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ABSTRACT

of the dissertation for the degree of Doctor of Science

ALLOPHONIC VARIATION OF THE OCCLUSIVE-PLOSIVE PHONEMES OF THE MODERN ENGLISH LANGUAGE (Experimental phonetic research)

Speciality: 5708.01 – Germanic languages

Field of science: Philology

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GENERAL CHARACTERISTICS OF THE WORK

The relevance and scope of the subject. The relevance of this topic is determined by the need to provide a systematic description of the occlusive-plosive consonants of the English language, to establish the limits of allophonic variation of these consonants and to identify the allophonic variation of the consonants of the English language. It is likewise connected with the systematic study of the variability of language as a universal property and the need for a systematic study of its description in various manifestations, including the function of interpreting the phonemic form of speech implementation. The development of a communicative model that most fully and adequately reflects the variation of structural units of language in the speech flow is one of the main and urgent tasks of modern anthropocentric linguistics. Studying the features of phonetic variability of consonant phonemes in spoken language will help solve problems associated with improving didactic approaches to teaching a foreign language and increasing students' intercultural competence. Finally, the study is relevant due to the insufficient study of the problem under consideration, since the occlusive/plosive consonants in the English language – /b/, /d/, /g/, /p/, /t/, /k/ – have more than once become the object of study in both domestic and foreign linguistics.

This dissertation is based on a theoretical framework formed based on the results of systematisation of foreign and Azerbaijani scientists in the field of private and general phonetics and phonology, as well as the variability of linguistic units. It should be noted that in linguistics, variability is traditionally studied, firstly, in the direction from the language system to speech material, as a manifestation of the systemic properties of language at the speech level, and secondly, as a modification of the form of a language unit that correlates with the same semantic essence.

These areas of research into variability based on the material of different languages are presented, for example, in the studies of I.A.Baudouin de Courtenay, L.V.Shcherba, N.S.Trubetskoy, L.R.Zinder, L.V.Bondarko, A.I.Smirnitsky, V.M.Solntsev,

Y.S.Stepanov, F.Y.Veysalli, L.A.Verbitskaya, G.P.Torsuev, E.Coseriu, K.S.Gorbachevich, F.G.Zeynalov, D.N.Yunusov. The problem of variability and variation of consonant phonemes in the English language has been addressed in many works, for example: P.Ladefoged, Lisker, L., Abercrombie, D., M.Ohala, Davidsen-Nielsen N., L.Schiefer, J.S.Catford, D.Jones, I.Lehiste, V.J.Boucher, H.A.Gleason, J.C.Wells, A.V.Vassilyev, G.Knowles and others.

Object and subject of the research. The object of the dissertation research is the occlusive/plosive consonants realised in different phonetic positions and combinatorial conditions in English speech by native English speakers. The subject of this work is the phonetic features of the realisation of occlusive/plosive consonant phonemes in the English speech of representatives of this language.

Purpose and objectives of the research. The main objective of the dissertation research is oscillographic and spectrographic analysis of the realisation of consonants in spontaneous English speech. The purpose of the work is to identify and systematise the features of allophonic variation of occlusive/plosive consonant phonemes in the speech of native English speakers. Since phonetic research of any level cannot be considered complete and successful without a certain phonological "perspective," without finding out whether the studied linguistic phenomenon in the studied language carries or does not carry a certain functional load and if it does, which. In other words, conclusions about the functions and functional loads of any sound differences without understanding what they consist of can easily turn out to be untenable. To achieve the set goal, it is necessary to solve the following tasks:

– to provide a phonetic and phonological description of the consonant phoneme system of the English language;

– to analyze modifications and alternations of consonants in speech based on auditory analysis;

– to compile tables of acoustic values of English occlusive - plosive consonant phonemes;

– to compile tables of variable modifications of consonants in the oral speech of native English speakers;

– to conduct a study of the acoustic characteristics of

occlusive-plosive consonants of the English language;

– to study the perceptual characteristics of occlusive-plosive consonants and to determine the degree of dependence of the perception of occlusive-plosive consonants on the phonetic environment;

– to study the variability of occlusive-explosive consonants in various phonetic positions of speech with different informative or functional loading;

– to study the principles of variation of quantitative characteristics of voiceless and voiced occlusive consonants in their pronunciation depending on the phonetic position and combinations of their implementation in the structure of a single word;

– analyze spectral and oscillographic patterns of English occlusive-explosive consonants in the implementation of English speakers;

– to identify the universal principles of phonetic modifications of English occlusive-plosive consonants.

Research methods. The following methods were used in this study: auditory analysis, acoustic analysis, spectrographic and oscillographic analysis, generalisation, and description. The material for this experimental study was words performed by English speakers – 2 men and 2 women, all native speakers of the British version of English with standard pronunciation. The number of studied allophones of occlusive-plosive consonants was 400 units. The variants of occlusive-plosive consonants involved in the experimental phonetic analysis from the English language were taken in different phonetic positions and the vicinity of different phonemes in the word. Such an approach to the selection of language material allows us to identify the main phonetic changes that English occlusive-plosive consonants undergo in the process of spoken speech.

The main provisions put out for defence:

– variability, as a manifestation of the basic properties of language in implementation, is a completely objective and natural phenomenon. Variation of linguistic units in speech is associated with the capabilities and characteristics of units of the language system, it accompanies their functioning and determines its result;

– variation of linguistic units (phonemes) in the English language is determined by the complex nature of the phonological subsystem, the interaction of intra- and extralinguistic factors, among which the phonetic position and combinations with other phonemes, as well as interlingual relations with other languages are of great importance;

– establishing the functional property of a variant (sound), i.e. which phoneme variant in a given phonetic position this sound (phone) is, allows for the description and identification of individual speech instances and then moving on to the level of linguistic abstraction;

– variability is manifested at all levels of language functioning, including at the phonemic level, where both general and specific features are realized;

– the variability of linguistic units in continuous speech is a large-scale process conditioned by linguistic and non-linguistic factors, as well as phonostylistic features of speech;

– functional variants of the same linguistic unit are based on those basic invariant-variant relations that exist within the system, and the identification and definition of the invariant occurs on the basis of the oppositional relations of linguistic units within the framework of the phonological system where these oppositional relations are functionally significant;

– the phonemic signifier of a linguistic sign existing in the linguistic consciousness of a native speaker, as a rule, does not coincide with its specific implementation in speech. The main linguistic factor in identifying individual sound (allophone) implementations into invariants is their functional properties;

– from a phonological point of view, the most promising is further study of the subsystem of English consonant phonemes, which involves searching for the relevant phonetic feature that distinguishes voiced and voiceless occlusive/plosive consonants in those phonetic positions and combinations where these consonants are not opposed to each other by the presence/absence of features of the participation of the vocal cords;

– variations as a way of adapting natural language to the communicative needs of society are anthropocentric in nature and are the main factor in maintaining its invariance. Positional and combinatorial variants as sound examples represent realisations of an invariant linguistic unit, possessing a specificity that manifests itself in spoken speech and allows us to establish constants and variables related to a particular linguistic unit.

The scientific novelty of the research. The scientific novelty of this work consists in the fact that it analyses the variation of occlusive-plosive consonant phonemes using the material of the English language, develops rules for establishing the range and inventory of variants, and determines the conditions for the variation of linguistic units in spoken speech. The scientific novelty of the study lies in its attempt at phonological interpretation of the considered modifications of consonant phonemes in a spontaneous speech flow.

For this purpose, the study pays special attention to the acoustic characteristics of the considered realisations of occlusive-plosive voiceless and voiced consonants, which are studied using computer speech analysis methods. The scientific novelty of the dissertation also lies in the systematisation and generalisation of acoustic values reflecting the phonetic features of the realisation of English occlusive-plosive consonant phonemes at the current stage of development of the standard version of the English language.

Theoretical and practical significance of the study. The theoretical significance of the work is that the method for determining the range and inventory of variants that we propose can be applied to solving problems of automatic recognition of speech units. The description of the phonetic implementation of occlusive-plosive consonants in speech is given on the basis of a theoretical analysis of scientific publications by foreign and domestic scientists.

The theoretical significance of the work lies in the fact that the obtained spectral and oscillographic information on the variability of segmental (consonant phonemes) units in continuous speech may be of interest not only for purely linguistic, but also for applied and experimental research on materials from different languages. In this work, specific acoustic indices of English occlusive-plosive

consonants in the speech of native English speakers were obtained, which can help develop the theory of variation in phonology and general theory of language, including automatic recognition and understanding of spontaneous speech.

The obtained experimental phonetic data have important applied significance. These acoustic and statistical data can be used in teaching theoretical and practical phonetics of the English language, in developing special courses on the phonetics of colloquial speech, and regional variation, in special courses on comparative linguistics, as well as in creating a computer database on the allophonic variation of occlusive-plosive consonants in English. The practical significance of this study also lies in the fact that its results can be used in the educational process to identify, systematise and correct errors in the pronunciation of English voiceless occlusive-plosive consonant phonemes in various phonetic positions (environments) and to eliminate abnormal pronunciation accents in students studying English.

Aprobation and application of the research work. The articles, theses and provisions of the plaintiff on the dissertation subject were published in scientific journals, International indexed scientific collections, International and Republican Scientific Conferences in the Republic, as well as in foreign countries.

Name of the organization in which the dissertation work is performed. The dissertation was performed at the Department of Phonetics of the English Language of the Azerbaijan University of Languages.

The structure and volume of the dissertation, in signs, indicating the volume of each structural unit separately. The research work consists of an introduction, four chapters, a conclusion and a bibliography.The introductory part of the dissertation is 10 pages, 16277 characters, chapter I is 57 pages, 99400 characters, chapter II is 46 pages, 78346 characters, chapter III is 44 pages, 77113 characters, chapter IV is 84 pages, 132308 characters and the conclusion is 5 pages, 8461 characters. The total volume of the dissertation is 411905 characters, excluding the list of literature.

THE KEY CONTENT OF THE WORK

Information about the relevance of the topic, the goals and objectives of the research and its scientific novelty, theoretical and practical significance, as well as methods and sources of research, defense provisions, aprobation and structure of the work are provided in the **"Introduction"**.

The first chapter **"The Problem of Phoneme Variability in Modern Linguistics"** consists of four paragraphs. The first paragraph of the first chapter is entitled *"Variability in General Linguistics"* and notes that the problem of variability in linguistic research has a long history; it emerged as an essential problem during the development of linguistic thought – when linguists began to clearly understand linguistic reality and moved from studying language sounds in isolated pronunciation to studying the mutual influence of sounds in the flow of speech. From the very first days, questions of general and particular variability were the subject of fundamental linguistic research of various ranks. This is confirmed by increasing research on variability over the past decades, has allowed us to accumulate and generalise rich theoretical material.

Variability is a clear sign of dynamic processes that occur continuously and not without a trace in language. It can be defined from the standpoint of a set theory as a multitude of options and the potential for variation of individual linguistic elements. The functional significance of language units within the system and the dynamics of the development of the language system as a whole are determined by the manifestation of variability in the use of language units.

The key characteristics of how linguistic units can vary are shaped by the nature of linguistic signs, often described as asymmetric dualism in linguistics. This concept highlights the tension between the limitless possibilities of meaning and the limited number of linguistic units that convey it. Linguistic units are part of the language system, and their role is influenced by their relationships within that system. This idea is rooted in the distinction between significance and

meaning, concepts introduced by F. de Saussure[1] and further discussed by S.O. Kartsevsky from the Prague School of Functional Linguistics. It is within the framework of variability that the principle of asymmetric dualism of the linguistic sign is manifest, as clearly articulated by S.O. Kartsevsky,[2] who, in defining his principles, built upon F. de Saussure's notion of the shift between the signified and the signifier as a consequence of linguistic change.[3]

In modern linguistics, the term "variant" has four main meanings: 1) *the realisation of any linguistic unit in a specific manifestation; 2) territorial, social and other variants concerning the norm of the literary language in sociolinguistics; 3) a variant of meaning in a polysemantic word; and 4) a variant of a written sign.*[4] Variants appear in language as a variety of speech, which are determined by various combinations and conditions of realisation, as well as the social affiliation of speakers to different strata of society.

In the field of linguistics, it was within phonology that the earliest significant contributions were made toward addressing the central issues of variability. These foundational works redefined the concept of the phoneme, viewing it as an invariant, while its phonetic realizations were regarded as variants. The consistency and frequency with which phonetic (or phonological) rules and patterns recur render the phonetic level the most spatially distinct. Variability received comprehensive theoretical treatment in N.S. Trubetskoy's seminal work, "Fundamentals of Phonology". Trubetskoy articulated the principles for identifying and establishing invariant linguistic units, and his contributions to the development of phonology as an autonomous discipline are substantial. The core of his theory posits that the invariant of a linguistic unit is an abstraction, constituted by a set of differential features. As Trubetskoy observed, *"None of the*

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[1] Saussure, F. de. Works on linguistics / F. de. Saussure. Translations from French language edited by A. A. Kholodovich - M.: Progress, - 1977. - 696 p.

