more white color, which makes it much lighter and easy-to-perceive. In the lines that convey joy, there are many red sounds [а] and [я], alternating with blue sounds [и] and [у]. Red and blue are the main colors of the Mother of God depicted on icons.

As in the analysis of the prayer "Our Father", the Greek prayer has the most uniform coloring among all the three prayers. For a full-fledged analysis, data on the sound-color correspondences of the Greek and Serbian languages are needed.

CONCLUSIONS

Based on **Experiment 1**, the following main conclusions can be drawn. The results of the survey show that the correlations of some Russian vowels with colors have changed over time. Emotional assessments of vowels have also changed, that is, some changes in emotional assessment correlate with changes in the color of vowels. From our point of view, the possible reasons for the identified changes may be the following factors: the influence of knowledge of foreign languages, the mixing of languages (according to L. V. Shcherba [Щерба, 1974]), changes in pronunciation norms and transformation of the picture of the world as a whole. Further research is needed to identify the exact causes of the changes. Most vowels have strong associations with sound representations from the natural world. Most of the associations of vowels with geometric shapes reflect the geometric outlines of vowels themselves. To confirm the revealed changes, it is necessary to repeat the experiment and further analyze the results.

Based on **Experiment 2**, the following main conclusions can be drawn. The information obtained is not complete, since in order to conduct a full-fledged phonosemantic analysis of the Greek and Serbian prayers, further surveys with the participation of native speakers of these languages are necessary. The phonosemantic characteristics of the prayer texts largely depend on the sounds that make them up. A clear connection between the content and sound aspects of the prayer texts has been revealed. The comparison of the prayers in different languages revealed the presence of a large number of identical phonosemantic markers: sound repetitions, alliterations, assonances, rhythm. Greek prayers are distinguished by the presence of a more clearly defined rhythmic structure and a greater concentration of phonosemantic markers. Therefore, it can be assumed that they have a greater impact on the recipient. One of the most interesting phenomena observed in prayers is their common sound representation, which is clearly manifested in the sounds of their names. In

the Greek prayer to the Mother of God, in addition to the image of the name – "Θεοτόκε Παρθένε", – the sound representation of the Mother of God's name is also expressed. Similar techniques are seen in poetry, starting from the era of the ancient Indian Vedas, mantras (prayers) dedicated to certain deities. The sound-color representation of Russian prayers corresponds to the established color images of God and the Mother of God in the Church tradition.

Thus, in the course of the two experiments of the study, a clear connection was established between the plane of expression and the plane of content of the language as a whole. The sound aspect of the language should be studied together with the content aspect.

The results of the study of these Orthodox prayers make it possible to suggest the conscious use of certain techniques to create an emotional impact on the recipient. This can be seen especially clearly in Greek prayers, which, apparently, have retained traces of the most ancient traditions of composing chants (songs) and versification.

From our point of view, further development of this problem is necessary, since a deep understanding of the phonosemantics of a language can be widely used in many areas of human activity. Currently, the role of phonosemantics is increasing when information flows are growing, and the opportunities for "face to face" communication with our interlocutors are narrowing, studies and work activities are increasingly transferred to a remote format (and not only because of the Covid-19 pandemic). A well-written text is very important in terms of achieving maximum efficiency of remote information exchange. Experimental data obtained as a result of research regarding phonosemantics of various language structures will help enhance the required emotional impact of spoken language, form the necessary emotional coloring and, as a result, ensure optimal psychological perception of both written and spoken language by recipients.

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