[2] Kartsevskiy, S.O. On the asymmetric dualism of the linguistic sign. – URL: http://philologos.narod.ru/classics/karz.htm (date of access: 05.11.2014).

[3] Saussure, F. de. Works on linguistics / F. de. Saussure. Translations from French language edited by A. A. Kholodovich - M.: Progress, - 1977. - p. 109.

[4] Akhmanova, O.S. Dictionary of linguistic terms: [About 7000 terms / O.S. Akhmanova - Moscow: Sov. encyclopedia, - 1966. - p.71.

segments isolated in speech and directly presented to us in observation can be designated as an invariant, for these are merely its 'material symbols.' In speech, we are directly presented only with variants, which are related to invariants as phenomena are to essence".[5]

In his examination of the phonetic system, G.P.Torsuyev effectively substantiated the concept of variability within the phonetic domain of the English language. He identifies four aspects of phonetic variability: 1) organo-genetic, resulting from the pneumatic-mechanical activities of the speech organs, which underlie the production of all sounds and speech itself; 2) structural, determined by the systemic relationships among linguistic units and their positions within the structures of meaningful units; 3) stylistic, influenced by the necessity of distinguishing between different speech styles; and 4) dialectal, arising from the existence of local and social variations within the phonetic system of the language. According to Torsuyev, *"In each of these four aspects of variability, a contrast with constancy exists, ensuring the functional identity of articulatoryphonetically varying units and structures, which is conditioned by the identity of significant units and the need for continuity and succession in the functioning and development of language."[6]*

In our research, we maintain the perspective that variability constitutes a potential linguistic foundation for variation, which is moderated by entrenched traditional tendencies that preserve the coherence of the linguistic system.

The second paragraph, ***"Variability in English Studies,"*** notes that variability as an internal source of modification and development of language manifests itself at all levels of language in speech – from mastery of structurally indivisible units of different languages to speakers' awareness of the admissibility of different phonetic variants belonging to one language. In modern English studies, phonetic variability is considered one of the main social indicators. The relationship between social types of pronunciation and regional accents in

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[5] Trubetskoy, N. S. Fundamentals of Phonology / N. S. Trubetskoy. – M.: Aspect Press, - 2000. – p.45.
[6] Torsuev, G. P. Constancy and variability in the phonetic system (based on the English language) / G. P. Torsuev. - M.: Nauka, - 1977. - p.4.

England is clearly reflected in the well-known pyramid of dialects, put forward by sociolinguist P. Trudgill: *"the higher the social status and level of education of the speaker, the closer his pronunciation is to the orthoepic norm of Received Pronunciation (RP)."*[7]

The works of G.P.Torsuev occupy a prominent position among studies on phonetic and phonological variability. G.P. Torsuev's examination of phonetic-phonological variation begins with an exploration of existing linguistic research in this domain, followed by his own conceptualization of the phoneme as an abstract unit within the language system, alongside its variants – known as allophones – which emerge directly in response to specific linguistic contexts.[8]

In relation to this issue, the sociolinguistic research of U. Labov, widely regarded as a pivotal figure in Western sociolinguistics, is of particular significance. In defining his research area as "variation and change," Labov posits two primary principles: first, that language change can be observed synchronically, and second, that an adequate explanation of language evolution must consider not only intralinguistic factors but also their intricate connection with social factors. *"The principal method for addressing this issue,"* Labov asserts, *"is to identify correlations between elements of the language system and the extralinguistic system of social behavior."*[9]

While studying language development and function, U. Labov acknowledges the importance of intralinguistic factors but emphasizes the necessity of considering extralinguistic factors in describing language evolution. Labov argues that *"language changes cannot be explained solely based on internal linguistic relationships, even when external sociolinguistic factors are recognized as additional determinants."*[10]

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[7] Trudgill, P. On Dialect: Social and Geographical Perspectives / P. Trudgill - New York, London: New York University Press, - 1984. - p.32.

[8] Torsuev G.P. Syllable structure and allophones in English (in comparison with Russian) / G.P. Torsuev. - USSR Academy of Sciences. Institute of Linguistics. - Moscow: Science, 1975. - p. 157.

[9] Labov, U. Study of language in its social context // - Moscow: New in linguistics. Sociolinguistics / edited by N.S. Chemodanov. Progress, - 1975. Issue VII. - p.202.

[10] Labov, U. Study of language in its social context // - Moscow: New in linguistics. Sociolinguistics / edited by N.S. Chemodanov. Progress, - 1975. Issue VII. - p.199.

In analyzing the expression of social and personal identity in language, B. Johnstone sharply critiques the deterministic approach, wherein personality is reduced to a "sum of demographic factors," and where "correlational relationships are frequently mistaken for cause-and-effect relationships." According to Johnstone, *"this approach establishes a false paradigm in which linguistically original and unique speakers are invariably perceived as deviations from the norm."[11]*

The third paragraph of the first chapter is entitled ***"The Correlation of Variants and Invariants in the English Language,"*** reveals such language features as variants and invariants. It is noted that the concepts of invariant and variant are essential for any essential characteristic of linguistic phenomena and their specific implementation. Therefore, modern linguistic theory cannot deny these most important concepts, which are of no small importance in interpreting both individual linguistic phenomena and the language itself as a whole.

The concepts of "invariant" and "variant" can be considered fundamentally different. This understanding of the invariant and the variant is characteristic of the followers of N.S. Trubetskoy and American descriptivists, who perceive the phoneme as a bundle of differential features and believe that the phoneme is realized in sounds.

Variants are different manifestations of the same unit, which, despite various modifications, remains fundamentally unchanged. An invariant is an abstract representation of a linguistic unit, independent of its specific modifications (variants). The invariant reflects the general properties of the variants. Every variant within a specific series carries the invariant properties inherent in each member of that series and can be identified as a "representative" of this invariant. For instance, phonetically similar and functionally identical sounds in a language [a1, a2, a3 ... an] or [t1, t2, t3, t4 ... tn] represent variant series of the phoneme /a/ or /t/, which, in the variant/invariant opposition, serve as invariants relative to their specific realizations.

From a linguistic point of view, an invariant can be defined as

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[11] Johnstone B. The linguistic individual: self-expression in language and linguistics / B. Johnstone. - Oxford: Oxford University Press, - 1996. – p.14.

a property (feature) or a complex of properties (features) of the studied systemic linguistic objects (units of language and speech), which remains unchanged under all modifications caused by the interaction of the original system with the environment (environment of use) and phonetic positions. This fact clearly means that a linguistic scientist should not perceive an invariant unit of any linguistic level as a purely dematerialised abstraction.

In modern linguistics, rather than conducting a taxonomic study of units across all levels of the language system, there is a preference for examining their qualitative and quantitative changes at the normative level. Instead of adhering to a dichotomous approach to linguistic phenomena, as noted by F.Y.Veysyalli, *"a ternary approach, based on the presence of three levels – the functional system, the norm, and a specific speech fact – seems appropriate and scientifically sound."*[12]

According to this tripartite model – system, norm, speech – linguistic units such as phoneme-variant (allophone)-background (sound); morpheme-allomorph-morph; and lexeme-allolexeme-lexeme are distinguished.[13]
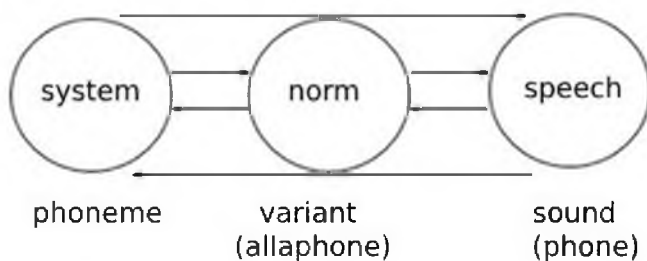

Diagram 1.3.1.
Diagram of tripartite division of language

In the trichotomous approach, phonemes form a system where they are opposed to one another based on differential features; variants function as units at the normative level, while sounds are

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[12] Veysalli, F.Y. Selected works / F.Y. Veysalli. - Baku: Translator, I c. - 2009, - p. 496.
[13] Ibid, - p. 496.

specific realizations of phonemes in speech. All variants of the same phoneme share the same differential feature but possess different integral features that are acquired depending on the phonetic context.

The fourth paragraph, *"Intralinguistic and Extralinguistic Conditions Causing Variation in Language,"* shows the main difficulties in studying linguistic variation associated with the complexities of the process of linguistic change, which depends on a number of different factors. If we take into account that a characteristic feature of modern linguistics is the recognition of the fact that a complete analysis of language is impossible without taking into account the role of a person with a unique vision of the world and himself in society, then among the causes that generate variability, social factors acquire special significance.

V.G. Gak identifies the primary factors influencing linguistic variation as internal (systemic-structural) and external. These factors are decisive and consistently regulate the variation of linguistic means. According to the author, *"they can be objective, independent of an individual's desires, and subjective, reflecting the conscious intentions and desires of the speaker."[14]*

G.V. Stepanov also categorizes the factors of linguistic variation into internal and external. According to the author, *"internal foundations, inherent in their essence, differ from external ones in their 'non-linguistic nature,' as they involve categories such as function (e.g., socio-stylistic), space (as well as time), and the structure of society, all of which are considered in relation to the usage and distribution of the options created within the system."[15]*

By distinguishing between external and internal causes of variation, K.S. Gorbachevich acknowledges the potential for the complex interplay of multiple factors. The author attributes the influence of territorial dialects and contact with other languages to

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[14] Gak, V.G. On General Factors of Variability in Language / V.G. Gak // Stepanov Readings. The Problem of Variability in Romance and Germanic Languages: Abstracts of Reports and Communications of the International Conference. - M.: RUDN University Press, - 2001.- p.5.

[15] Stepanov, G.V. On the Problem of Language Variation. Spanish language of Spain and America / G.V. Stepanov. 2nd ed., stereotyped. – M.: Editorial URSS, - 2004. – p.3.

external causes. Given that variability, like the norm as a whole, is characteristic of all levels of the language system, the author also attributes to internal causes the desire to realize the differential features of phonemes and the tendency to simplify the pronunciation of individual sounds.[16]

The phenomenon of variation in linguistic units arises from both universal and specific causes of variability. Universal causes are common to units across all levels of language, while specific causes are unique to particular forms of linguistic representation, such as phonemes, morphemes, lexemes, or sentences. The universal reasons for the variable realization of a phoneme are rooted in the properties of language as a systemic-structural formation. According to F.Y. Veysalli, *"the diversity of its [the phoneme's –S.P.] realizations is connected not with the phoneme itself nor with its internal structure, but with conditions external to the phoneme, yet inherent to the structure of the given language; phonemes cannot exist outside their variants, just as variants cannot exist outside the phonemes to which they belong."[17]*

We are firmly convinced that any description of the processes of linguistic variation must not overlook the so-called human factor – the processes occurring within society. Without considering the interaction between language and society, any linguistic description will be, at best, incomplete and will lack sufficient explanatory power. Some researchers argue that extra-linguistic factors play a dominant role in language modification. Taking this into account, we believe that social factors, such as the age of the speaker and the prestige associated with certain speech patterns, are particularly significant in the unification of the modern British pronunciation norm.[18]

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[16] Gorbachevich, K.S. Word variance and language norm: Based on the modern Russian language / K.S. Gorbachevich - M: Librokom Book House, - 2009. - p.25.

[17] Veysalli, F.Y. Selected works / F.Y. Veysalli. - Baku: Mutarcim, - vol.II. - 2014, - p. 221.

[18] Grishina, L.V. Positional variability of the feature of the degree of aspiration of English voiceless plosive consonants: // Diss. ... Cand. Philological Sciences. - M., 2003. - p.74.

The main provisions derived from this chapter are highlighted in the following articles and conference materials published by the author.[19]

The second chapter of the thesis, entitled **"System, Norm, and Speech Instances at the Phonological Level,"** consists of five paragraphs. The first paragraph of the second chapter is entitled ***"Linguistic Criteria for Phonological Segmentation of the Speech Continuum."*** The analysis in this paragraph is based primarily on linguistic criteria.

In modern linguistics, L. V. Sherba was the first to propose the theory of morphemic boundaries, which is used to isolate phonemes from the sound chain. According to the main provisions of this theory, the phonemic division of the speech continuum should depend on the morphemic and morphological division. The idea of the dependence of phonological segmentation on morphological segmentation means that *"a speech segment of a given type has as*

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[19] Poladova, S.E. Features of intonation variability of regional English phonemes in modern linguistics // - AD ALTA: Journal of Interdisciplinary Research. Special Issue - 2021, - pp. 103-107; Phonetic varieties and variants of the English language // - Dnipro, Ukraine: Ways of science development in modern crisis conditions: abstracts of the 2nd International Scientific and Practical Internet Conference, - June 3-4, - 2021, pp. 381-383; On the phonological system of the English language and approaches to the interpretation of phonemes // - Baku: Azerbaijan National Academy of Sciences, Institute of Linguistics named after Nasimi, Tadgiglar, - 2021. №3, - стр. 25-28; Correlation of variant and invariants in language // - Baku: Azerbaijan National Academy of Sciences, Institute of Linguistics named after Nasimi, Linguistic studies. International scientific journal, - 2021. No. 2, - p.90-93; Variability as the concept of allophonic variation // - International scientific and practical journal, Endless light in science, - Almaty, Kazakhstan, - October 28, - 2022, - pp.236-240; Variability as a language feature // - Azerbaijan Science Center, materials of the III International conference on the basics of science and education, - Baku, - April 7, - 2023, p. 9-12; The problem of variability in linguistics // - Actual issues of Azerbaijani studies (research, discourse, internationalization). Proceedings of the XIV International scientific conference dedicated to the 100th anniversary of the birth of national leader Heydar Aliyev (in 2 volumes), Volume I (Sections I-VII), Baku, - May 04-05, - 2023, p. 345-348; Historical variation of the phoneme composition of the English language: the concept of sound law // - Baku: Scientific work, International scientific journal. – 2024. v. 18 (5), - p. 33-37.

many phonemic boundaries as there are possible morphological boundaries in it."[20]

Linguistic evidence clearly indicates that the phonological segmentation of continuous English speech can be determined not only by the presence of morphemic boundaries but also by morphologized alternations of vowel segments. For example, in modern English, the word "run" is segmented as [r-ʌ-n], while its past tense form "ran" is segmented as [r-æ-n], based on the corresponding morphologized alternation of the vowels /ʌ/ and /æ/ in these words. Considering this, F.Y. Veysalli emphasizes that *"the phoneme appears in various phonetic conditions; therefore, it exists in a multitude of sound expressions."*[21]

Sound instances extracted from the speech chain through syntagmatic segmentation are reduced, via paradigmatic identification, to a quantitatively limited set of invariant units. The reduction of a set of sound segments to a specific invariant is determined exclusively by linguistic criteria, rather than by the acoustic-articulatory similarities and differences of these segments. Therefore, it is difficult to disagree with Y.S. Maslov, who argues that *"the distinguishability of a phoneme is somehow based on meaning, on significance, although the phoneme itself is not a meaningful unit."*[22]

In the syntagmatic division of the speech chain into structurally indivisible units – i.e., phonemes – we proceed from the understanding that the phoneme is not, in fact, a meaning-distinguishing unit but rather acts as a formal distinguisher of the phonetic envelope of words or word forms. Consequently, when establishing the phonemic inventory of a language, we tend to rely on the theory of L.V.Shcherba, L.P.Zinder, and F.Y.Veysalli, who advocate for the isolation of phonemes from the flow of speech based on their connection to grammatical meaning. For instance, in modern Russian,

[20] Kasevich, V. B. Phonological problems of general and Eastern knowledge of language / V. B. Kasevich // Works on linguistics – St. Petersburg: Philological faculty S. Pt. state hospital – 2006 – p. 28.

[21] Veysalli F.Y. Selected works / F.Y. Veysalli - Baku: Mutarcim, 2 volumes, - 2014, - p. 231.

[22] Maslov, Y.S. Introduction to linguistics/ Y.S.Maslov. –Moscow: Higher School, -1987. - p.46.

the sound envelope of the word "isk" consists of three sounds, each of which can independently form the sound envelope of a word or morpheme: /i/ – preposition, /s/ – preposition, /k/ – preposition.

Segmentation of continuous speech into structural linguistic units can only be conducted based on linguistic criteria. Since individual speech sounds serve to distinguish the sound envelopes of morphemes and words, and since these sounds can have a direct relationship to grammatical meaning, it is appropriate to assert that any continuous speech can be divided into individual sound segments or consist of discrete sound units. In other words, when a phoneme is directly connected to meaning—constituting the sound envelope of a word or morpheme—it is distinguishable even when it is not the sound envelope of higher-level linguistic units.

If a boundary between morphemes passes within a sound segment, it means that the segment is also divided by a phonemic boundary, i.e., it is segmented into separate phonemes. For example, in modern Russian, at the beginning of the phonetic word [ˈs:°oboj] (with yourself) or at the junction of phonetic words [ˈvaˈs:°ovsem] (with you completely), there is a sound segment [s:°]. The presence of a morphologically significant boundary in these examples indicates that there is a phonemic boundary within the [s:°] sound complex, where [s:°] sounds are realized as a combination of two phonemes /ss/. The same principle applies when there is no morphologically significant boundary within [s:°] or [s:], as in [ˈpas:iv] (passive) and [mas:a] (mass). That is, if a sequence of sounds is divided into two phonemes when it crosses a morpheme boundary, then the same sequence must also be divided into two independent phonemes in the absence of such a boundary. Thus, the sound segment [s:°] in [ˈs:°oboj] (with yourself) is a bi-phonemic combination, regardless of the sound envelope of the significant units this segment realizes.

Therefore, it can be argued that the science of the sound composition of language has, to a large extent, established principles and methods for solving fundamental issues by relying on linguistic criteria. Language and the system of language units should be described solely based on linguistic criteria.

The second paragraph, entitled *"On the Phonological System of Consonants in English and Its Controversial Issues,"* contains extensive information about English consonants and states that there is no particular disagreement among scholars regarding the number of consonant phonemes in German studies. For example, according to G. Gleason, there are 24 consonant phonemes in the phonological system of the modern English language.[23] According to V.D. Arakin, in modern English there are 20 vowels and 24 consonant phonemes.[24] According to E.E. Radnaeva, the consonant subsystem of modern English consists of 24 consonant phonemes and they are presented as follows: p/, /b/, /t/, /d/, /k/, /g/, /ʧ/, /ʤ/, /m/, /n/, /ŋ/, /f/, /v/, /θ/, /ð/, /s/, /z/, /ʃ/, /ʒ/, /h/, /w/, /l/, /r/, /j/. According to the author's definition, 6 of them are occlusive-plosive: /p/, /b/, /t/, /d/, /k/, /g/, 2 affricates: /ʧ/, /ʤ/, 9 fricatives: /f/, /v/, /θ/, /ð/, /s/, /z/, /ʃ/, /ʒ/, 3 nasal consonants: /m/, /n/, /ŋ/ and fricative (non-nasal) consonants: /w/, /l/, /r/, /j/.[25]

In modern English, consonants are classified according to the following principles: 1) by the type of obstruction and the method of noise production; 2) by the work of the active organ of speech and the place of formation of the obstruction; 3) by the participation of the vocal cords.

When classifying consonants in the English language, F.G.Zeynalov uses the following principles as a basis:

1. By the work of the active organ of speech and the place of articulation;

2. By the type of obstruction and the method of noise production;

3. By the participation of the vocal cords;

4. By the position of the soft palate.[26]

[23] Gleason, G. Introduction to descriptive linguistics / G. Gleason / trans. from English by E. S. Kubryakova, V. P. Murata. - 3rd ed. - M.: LKI, - 2000. - p.57.

[24] Arakin, V.D. Comparative typology of English and Russian languages / V.D. Arakin. - Leningrad: Prosveshchenie, - 1979. - p.72.

[25] Radnaeva E.E. Comparative-typological phonology of the Buryat and English languages: / Dis. ...cand. Philol. Sciences/ - Moscow: RSL, - 2005, - p.159.

[26] Zeynalov, F.H., Huseynova, Z.A. Pronunciation and spelling in English / F.H. Zeynalov, Z.A. Huseynova - Baku, - 1998, - p.18.

The universal classification of English consonant phonemes, which we adopt in our dissertation, comprises seven criteria, categorized as follows:

1. By the position of the soft palate: oral and nasal;

2. By the participation of noise: noisy and sonorous;

3. By the method of articulation/type of obstruction: noisy-sonorant, fricative-sonorant, affricates;

4. By the active articulatory organ: labial, labio-dental; lingual: pre-dental (by the work of the tip of the tongue: apical, cacuminal; by the position of the obstruction: interdental, alveolar, alveolo-palatal); mid-lingual: palatal, velar; glottal;

5. By the presence/absence of vocal cord vibration: voiced, voiceless;

6. By the strength of articulation: strong (voiceless) / weak (voiced);

7. By the number of obstructions: single-focus, bi-focus.

There is no unified consensus in theoretical sources regarding the number of consonants in the English language. A notable example is the debate over whether the consonant subsystem in the English phonological system consists of 24 or 25 consonants. The controversy centers on the phonological status of the voiceless correlate of the labial-velar fricative sonorant /w/. When classifying consonant phonemes in Standard British English pronunciation, D. Jones includes the voiceless equivalent of the phoneme /w/, denoted as /ʍ/, in brackets.[27] In contrast, A.K. Gimson, in his classification, considers the voiceless analogue of /w/ as a unit with the status of an independent phoneme.[28]

Post-Soviet Germanists such as G.P.Torsuev and V.A.Vasiliev[29] share the views of D. Jones and A. Gimson, including the voiceless correlate /w/ as an optional phoneme in the inventory of English

[27] Jones, D. An Outline of English Phonetics // D.Jones. – Cambridge: Cambridge University Press, - 1997, - p.27.

[28] Gimson, A.C. An Introduction to Pronunciation of English. 4th ed. / Ed. By S. Ramsaran / A.C.Gimson. - London: Edward Arnold, - 1989, - p.216.

[29] İbid, - p.195.

consonant phonemes.[30] However, others, including O. Dikushina, M.A. Sokolova, and S.F. Leontiev, do not recognize the voiceless correlate of this sonorant consonant as part of the consonant phoneme inventory in English. According to P. Roach, replacing the sonant /w/ with /ʍ/ in the pair of words "which" and "witch" results in two distinct meanings, indicating that they are two separate phonemes.

One of the controversial issues in the subsystem of consonant phonemes of the English language is also the question of the phonological status and number of affricates. Among scientists, the subject of dispute is such questions as: 1) are English /ʧ/, /ʤ/ mono- or biphonemic combinations, 2) if these affricates represent one phoneme, then how many such phonemes are present in the subsystem of English consonants, and can [tθ, dθ, tr, dr, ʦ, ʣ] be considered affricates, i.e. independent phonemes?

Soviet linguists generally agree that there are only two affricates in modern English: /ʧ/ and /ʤ/. In contrast, foreign phonologists argue that modern English contains a greater number of affricates. Moreover, some researchers examine affricates from both morphological and phonological perspectives, which leads them to classify /ʧ/ and /ʤ/ as monophonemic formations, while [tθ, dθ, tr, dr, ʦ, ʣ] are considered biphonemic.

The third paragraph of the second chapter is entitled *"The Relationship Between the System - Norm - Speech: the Orthophony of the English Language."*

In recent years, the problem of the system-norm-speech relationship in the study of variability in language and speech activity has acquired a particularly acute character in linguistics, which is mainly explained by the ambiguity of these linguistic concepts themselves. An accurate delineation of the plane of the language system and the norm in implementation has a certain theoretical and applied significance for clarifying existing disagreements in the description and interpretation of the phonological system, in particular, for determining the phonological status of individual phonemes and sound combinations, i.e. complex sounds.

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[30] Jones, D. An Outline of English Phonetics // D.Jones. – Cambridge: Cambridge University Press, - 1997, - p.63.

Before proceeding, it is important to note that the issue of linguistic variability in modern linguistics is traditionally addressed in the following sequence: variability → language system → norm → speech.[31]

According to some linguists, the increased variability of phonemes in spontaneous speech is linked to Martinet's Law, or the "principle of least effort," which suggests that phonetic changes are driven by the speaker's desire to simplify articulation.[32] While we partially accept this notion, we are inclined to believe that the variability of phonemes in spontaneous speech is also influenced by the high frequency of usage and the rapid rate of pronunciation.

The norm serves as a pronunciation standard, a model for the realization of specific phonological patterns of words in spoken language, functioning as a blueprint and basic unit of expression for each lexeme as a linguistic sign. Like any standard, the pronunciation norm is an abstraction, a model, a construct. However, the existence of such an "ideal" phonetic envelope for a word is essential for adapting each lexeme to its content, as this adaptation is a prerequisite for word recognition, considering a word is a two-sided linguistic unit of language.

The concept of a norm is somewhat relative and acquires a socio-psychological dimension, as perceptions of the acceptability or inadmissibility of specific linguistic forms or pronunciations vary among native speakers. According to O.S. Akhmanova, *"a norm is the accepted use of linguistic means in speech, a set of rules (regulations) that govern the use of linguistic means in individual speech."[33]* The norm is not permanent, as it is subject to change over time due to both external linguistic factors and internal developments within the system, including the emergence of new forms that gradually displace outdated ones.

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[31] Jones, D. An Outline of English Phonetics // D.Jones. – Cambridge: Cambridge University Press, - 1997, - p.63.
[32] Martine, A. The principle of economy in phonetic changes. (Problems of diachronic phonology) / A. Martine - Moscow: Foreign Literature Publishing House. - 1960. - 264 p.
[33] Akhmanova, O.S. Essays on General and Russian Lexicology / O.S. Akhmanova. Moscow: Uchpedgiz, - 1957. - p.46.

It is worth noting that the detailed development of the ternary opposition system-norm-speech was elaborated by E. Coseriu. The system, according to Coseriu, is *"a system of possibilities, coordinates that indicate open and closed paths" within the speech of a given group. In contrast, a norm is "a system of obligatory implementations" accepted within a given society and culture: a norm corresponds not to what "can be said," but to what "has already been said."[34]*

While the system contains ideal forms of language realization, the norm encompasses forms that have already been realized. It is important to highlight that in Coseriu's tripartite opposition, the relationship between speech and norm is not explicitly defined. Coseriu introduces speech into his concept because the norm does not always cover all possible and acceptable implementations. If this is the case, then non-traditional implementations of a given unit of the system cannot be associated with the norm but must instead be linked to speech. Consequently, the relationship should not be represented as the sequence system → norm → speech, but rather as system → norm; system → speech. This suggests that while both speech and norm represent the implementation of the language system, their relationship is not clearly defined.

In examining the language norm, V.G.Gak identifies two primary aspects: the objective language norm, which is the generally accepted form of linguistic means within a particular social group, and the evaluative, axiological norm, which establishes the correctness or incorrectness of the existing objective norms. *"This distinction", Gak notes, "corresponds in broad terms to the difference between descriptive (objective) and prescrip".[35]*

The norm constitutes a set of generally accepted realizations of the language system. It is a form of linguistic units that is widely recognized within a given language community. The norm can be described as a collection of the most stable, traditional realizations of linguistic structures, materialized through social linguistic practice. Based on these considerations, this work defines the norm as a distinct

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[34] Coseriu, E. Synchrony, Diachrony and History / E. Coseriu // - New in Linguistics. - 1963. - Issue 3. - p. 173.

[35] Gak, V.G. Norm and tolerance / V.G. Gak // IYASh. - 1984, - No. 1. - p. 7.

level of language where variants of invariant linguistic units are presented in their phonetic manifestations. The norm ensures the functioning of language as a system, maintains connections between individual variants, and provides universality, consistency, and variability to meet the needs of speakers in various communicative contexts.[36]

The fourth paragraph, entitled *"The Relationship of the Variant to the System and Their Place in the System,"* tackles the question about the relationship and variability of the sound structure of language as systems. Here it is noted that due to the historical variability of the norm, its integral part is the variability of linguistic units and means, however, the norm, as a separate level in the ternary approach, also acts as a limiter of the variation processes, defining the boundaries of variability and the inventory of variants.

Based on the ternary approach (system-norm-speech) proposed by academician L.V. Shcherba, the relationship between invariant, variant, and phone can be illustrated as follows:[37]

phoneme   allophone (variant)   phone

phoneme   allophone (variant)   phone

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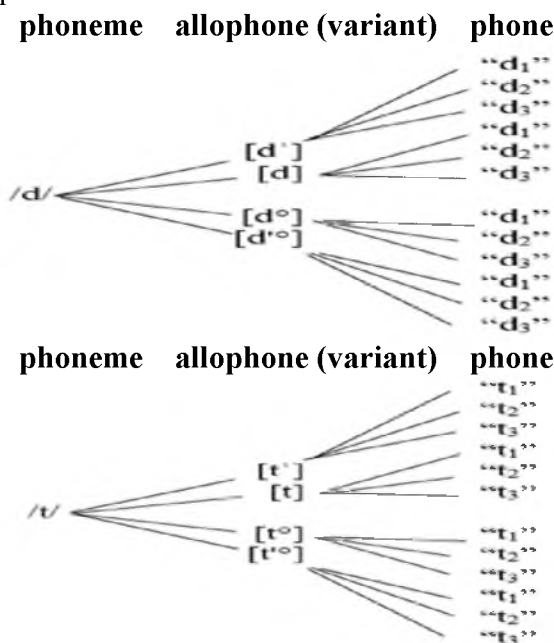
[36] Gak, V.G. Norm and tolerance / V.G. Gak // IYASh. - 1984, - No. 1. - p. 7.
[37] Gak, V.G. Norm and tolerance / V.G. Gak // IYASh. - 1984, - No. 1. - p. 7.

In this diagram, variants, as units of the norm level, occupy an intermediate position between invariants and sound implementations. Phonemes consist of a set of features that enable them to distinguish the sound envelope of morphemes and words and differentiate them from each other within the language system. Variants serve as a set of differential features inherent to a given phoneme, functioning as a unit within the functional system, and acquiring integral features in a specific speech context. Thus, allophones, as units of the norm level, correlate with the phoneme on one hand and with the sound of speech on the other. The elements of the three-member diagram are interconnected through interdependent relationships. As R.R. Kaspransky writes, *"In one representative, there is a simultaneous realization of a phoneme and an allophone, as the realization of a phoneme without considering normative restrictions is impossible, and the realization of an allophone without understanding systemic patterns cannot fulfill a communicative function."*[38] In this tripartite model, the phone (sound) is a physiological-acoustic manifestation, a physical indicator, and the realization of a phoneme. In other words, the phoneme and allophone in speech (in the phone) are simultaneously represented by acoustic-perceptual parameters.[39]

According to the principles of the L.V. Sherba phonological school, the phonetic characteristics of allophones in specific positions are determined by orthophonic rules, while orthoepy defines the phonemic composition of the language. Thus, orthophony is associated with allophonic variants, and orthoepy with phonemic variants. We also support the position of the L.V. Sherba phonological school regarding the role of orthoepic and orthophonic norms as rules for codifying the pronunciation properties of linguistic units in language and speech, respectively, thereby ensuring the uniformity of the sound structure in literary pronunciation.

The fifth paragraph of the second chapter is entitled *"Distributive Characteristics of Consonants and Their Variants in*

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[38] Kaspransky R.R. On the norms of phonetic realization of colloquial speech. In the book: Theory and practice of linguistic description of colloquial speech. // - Gorky, - 1974, issue 5, - p.96.

[39] İbid, - p.96.

English." It is noted here that by phoneme distribution we mean, first of all, the totality of all environments in which a given phoneme can be found, i.e. its place, order and compatibility with other phonemes. Distributive analysis of linguistic units is also an important step in the construction of a phonological typology, since in each language the combination of phonemes in syntagmatics has its intralinguistic patterns.

The influence of combinatorial (phonotactic) rules on both syllable structure and the nature of syllabic composition is of primary importance. Different languages exhibit varying degrees of consonant saturation, which is directly reflected in the number of syllabic patterns within each language. According to R.K. Potapova, *"the higher the frequency of occurrence of consonants in a language, the greater its 'syllabic weight'. For the German language, the syllabic weight is 2.6 phonemes, while for the English language, it is 2.7."*[40]

One typological feature of the English phonological system is the absence of neutralization of voiced consonant phonemes in syllable-final and word-final positions. Another characteristic feature is the acceptability of the phoneme /ŋ/ at the absolute end of a word in English, and the phoneme /h/ at the beginning of a word, but never at the end. English-voiced occlusive-plosive consonants are traditionally not used at the absolute end of morphemes (words), as they regularly alternate with voiceless occlusive-plosive consonants in this phonetic position.

British English speakers do not fully devoice the voiced occlusive-plosive consonants /b/, /d/, /g/. Similarly, speakers of American English avoid substituting voiceless consonants for voiced ones, understanding that such substitutions often lead to a change in word meaning. However, in American English, the voiceless conso-nants /p/, /t/, /k/ are often pronounced as their voiced counterparts /b/, /d/, /g/. According to J. Wells, *"this occurs when the voiceless*

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[40] Potapova, R.K. Syllabic phonetics of Germanic languages / R.K. Potapova. - M.: Higher School, - 1986, - p.33.

consonants /p/, /t/, /k/ appear between vowels after a stressed syllable, for example, in the word 'better' as /'bedər/," among others.[41]

According to the vowel+consonant (VC) model in English, the combinations of occlusive-plosive consonants /p/, /t/, /k/ and /b/, /d/, /g/ with vowels can be described as follows:

Table 2.4.1.
Vowel+consonant combination (V+C) in English

Consonants / Vowels (VC)	p	b	t	d	k	g
/ɪ/	+	+	+	+	+	+
/e/	+	+	+	+	+	+
/ɪ/	+	+	+	+	+	+
/ʌ/	+	+	+	+	+	-
/ɔ/	+	+	+	+	-	-
/ʊ/	+	+	+	+	+	+
/ə/	-	+	+	+	+	-
/i/	+	-	+	+	+	+
/ɑ:/	+	-	+	+	+	+
/ɔ:/	-	-	+	+	+	+
/u:/	-	-	+	+	-	-
/ɜ:/	-	+	+	+	+	-

Referring to the statistical data and the aforementioned model, it can be observed that in English, the occlusive-plosive consonants /t/ and /d/ occur after all vowel phonemes. In contrast, the consonants /b/ and /p/ appear in only eight out of twelve possible cases. The consonant /k/ is found in ten out of twelve cases, while the consonant /g/ occurs in seven out of twelve possible combinations.

Based on these statistical results, it can be concluded that in English, the consonants /t/ and /d/ are among the most common sounds in postvocalic positions. Conversely, the voiced consonant /g/ has the lowest frequency of occurrence in this phonetic position.

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[41] Wells, John. C. Accents of English / John Wells. – Cambridge University Press, - 1982. – p.489.

The main provisions derived from this chapter are highlighted in the following articles and conference materials published by the author.[42]

The third chapter of the dissertation is entitled **"Positional and Combinatorial Variants of Consonant Phonemes in English."** The chapter consists of three paragraphs. The first paragraph of the third chapter is entitled *"Types of Variants and Differences Between Them"* and notes that the acoustic properties of a variant are determined by the phonetic position where the given phoneme is used. In each phonetic position, any phoneme is represented by only one variant, which cannot be realized in another position. The variants of a single phoneme are distributed based on complementary distribution. As F.Y. Veysyalli notes, *"combinatorial variants depend on the combination with other phonemes, while positional variants depend on the position of the phoneme."* [43] The author categorizes these variants into essential and non-essential types. Essential variants are further divided into basic and specific, with the specific ones being subdivided into combinatorial and positional. Non-essential variants are classified into two groups: optional and individual.

Combinatorial variants of phonemes arise due to their combination or association with other phonemes in the sound chain. For example, the English consonant phonemes /b/ and /t/ in the words "band" [bænd], "beach" [biːʧ], "bean" [biːn], "tall" [t ɔːl], "take" [teɪk], "tea" [tiː], "team" ['tiːm], "tea-pot" ['tiːpot], "team" [tiːm], "tell"

[42] Poladova, S.E. .Regional variants in English // The XVI International Scientific Symposium " World Science: problems and innovations" dedicated to the 115th anniversary of Mahammadhuseyn Shahriyar, - East Lansing, Michigan. USA, - July 26, - 2021, - pp. 98-101; The main linguistic criteria of phonological segmentation of speech // - Minsk: Minsk State Linguistic University. Phonetics in the modern linguistic paradigm. Collection of scientific articles, - 2021, pp. 19-22; Speech processes from a phonological point of view //- "Higher Education in the Regions: Realities and Prospects", Proceedings of the International Scientific Conference, Guba/Azerbaijan, - November 25-26, - 2021, p.118-122; Phonological system as one of the main stimuli for sound changes // - Baku: Azerbaijan National Academy of Sciences, Institute of Manuscripts named after M. Fizuli, Issues of Philology, - 2021 (7), - p.107-113.

[43] Veysalli, F.Y. Selected works / F.Y. Veysalli. - Baku: Mutarcim, in 2 volumes, - 2014, - p. 248.

['tel], "ten" [ten] demonstrate combinatorial variation, while positional variants in some languages depend on suprasegmental characteristics. For instance, strong reduction in modern Azerbaijani often leads to the loss of vowel phonemes between unstressed voiceless consonants, as in "kükürd," "bişmiş," and "bıçaq." In other languages, positional variants may depend on their placement within higher-level units. For example, in modern Russian, all voiced consonants at the absolute end of a word are replaced by their voiceless counterparts, as seen in "хлеб" [хлеп], "код" [кот], and "город" [горот].

We have considered these realizations as variants of consonants, categorized as positional and combinatorial variants within the phonetic systems and pronunciation norms of modern English, Azerbaijani, and Russian languages. This interpretation is grounded in the observation that all the discussed realizations of variants are marked either positionally or combinatorially, representing a certain community of variations. Native speakers typically associate these realizations with the normatively acceptable pronunciation of a phoneme in a given phonetic position.

It can be observed that the phonetic differences between allophones often relate to the degree of expression of certain features. For instance, this includes the voicing or labialization of English voiceless occlusive-plosives [t], [p], [k] or the devoicing or labialization of voiced occlusive-plosives [b], [d], [g]. Besides these quantitative changes, allophonic variation may also involve qualitative modifications, though these do not disrupt the phoneme's realization.

There exists a general and specific relationship between a phoneme and its allophones. All sounds produced in speech are allophones of specific phonemes. The allophones of a particular phoneme are grouped within the system into a relatively small number of phonemes. According to L.L.Bulanin, *a phoneme is something general that exists in many particular manifestations. All allophones of one phoneme necessarily differ from each other due to their appearance in different phonetic conditions, but they are not opposed to each other under the same conditions.*[44]

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[44] Bulanin, L.L. Phonetics of the modern Russian language / L.L. Bulanin. – Moscow: Higher School, -1970. – p.32.

The unification of variants into a single phoneme (invariant) is not based on their acoustic similarity alone. Relevant sound differences between allophones do not preclude their membership within the same phoneme. Instead, the unification of variants into one phoneme is primarily determined by functional features. The differences between variants are fundamentally distinct from differences between phonemes, as they are non-distinctive. Such differences are considered only at the phonetic level and are understood as features of the phoneme's realization in speech. However, due to the perceptual sufficiency of these changes and their adherence to specific combinatorial-positional conditions, variable differences gradually become part of the pronunciation norm of the language.

The second paragraph of the third chapter, entitled ***"Combinatory Variants of Occlusive-Plosive Consonants of Modern English and Their Characteristics"*** and notes that when studying the variability of English voiced and voiceless occlusive-plosive consonants, a linguist must take into account both purely linguistic factors (the boundaries of allophonic variation and its variants, the correspondence of this variation to the internal laws of the language system) and non-linguistic factors (i.e., sociophonic variation caused by age, social status, situation and the influence of spelling on pronunciation). A thorough analysis of a language's phonological system requires an integrated approach that considers both linguistic and extralinguistic factors. Such an approach must account for the language's structural mechanisms and the individual characteristics of its speakers.

The variation in phonemes is often attributed to combinatorial and positional conditions, with the frequency of a phoneme's occurrence playing a significant role in its variation. A. Martine's research underscores the correlation between phoneme frequency and functional load, suggesting that *"the more frequently a linguistic unit (phoneme) is used in speech, the weaker its distinctive power."*[45] Thus, phonemes with higher occurrence rates are subject to greater variation due to their widespread use in diverse contexts.

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[45] Martine A. On the book "Fundamentals of Linguistic Theory" by Louis Elmsleva // - New in Foreign Linguistics. Issue 1. - M.: Progress, - 1960, p.184.

Phonemes in speech are influenced by adjacent sounds, leading to allophonic variation within a single phoneme without affecting its distinctive features. Allophones of a phoneme exhibit variations based on the phonetic characteristics of neighboring sounds. For instance, the articulation of consonants is notably impacted by following vowels, particularly in terms of labialization. This influence is evident in the reduction of noise components and the attenuation of consonant intensity. In English, the phoneme /d/ in words like "door," "darn," and "down" retains its characteristics as a plosive, pre-dental-apical, alveolar, voiced, and weak consonant. In contrast, in words such as "do," "dock" [dɒk], "doff" [dɒf], and "dour" [dʊə], /d/ demonstrates lip rounding due to the influence of the following vowel [uː]. Additionally, /d/ exhibits slight palatalization before front vowels and sonorants, as observed in "deal," "day," "did," and "did you." In words like "dry" [draɪ], "drug" [drʌg], and "driving" [ˈdraɪvɪŋ], /d/ becomes post-alveolar under the influence of the post-alveolar sonant [r].

From the provided examples, it is evident that the realizations of the phoneme /d/ in different phonological contexts exhibit significant variation. For instance, /dl/ and /dw/ do not overlap phonetically, nor do /dn/ and /dθ/. This suggests that a phoneme cannot be simply viewed as a mechanical aggregation of its allophones. Instead, phonemes exhibit a complex interplay of phonetic variations that are context-dependent and not merely a summation of their individual variants.

The English occlusive-plosive consonant /t/ is characterized by its energy distribution across low formant frequencies. The total energy of this consonant is evenly spread within all frequency parameters. According to formant data provided by A. Gimson, *the occlusive-plosive /t/ displays energy primarily at 360 Hz before all vowel phonemes. In contrast, subsequent front and back closed vowels shift the energy concentration to around 2000 Hz.*[46] In spectrographic analysis, /t/ shows an energy concentration of 2000-4000 Hz before labial vowels, and 3400-5800 Hz before non-labial

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[46] Gimson, A.C. An Introduction to Pronunciation of English. 4th ed. / Ed. By S. Ramsaran / A.C.Gimson. - London: Edward Arnold, - 1989, - p.149.

vowels. These spectral indicators suggest that /t/ is phonetically most stable and perceptually distinct before non-labial vowels.

The main provisions derived from this chapter are highlighted in the following articles and conference materials published by the author.[47]

The third paragraph of the third chapter is entitled ***"Positional Variants of Occlusive-Plosive Consonants of Modern English and Their Characteristics,"*** emphasises that in the phonological system of the English language there are two categories of consonants that oppose each other according to two differential features: the first type includes voiceless consonants /p/, /t/, /k/, which are usually characterised by stronger articulation and voicelessness; the second type includes /b/, /d/, /g/, characterised by weaker articulation and potential presence of voice during its implementation.

In English, the realization of voiceless occlusive-plosives /p/, /t/, /k/ as aspirated allophones in word-initial positions is a phonological phenomenon. Their voiced counterparts, /b/, /d/, /g/, tend to appear in semi-voiced allophones, as previously mentioned. As E.A. Buraya notes, *"aspiration is a meaning-distinguishing feature in English, exemplified by pairs like "pay" [pʰeɪ] – "bay" [beɪ], "tie" [tʰ aɪ] – "die" [daɪ], "Kate" [kʰ eɪt] – "gate" [geɪt]".[48]*

Aspirated variants of the English occlusive-plosives /p/, /t/, /k/ specifically occur in contexts where these consonants cannot be

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[47] Poladova, S.E. The Consonant System of the English Language and its Modification in Colloquial Speech // – United Kingdom: Advances in Social Sciences Research Journal. – 2021. Volume 8 (6), – pp.505-514; Glottalized allophones of consonant phonemes in English // -Baku: Baku Slavic University, Actual problems of studying the humanities - 2021. №3, -p.110-112; Features of the development of voiced occlusive phonemes in English // - Baku: Baku Girls University, Scientific works, – 2021. №3. vol.12(47), - p. 120-123; Norm and variability of phonetic means, style and language systems // – The XXXI International Scientific Symposium "Turkic World and National Unity", Andijan Uzbekistan, - October 29, - 2022, pp. 74-77; Positional and combinatorial variants of English phonemes // - Czechia: Proceedings of the 1st International Scientific Conference. Research Reviews, - December, 2022. №1, - pp.10-13.

[48] Buraya E.A. Phonetics of the modern English language. Theoretical course: textbook for students of linguistic universities and faculties / E.A. Buraya. - M.: Academy, - 2006, - p.58.

realized due to their limited distribution, such as after the voiceless consonant /s/. This phenomenon reflects the language's tendency to maintain a stable phonological correlation between voiced and voiceless sounds within its system.

Spectrographic and oscillographic analyses of language material reveal the phonetic positions where consonants are most and least resistant to changes in continuous speech. The data indicates that occlusive-plosive voiced and voiceless phonemes exhibit the greatest stability in the consonant + vowel (CV) combination.

In word-initial positions, the voiced plosive consonants /b/, /d/, and /g/ are commonly found, as seen in phrases like "in a little boat club," "go to beaches," and "have barbecues." In these initial positions, there is a noticeable degree of devoicing of the voiced plosives, a finding confirmed by acoustic analysis. Spectrograms of the plosive /b/ show either partial or complete devoicing performed by the speakers (see figure 3.3.1).

/in   a little   boat   club/   /g   o   t   o   b   ea   ch   e   s/
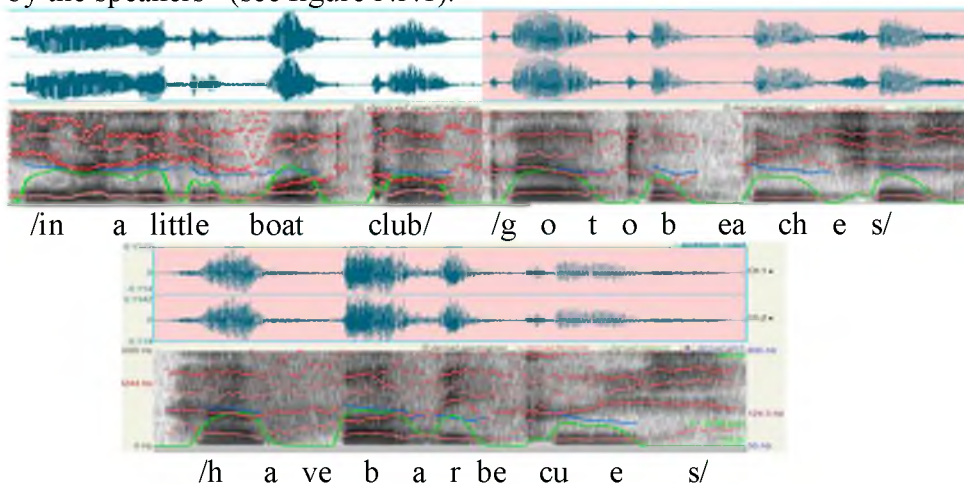
/h   a   ve   b   a   r be   cu   e   s/

Figure 3.3.1 a, b, c, d
Spectrogram and oscillogram of the English words "in a little boat club", "go to beaches", "have barbecues"

In the word-final position after a stressed vowel, the voiceless occlusive-plosive consonants /p/, /t/, /k/ are realized as strongly-mid-aspirated, and as weakly aspirated/unaspirated, and as non-plosive.

For example, in the words: "pap" [pæp], "pep" [pep], "pip" [pɪp], "pipe" ['paɪp], "pop" [pɔp], "tape" ['teɪp], "tap" [tæp]; "tit" ['tɪt], "toot" ['tuːt], "meet" ['miːt], "sit" ['sɪt], "first" ['fəːst], "text" ['tekst]; "kink" ['kɪŋk], "dark" ['daːk], "deck" [dek], "black" ['blæk], "cake" ['keɪk], "speak" ['spiːk].

As a result of the distributive analysis of occlusive-plosive voiced and voiceless consonants, the corresponding allophones were obtained: [p*], [b*], [b<], [b>] и [k*], [g*], [g<], [g>]. The obtained allophones in different types of syllables with occlusive consonants are presented in the following table (see table 3.3.1).

Table 3.3.1.

Allophones of occlusive- plosive consonants in different syllabic patterns

type of consonant	labial	pre-dental	velar
occlusive-plosive voiceless consonants	[pʰ],[pʰa],[p*a]	[#t*ʰa], [t*a]	[#k*ʰa],[k*a]
	[a#p*], [a#p*ʰ]	[a#t*], [a#t*ʰ]	[a#k*],[a#k*ʰ]
occlusive-plosive voiced consonants	[#p*b<a],[b*b<a]	[#t*d<a],[d*d<a]	[#k*g<a],[g*g<a]
	[ab>], [ab>b*], [ab>#p*]	[ad>],[ad>d*], [ad>#t*]	[ag>], [ag>g*], [ag>#k*]

When analyzing the acoustic variation of consonant realizations, segments such as [d>], [d<], and noise segments [t*], [d*] can be grouped into a single phonemic unit due to their complementary distribution. This relationship supports the classification of /d/ and /t/ with allophones [d>], [d<] and [t*], [d*] as phonetically similar, maintaining their status as a unified phoneme despite subtle differences (see table 3.3.1).

In English, the voiced consonant /d/ often exhibits partial devoicing in stressed positions, while the velar voiced consonant /g/ shows a tendency towards partial voicelessness. Analyzing the degree of sonority for voiced occlusive-plosive consonants before stressed vowels reveals a pattern: the labial /b/ is the most frequently

devoiced, followed by the velar /g/, with the alveolar /d/ demonstrating the least devoicing.

The main provisions derived from this chapter are highlighted in the following articles and conference materials published by the author.[49]

The fourth chapter, **"Experimental Phonetic Research of Variants (Consonants),"** consists of four paragraphs. The first paragraph, which is entitled *"Choosing Language Material and Principles of Compiling a Research Program,"* provides information on language materials and principles of program development, and also notes that the study of spoken speech is important from the point of view of identifying the possibilities of implementing the phonological system of any language, the features of speech construction in native and non-native languages, and studying the possibilities of influencing the interlocutor with speech.

Experimental phonetic methods have significantly enhanced our ability to characterize and precisely define the objective properties of sound phenomena. Advances in audiovisual technology have rendered human speech visible and enabled objective analysis of phonetic subtleties that are difficult to discern aurally. For example, the partial devoicing of the consonant /r/ at the end of words in Azerbaijani is challenging to detect without specialized equipment. Acoustic devices that record and visually represent acoustic signals provide clear insights into these subtle phonetic phenomena.

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[49] Poladova, S.E. The Consonant System of the English Language and its Modification in Colloquial Speech // – United Kingdom: Advances in Social Sciences Research Journal. – 2021. Volume 8 (6), – pp.505-514; Glottalized allophones of consonant phonemes in English // -Baku: Baku Slavic University, Actual problems of studying the humanities - 2021. №3, -p.110-112; Features of the development of voiced occlusive phonemes in English // - Baku: Baku Girls University, Scientific works, – 2021. №3. vol.12(47), - p. 120-123; Norm and variability of phonetic means, style and language systems // – The XXXI International Scientific Symposium "Turkic World and National Unity", Andijan Uzbekistan, - October 29, - 2022, pp. 74-77; Positional and combinatorial variants of English phonemes // - Czechia: Proceedings of the 1st International Scientific Conference. Research Reviews, - December, 2022. №1, - pp.10-13.

The experimental phonetic analysis was conducted on isolated English word forms containing occlusive-plosive consonants. The research focused primarily on mono- and disyllabic words, with occasional inclusion of polysyllabic words to assess varying degrees of phonetic change. The study examined the occlusive-plosive consonants in relation to their word position, phonetic environment, and the specific qualities of the consonant sounds. Initially, the acoustically analyzed word forms were evaluated using audiovisual observations and acoustic readings from speaker-informants.

Subsequently, the study employed acoustic computer programs to conduct a detailed phonetic analysis. The program "Praat" was utilized for this purpose, allowing the conversion of audio signals into visible oscillograms and spectrographs. These visual representations, included in this study, provide a detailed and objective illustration of the phonetic phenomena under investigation.

The experimental material was voiced by native speakers of Standard British English. The adherence of the speakers' pronunciation to standard literary norms was evaluated through expert assessment. The recordings were performed by four speakers, aged 20 to 25 years, each with incomplete higher education, ensuring nominal intonation and clear pronunciation in the language material.

Information about the speakers:

Speakers	Gender	Age	Special ty	Place of residence	English proficiency
Speaker I	male	20 years old	student	London	excellent
Speaker II	female	22 years old	student	London	excellent
Speaker III	male	23 years old	student	London	excellent
Speaker IV	female	25 years old	student	London	excellent

The program employed for this study facilitates the acquisition of spectrographic and oscillographic images of speech signals. Oscillograms and spectrograms serve as crucial sources of information regarding the three fundamental parameters of each

speech signal: duration, intensity, and frequency. These parameters are visually observed on spectrograms and oscillograms, which can vary significantly from one sound to another, between different speakers, and under varying conditions of sound production. The program also allows for the precise selection of small sound segments within the speech and the measurement of specific parameters within these segments.

In the second paragraph of the fourth chapter ***"Spectral Characteristics of Variants of Occlusive-Plosive Consonant Phonemes in the English Language,"*** it is highlighted that, unlike vowel sounds, consonant sounds on spectrograms typically lack a clear formant structure. Sonorant consonants, particularly when situated between vowels, exhibit a spectral pattern that is most similar to vowel phonemes. Like vowels, sonorants have a distinct sound source and a well-defined formant structure, but they are distinguished by their considerably lower relative intensity. The spectral distribution of occlusive-plosive voiceless consonants is also notably distinctive. According to L.R. Zinder, *"voiced consonants on spectrograms are characterized by the presence of low-frequency components corresponding to the speaker's fundamental frequency, known as the zero formant (F_0). This component often merges with the first formant (F_1)."*[50]

The study subjected the English consonants /p/, /b/, /t/, /d/, /k/, and /g/ to spectral analysis. Special emphasis was placed on contrasting voiceless and voiced consonants to identify the variations they undergo in similar phonetic contexts. The analysis utilized 600 words from contemporary English, featuring these consonants in various phonetic positions and adjacent to different vowels or consonants. Spectrographic images of these words were captured and subsequently analyzed, with spectrogram segmentation performed to assess the phonetic characteristics of the consonants.

The occlusive-plosive consonant sound /r/ in the initial of words is realized before different vowel phonemes. The average statistical duration of this consonant before the vowel /a/ in the words

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[50] Zinder, L.R. General phonetics / L.R.Zinder. - Moscow: Higher School, - 1979. - p.124.

"pace" [peɪs], "page" [peɪʤ], "pain" [peɪn], "pair" [pɛə], "palate" [pælɪt]   according to the readings of all speakers is 92 m/s Before the vowel phoneme /i/, the duration of the consonant /p/ in the words "piano" ['pjænoʊ], "picket" ['pɪkɪt], "picture" ['pɪkʧə], "piggy" ['pɪgɪ], "pike" ['paɪk], "pink" [pɪŋk], etc. is 86 m/s In the preposition of the vowel /e/ in the following words "peace" ['piːs], "pear" [pɛə], "people" ['piːpl], "perfect" ['pəːfɪkt], "perhaps" [pə'həps], "perk" ['pəːk], "pert" [pəːt], "petrol" ['petr(ə)l] the sounding time is 83 m/s. In the words like "pub" [pʌb], "puce" [pjuːs], "puddle" ['pʌdl], "puffy" [pʌfi], etc. before the vowel /u/, the duration of the consonant /p/ is 97 m/s. Before the vowel sound /o/ the average duration of this consonant sound in the English words, like "pock" [pɔk], "poem" ['poʊɪm], "pole" [poʊl], "police [pə'lis], "point" [pɔɪnt], "polite" [pə 'laɪt], "poker" ['poʊkə], "polar" ['poʊlə], "poll" [poʊl] is 94 m/s. The average duration of this consonant sound in the English words "pyre" ['paɪə], "pyramid" ['pɪrəmɪd], "pyjamas" [pəʤ aː'məz], "pygmy" ['pɪgmɪ] before the vowel sound /y/ is 81 m/s. (see Fig. 4.2.1.a, b, c, d, e, f).
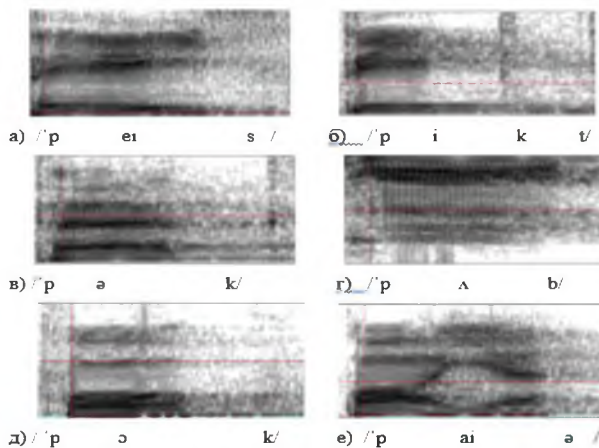

Fig. 4.2.1.a, b, c, d, e, f.
Spectrogram of words: a) "pace" [peɪs], b) "picket" ['pɪkɪt], c) "perk" ['pəːk], d) "pub" [pʌb], e) "pock" [pɔk], f) "pyre" ['paɪə]
   The occlusive-plosive consonant /b/ involved in the spectrographic analysis was also taken in all phonetic positions. The average duration of the consonant /b/ in the position before the vowel

phoneme /a/ is 85 m/sec (for example, in the words "back" [bæk], "bad" [bæd], "bait" [beɪt], "balk" [bɔːk], "ban" [bæn], "band" [bænd]); In the words like "beach" [biːʧ], "bean" [biːn], beauty['bjuːtɪ], "below" [bɪ'loʊ], "best" [best], "between" [bɪ'twiːn], "berry" ['berɪ], the phonetic position of the words, before the vowel /e/ is 73 m/sec; In the words like "board" [bɔːd], "bout" ['boʊt], "body" ['bɔːdɪ], "bonny" ['bɔːnɪ], "boy" [bɔɪ], the phonetic position before the vowel /o/ is 82 m/s; In the words like "buck" [bʌk], "bud" [bʌd], "buff" [bʌf], "build" ['bɪld], "butcher" ['buʧtə], "but" [bʌt], "butter" ['bʌtə], the phonetic position before the vowel /u/ is 81 m/s. (see Fig. 4.2.4 a, b, c, d, e, f).
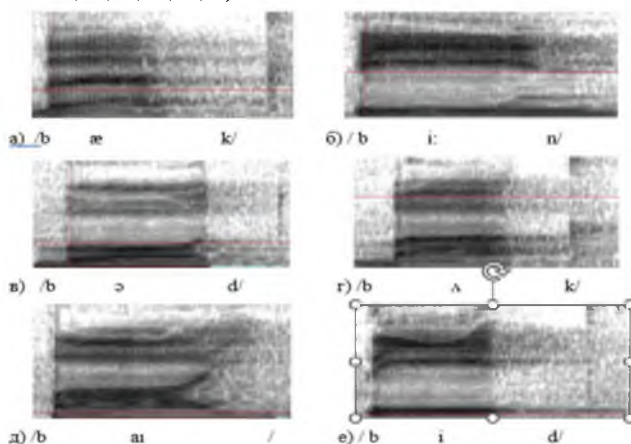
Fig. 4.2.4. a, b, c, d, e, f.
Spectrogram of words: a) "back" [bæk], b) "bean" [biːn], c) "board" [bɔːd], d) "buck" [bʌk], e) "by" [baɪ], f) "bid" [bɪd]

The average duration of the occlusive-plosive consonant /t/ in the middle of a word with the syllabic model CV, CVC (for example, in the words "title" ['taɪtl], "titmice" ['tɪtmaɪs], "titular" ['tɪtlʊlə], "total" ['toʊtl], "totter" ['tɔtə], "turtle" ['tɔːtl], "tutor" ['tjuːtə], "city" ['sɪtɪ], "party" ['paːtɪ], "street" [strɪːt]) is 86 m/sec (see Fig. 4.2.9 a, b, c).

The temporal indices of words included in the spectrographic analysis reflect the dependence of the length of English vowel sounds on the voicelessness/sonority of the following consonant. In other words, in preposition to a voiceless consonant, the length of the

vowel is reduced, and before a voiced consonant it constantly increases (see Fig. 4.2.9 a, b, c).
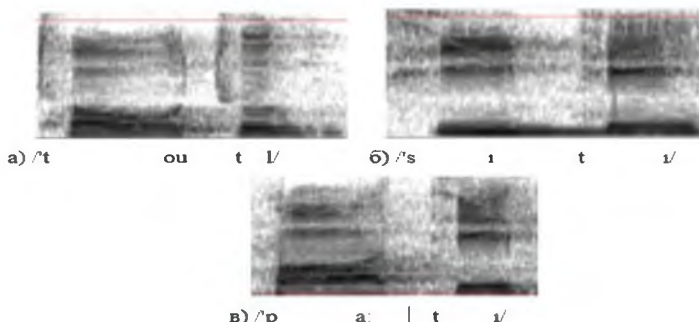

Fig. 4.2.9 a, b, c.
Spectrogram of words: a) "total" ['toutl, b) "city" ['sɪtɪ], c)
"party" ['pa:tɪ]

The average duration of the occlusive-plosive consonant /d/ in the middle of a word with the syllabic model CV, CVC (for example, in the words "dedicate" [' dedikeɪt], "deduce" [dɪ'dju:s], "deduct" [dɪ'dʌkt], "didactic" [dɪ'dæktɪk], "garden" ['ga:dn], "ready" ['redɪ], "hardly" ['ha:dlɪ], "lady" ['leɪdɪ]) is 69 m/s. Based on the spectral images of the voiced consonant /d/, realized in the intervowel position, we can say that the spectrum of this allophone, realized in this position, has formants that reflect the participation of the vocal cords in its spectrum (see Fig. 4.2.12.a, b, c).
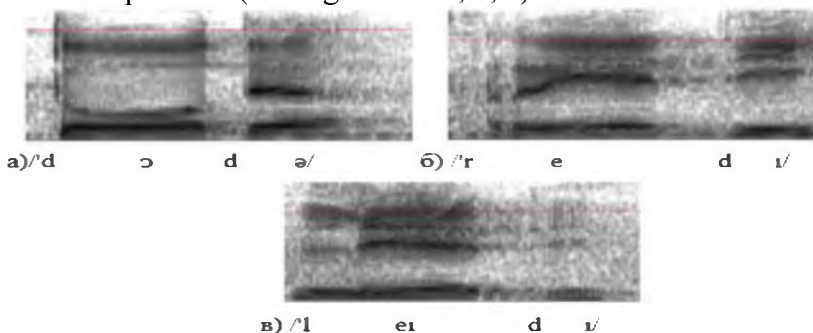

Fig. 4.2.12.a, b, c.
Spectrogram of words: a) "dodder" ['dɔdə], b) "ready" ['redɪ] c)
"lady" ['leɪdɪ]

In the prevocalic position at the beginning of a word, the duration of the voiced occlusive-plosive consonants /b/ and /d/ is influenced by the quality of the following vowel. Spectrographic analysis reveals that these consonants have shorter durations before high vowels, whereas they are extended before low vowels.

In final positions, voiced occlusive-plosive consonants are typically realized as voiced implosives, while in initial positions, weak voiceless allophones of these consonants are observed. This variation suggests that, particularly in contexts where conveying significant information is crucial, maintaining the voiced quality of occlusive-plosive consonants is essential for effective communication. For instance, in the word "god" [gɔːd], from the CVC syllabic model, the occlusive-plosive consonant /d/ at the end is acoustically realized as a voiced implosive with a brief duration, featuring a prominent F_0 and residual formants from the preceding vowel sound (see Fig. 4.2.14).
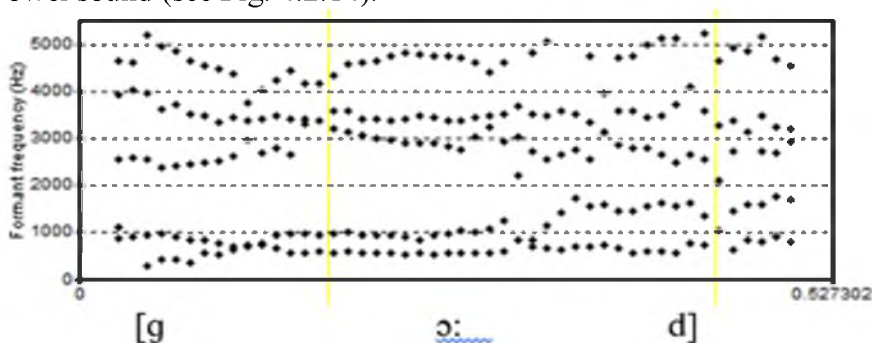

Fig. 4.2.14.
Formant indicators of the realization of the non-palatalized allophone of the consonant /g/ at the end of the word "god"

The closed nature of a syllable significantly impacts its temporal organization, reflecting a specific relationship between the durations of the vowel and the following consonant. This phenomenon, known as temporal compensation, is indicative of a close temporal organization within the syllabic model of VC (vowel-consonant). The principle of temporal compensation suggests that in

a closed syllable, a longer vowel duration corresponds to a shorter duration of the subsequent consonant, underscoring the VC syllabic model as a fundamental unit of speech organization in English.

Spectrographic analysis reveals that occlusive-plosive consonants undergo qualitative changes in continuous speech. Voiceless occlusive-plosive consonants produce a pulsed noise source on the spectrum, maintaining voicelessness throughout the entire sound, often accompanied by a physical pause in the acoustic spectrum. Voiceless consonants exhibit longer durations compared to their voiced counterparts, with the average duration of voiced plosives being 74 m/sec overall. Specifically, voiced plosives have an average duration of 68 m/sec at the beginning of words, and 96 m/sec at the end. Conversely, voiceless plosives average 88 m/sec at the beginning, 83 m/sec in the middle, and 110 m/sec at the end of words. The minimum acoustic values for both voiceless and voiced consonants occur in the middle phonetic position, whereas the maximum durations are observed at the end of words. This pattern illustrates the dynamic nature of consonantal duration concerning syllabic position, highlighting the influence of syllable closure on consonant temporal properties (see table 4.2.1, graph 4.2.1).

Table 4.2.1.

Average duration of English consonants /p/, /b/, /t/, /d/, /k/, /g/ in different phonetic positions of the words.

Average duration of consonants	at the beginning	in the middle	at the end
/p/	89	81	112
/b/	77	65	94
/t/	87	86	110
/d/	72	69	97
/k/	88	83	108
/g/	74	69	98
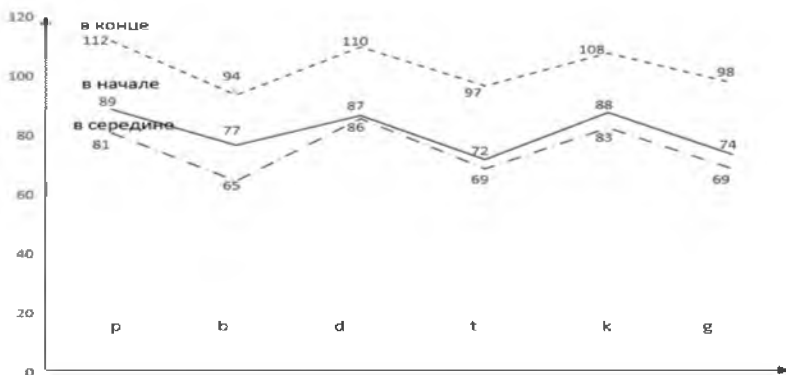
Graph 4.2.1

The results of the spectrographic analysis indicate that the duration of consonant phonemes varies according to their phonetic position and combinations with adjacent phonemes. Regardless of whether the consonants are voiceless or voiced, the longest duration values are observed in the absolute final position of the word. Consonant phonemes undergo quantitative variations depending on their phonetic position and their interaction with neighboring sounds. Conversely, the shortest duration for consonant sounds is recorded in the middle position within the word structure.

In the third paragraph of fourth chapter, ***"Oscillographic Analysis of Variants of Occlusive-Plosive Consonant Phonemes in English,"*** it is noted that occlusive-plosive consonants involve a sudden release of accumulated air from the oral cavity when the occlusion is released. For labial consonants, this process involves fully opening the lips and lowering the lower jaw. This mechanism applies to both voiced and voiceless consonants. For instance, in the articulation of /t/, the lips and vocal cords remain open, with the occlusion being created by the tip of the tongue.

Oscillographic data from the analyzed words "tit" and "tut" show that the duration of occlusion and plosion of the consonant /t/ at the beginning of the word is 78 and 47 m/sec for "tit," and 83 and 52 m/sec for "tut." The vowels in these words require 287 m/sec and 312 m/sec, respectively. The duration of the consonant /t/ at the absolute end of the words is longer than at the beginning, with 168

m/sec for "tit" and 186 m/sec for "tut." The oscillographic evidence suggests that the occlusive phase of the final consonant /t/ is shorter and less distinct, reflecting the influence of voicing on the occlusive phase of /t/ at the word's end (see Fig. 4.3.1).
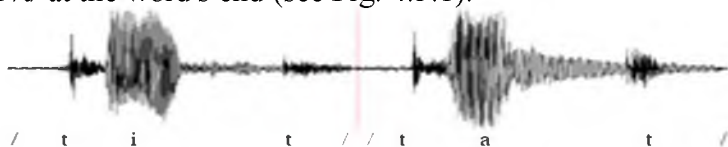

Fig. 4.3.1
Oscillograms of the English words "tit" and "tut"

It has been experimentally demonstrated that the duration of articulatory occlusion for voiceless plosive consonant phonemes significantly exceeds that for voiced consonants.

L.R. Zinder asserts that *"the duration of a sound depends on phonetic conditions. The duration often varies between open and closed syllables, influenced by the nature of adjacent consonants, the number of consonants following the vowel, stress placement, and the number of syllables in the word."*[51]

The duration of consonant sounds is contingent upon the phonetic environment, which can be termed "positional" or "contextual" duration. This duration is shaped by the immediate phonetic context surrounding the sound. In English, the duration of consonant segments plays a crucial role in the perception of sonority and voicelessness.

Oscillographic analysis predominantly focuses on consonant length indicators due to the limited expression of other acoustic parameters in the oscillograms of consonant sounds. Digital analysis of consonant length provides insights into how these sounds vary across different phonetic positions and in combination with other phonemes. Quantitative changes in the length of consonants are accompanied by parallel qualitative changes, as these parameters are closely interconnected.

The fourth paragraph of the fourth chapter, titled *"Linguistic Interpretation of the Results of the Acoustic Analysis of Variants of*

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[51] Zinder, L.R. General phonetics / L.R.Zinder. - Moscow: Higher School, - 1979. - p.187.

Occlusive-Plosive Consonant Phonemes in English," addresses the quantitative characteristics of initial and final occlusive-plosive consonants. It is observed that the completeness of articulation for initial consonants is generally higher compared to final consonants. Additionally, the percentage of final voiceless occlusive-plosive consonants that are fully articulated is greater than that of voiced consonants. The results of acoustic measurements of the duration parameters of occlusive- plosive consonant phonemes in the initial of a word are presented in the following tables (4.4.1; 4.4.2; 4.4.3).

Table 4.4.1.

Comparison of the duration of English voiced and voiceless occlusive-plosive consonants at the beginning of the words

Type of syllable consonant + vowel (CV)	average duration of occlusive- plosive consonants in the initials of the words (in m/sec)				average duration for all speakers
	Speaker I	Speaker II	Speaker III	Speaker IV	
/t/	108	113	104	97	105,5
/d/	94	90	95	89	92
/p/	150	120	110	104	121
/b/	86	88	90	85	87
/k/	110	105	100	90	101
/g/	78	74	77	69	74,5

An analysis of the implementation of occlusive-plosive consonants across all speakers reveals a general tendency for increased duration of voiceless consonants, often resulting in a perceptible slowing of tempo. The duration of voiced consonants ranges from 69 m/s to 94 m/s, whereas the duration for voiceless consonants varies between 90 m/s and 150 m/s. This variation suggests that, particularly at the beginning of a word, voiceless consonants tend to be longer in duration compared to their voiced counterparts (see table 4.4.1).

Table 4.4.2.

Comparison of the duration of English voiced and voiceless occlusive-plosive consonants in the middle of the words

Type of syllable CV, CVC, CVCC	average duration of occlusive- plosive consonants in the middle of the words (in m/sec)				average duration for all speakers
	Speaker I	Speaker II	Speaker III	Speaker IV	
/t/	87	83	92	81	86
/d/	74	71	75	78	74
/p/	116	102	98	96	103
/b/	76	80	81	79	79
/k/	100	95	97	87	95
/g/	69	71	68	60	67

An analysis of occlusive-plosive consonants in the middle of words indicates that the duration of voiced consonants ranges from 60 m/s to 81 m/s, while voiceless consonants exhibit a duration ranging from 87 m/s to 116 m/s. The interval between the lower and upper average durations for both voiced and voiceless consonants spans 27 m/s to 35 m/s. This data suggests that, in the middle position of a word, voiceless consonants generally have a longer duration compared to their voiced counterparts (see Table 4.4.2).

Table 4.4.3.

Comparison of the duration of English voiced and voiceless occlusive-plosive consonants at the end of the words

Type of syllable VC, CVC	average duration of occlusive- plosive consonants at the end of the words (in m/sec)				average duration for all speakers
	Speaker I	Speaker II	Speaker III	Speaker IV	
/t/	191	216	198	189	198
/d/	168	157	165	159	162
/p/	221	194	202	190	202
/b/	167	160	170	158	164
/k/	196	193	206	189	196
/g/	156	154	167	146	156

The analysis of the digital realizations reveals distinct variations in the duration of occlusive-plosive consonants depending on their position within a word. The consonant /t/ exhibits the following durations: at the initial position, it ranges from 97 m/s to 108 m/s; in the middle position, from 81 m/s to 92 m/s; and at the end of words, from 189 m/s to 216 m/s. The consonant /d/ shows durations ranging from 89 m/s to 95 m/s at the beginning, 71 m/s to 78 m/s in the middle, and 157 m/s to 168 m/s at the end. For the consonant /r/, the durations are 104 m/s to 150 m/s initially, 87 m/s to 100 m/s in the middle, and 190 m/s to 221 m/s at the end. The voiced consonant /b/ has durations ranging from 85 m/s to 90 m/s at the beginning, 60 m/s to 69 m/s in the middle, and 158 m/s to 170 m/s at the end. The consonant /k/ has durations of 90 m/s to 110 m/s initially, 96 m/s to 116 m/s in the middle, and 189 m/s to 206 m/s at the end. Finally, the voiced consonant /g/ ranges from 69 m/s to 78 m/s at the beginning, 76 m/s to 81 m/s in the middle, and 146 m/s to 167 m/s at the end.

The comparative analysis shows that the average duration of voiceless occlusive-plosive consonants generally exceeds that of their voiced counterparts across all positions. Specifically, at the beginning of a word, the ratio of the duration of voiced to voiceless consonants is approximately 84 m/s to 110 m/s; in the middle position, it is 98 m/s to 73 m/s; and at the end, it is 198 m/s to 154 m/s. This demonstrates that voiceless occlusive-plosive consonants are consistently longer in duration compared to voiced ones. The observed duration advantage for voiceless consonants is 26 m/s at the beginning, 25 m/s in the middle, and 44 m/s at the end of words. (see Table 4.4.1; 4.4.2; 4.4.3; graph 4.4.1).
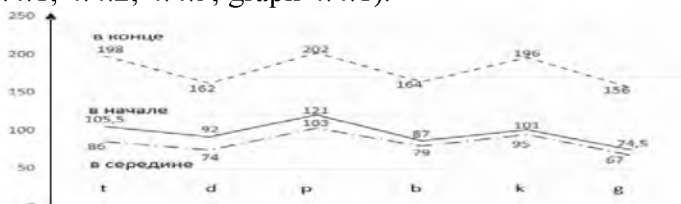
Graph 4.4.1
Oscillographic values of the average duration of English consonants /p/, /b/, /t/, /d/, /k/, /g/ at the beginning, middle and end of the words.

The main provisions derived from this chapter are highlighted in the following articles and conference materials published by the author.[52]

The **"Conclusion"**part of the dissertation summarizes the findings of the research process. As the main results of the dissertation, the following can be noted:

1. The phenomenon of variability is a mandatory and integral characteristic of language, one of the fundamental properties of its existence, functioning and evolution. It should be considered as an objective immanent characteristic of the language system, affecting all levels and units in the language in terms of form and content, both in synchrony and diachrony. Allophonic variation is an essential phenomenon in the realization of a phoneme, representing a phoneme in spontaneous speech in specific combinatorial-positional contexts.

2. Variability is not a proper linguistic phenomenon. The variability of the language as a whole, and its separate level units, are influenced by both system-structural features of the language, which are determined by intra-linguistic rules and regularities, as well as extra-linguistic factors, which are determined by social status, gender, ethnicity, place of residence, and specific cultural-historical conditions. On this basis, extralinguistic (or external) and intralinguistic (or internal) factors should be distinguished, which completely determine the level of properties and the range of variation of linguistic units in terms of form and content.

3. When studying variants and variations of language structures, it is necessary to take into account both linguistic factors themselves,

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[52] Poladova, S.E. Intonation characteristics of syntagms of different degrees of completeness/incompleteness // - Educational and research activities in the new era: realities and challenges, materials of the International scientific conference, - Mingachevir, - December 16-17, - 2022, p.183-186; Classification of changes in the orthoepic norm at the phonetic level // - Materials of the V International scientific conference dedicated to the 99th anniversary of the birth of national leader Heydar Aliyev, Baku, - April 28, - 2022, - p.157-158; The role and significance of phonetic segmentation in the organization of speech flow // - Baku: Baku Girls University, Scientific works, - 2024. v.18 (57), #1, - p.204-208; Spectral properties of English occlusive- plosive consonant phonemes // - Baku: Gadim Diyar. International online journal, - 2024. v.6 (3), - p. 178-185.

caused by those modifications that occur within the language system itself in the process of its functioning and development, as well as extralinguistic factors, i.e. social and stylistic factors that have a strong influence on the choice of a language speaker of one or another variant form. Allophonic variation of phonemes, caused by combinatorial-positional factors of phoneme implementation, is constant and does not depend on the will of the speaker.

4. According to the results of the spectrographic and oscillographic analysis, it can be said that the differences between allophones in some cases refer only to the degree of expression of the sign (for example, the degree of aspiration of the voiceless occlusive-plosive /b/, /d/, /g/, /t/, / p/, /k/, palatalisation, voicelessness, vocalisation), and not to the presence or absence of this phonetic sign. In addition to purely quantitative modifications of consonant phonemes in spontaneous speech, allophonic variation also includes modifications of a qualitative nature, which affect, but do not completely disrupt, the way of realisation of this phoneme. This is, for example, the incompleteness of the occlusive phase observed in spontaneous speech, which usually leads to the affrication of occlusive-plosive consonants, non plosive realisation of occlusive-plosive consonants, etc.

5. Voiced occlusive-plosive consonants of the English language can be realised in unified speech without the participation of the vocal cords, which allows us to talk about the presence of opposition due to tension/non-tension in the phonological system of the English language. As a result of the spectral study of transition sections of English occlusive-plosive consonants, a certain dependence of these characteristics, tension/non-tension of neighbouring consonants and vowel segments was revealed.

6. Judging by the quantitative characteristics of the occlusive-plosive consonants, it can be said that the absolute duration of these sounds depends on their distribution. The acoustic characteristics of the voiceless occlusive-plosive consonants /p/, /t/, /k/ vary in the preposition of different vowel phonemes, which indicates the assimilating effect of consonant units in the speech flow of vocal units. When implemented in the speech chain, a "simplification" of

the oscillographic picture of voiced occlusive-plosive consonants is observed. The acoustic features of the implementation of combinations of voiceless occlusive-plosive consonants with different vowels are supplemented by some shades of manifestation of their qualitative characteristics when implemented. The initial voiceless occlusive-plosive consonants /p/, /t/, /k/ significantly reduce the formant indicators of the value of the upper limit of noise components – from 520 to 1300 Hz.

7. Based on the obtained acoustic indicators, it can be stated that the allophonic variation of the English occlusive-plosive consonants /t/ and /d/ is gradual, something that is manifested in quantitative and qualitative changes both in the occlusive phase and in the noise phase of the allophones of the consonants. The identified variants of the occlusives /t/ and /d/ can be presented as a continuum from an unaspirated occlusive consonant pronounced with a plosion to a vowel-like single-stress consonant.

8. The realisation of the sonority feature of initial voiced occlusive-plosive consonants depends on positional and combinatorial conditions. The differentiation of occlusive-plosive consonants into voiced and voiceless ones with different types of realisation has corresponding time correlates. The reduction of the duration feature indicators in voiced occlusive-plosive consonants with phonetic realisation covers the occlusive and the plosive phases.

9. The time realisation of English consonants varies due to the phonetic context. A certain hierarchy has been identified among the factors influencing the time realization of consonants: a) the greatest influence is exerted by the factor of voice participation; b) the position of the consonant in the structure of the word; c) the place of formation of the consonant sound; d) the method of formation of the consonant sound; e) the number of syllables in the word, i.e., the segmental length of the word; e) the quality of the syllable (openness/closedness of the syllable).

10. Spectrographic analysis of the realisations of the English voiced occlusive-plosive consonants /b/, /d/, /g/ in the initial position of a word reveals a high percentage of partially and completely devoicing variants of these consonants. This situation clearly

demonstrates that here the voicelessness of the voiced consonants manifests itself as an immanent, internal feature of these consonants themselves, since in this phonetic position the environment does not greatly affect the quality of the realization. Speaking in terms of modern phonology, these phonetic characteristics are usually defined as a distinctive feature, therefore, the phonological opposition /p/, /t/, /k/ and /b/, /d/, /g/ in terms of voice participation gets the following form: voiceless (for the consonants /p/, /t/, /k/) and partially devoicing (for the consonants /b/, /d/, /g/), or: voiceless (for the consonants /p/, /t/, /k/) and completely devoicing (for the consonants /b/, /d/, /g/).

11. An experimental phonetic study of the degree of sonority of English voiced consonants /b/, /d/, /g/ in different phonetic positions shows that the positions of least differentiation between voiced plosives and their voiceless pairs are the following: a) the position of the absolute end of the word, for example, "heard" [ˈhɜːd], "good" [gʊd], "to St. Petersburg" [tuˌseɪnt ˈpi.tərzˌbɜrg]; b) after a voiceless consonant "the last book that", "predominant" [prēdʌmənt]; c) before a voiceless consonant, for example, "a pub here", "four days after" [fɔː deɪz ˈaftər], "to St. Petersburg for a month".

12. Based on acoustic indicators, it can be said that occlusive-plosive voiceless consonants are characterized by an increase in duration and a slowdown in the rate of pronunciation. If the duration of voiced consonants varies within the range of 69-94 m/sec., then the duration of voiceless consonants varies within the range of 90-150 m/sec. In the initial of a word, the duration of voiceless consonants exceeds the duration of voiced consonants.

13. The duration of occlusive- plosive consonants in the middle of words is expressed as follows: the range of duration of voiced consonants varies from 60 m/sec. to 81 m/sec.; the range of duration of voiceless consonants varies from 87 m/sec. to 116 m/sec. Judging by the acoustic data, it can be said that the interval between the lower and upper average duration indicators of voiced and voiceless consonants varies from 27 m/sec. to 35 m/sec.

14. The acoustic indices of the analysed consonants are expressed as follows: the duration of the consonant /t/ in the initial

fluctuates between 97 m/sec. and 108 m/sec., in the middle 81-92 m/sec., at the end of words fluctuates between 189 m/sec. and 216 m/sec. The indices of the duration of the voiced consonant /d/ in the initial are 89-95 m/sec., in the middle – 71-78 m/sec., and at the end – 157-168 m/sec. The duration of the consonant /r/ at the beginning is 104-150 m/sec., in the middle 87-100 m/sec., at the end of words 190-221 m/sec. The duration of the voiced /b/ in the initial is 85-90 m/sec., in the middle 60-69 m/sec., and, at the absolute end 158-170 m/sec. The duration of the consonant /k/ in the initial is 90-110 m/sec., in the middle 96-116 m/sec., at the end 189-206 m/sec. The duration of the voiced /g/ in the initial is 69-78 m/sec., in the middle 76-81 m/sec., and at the end of words 46-167 m/sec.

15. The duration of occlusive-plosive consonants changes depending on their position in the word. The greatest duration is observed at the absolute end of the word for voiceless consonants, voiced consonants are characterised by a greater duration in the middle of the word and a shorter duration at the beginning. The latter can be explained by the fact that for these occlusive in several cases it was possible to isolate the voiced occlusion at the absolute beginning of the word. The duration of occlusive-plosive consonants varies depending on the phonetic context. The greatest spread in the duration of occlusive-plosive consonants is inherent in voiceless consonants, which are distinguished by a wider distribution.

16. Phonetic processes that take place during the implementation of occlusive-plosive consonants cover the stationary-noise area of the initial consonant, the transitional section of the following sound finds its expression in the corresponding quantitative-qualitative indicators. During the implementation of combinations of occlusive-plosive consonants with sonorants, phonetic processes are manifested in the localisation of areas of plosion or aspiration energy, as well as during the implementation of combinations of occlusive-plosive consonants with a vowel, which is accompanied by a change in the level of high-frequency components.

The main provisions of the research are reflected in the following published scientific works of the author:

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4. Особенности развития звонких смычных фонем на английском языке // – Bakı: Bakı Qızlar Universiteti, Elmi əsərlər, – 2021. – Cild 12, №3(47), – s.120-123.

5. Фонологическая система как один из основных стимулов звуковых изменений // – Bakı: Azərbaycan Milli Elmlər Akademiyası, M.Fizuli adına Əlyazmalar İnstitutu, Filologiya məsələləri, – 2021. №7, – s.107-113.

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13. Variability as the concept of allophonic variation // Международный научно-практический журнал, Endless light in science, – Алматы, Казахстан, – 28 Октября, – 2022, – p.236-240.

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