PROBLEMS OF THEORETICAL PHONOLOGY

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by

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PREFACE

The task of the following investigation is a systematic explication of basic phonological concepts within the framework of theoretical phonology. The results of this explication lead the author to the formulation of a new phonological theory which he terms the two-level theory of phonology.

In order to clarify the general character of this investigation we deem it necessary to say a few words about the subject of theoretical phonology, and about the essence of concept explication.

Theoretical phonology is quite often confused with general phonology; in effect, they are two different disciplines. The subject matter of theoretical phonology is the nature of phonological reality which is studied with the help of the corresponding conceptual apparatus, while general phonology is concerned with the typology of concrete phonological systems. The different subject matters use correspondingly different methods. The basic tool of theoretical phonology is the hypothetico-deductive method which enables us to disclose the immanent laws of phonological reality. In so far as general phonology is concerned, its basic method is generalization, which reduces concrete phonological systems to a limited number of basic types of phonological systems. Since it discloses the immanent laws of phonological reality, theoretical phonology functions as a foundation of general phonology, as well as a foundation of phonemic descriptions of concrete languages, upon which general phonology rests.

Theoretical phonology should be differentiated not only from general phonology, but also from descriptive phonology which has been developed in the United States. In contrast to theoretical phonology whose main task is the elaboration of a conceptual

apparatus that characterizes the nature of phonological reality, descriptive phonology concentrates on the actual technique of phonological description. Descriptive phonology is not a theory of phonological reality but a methodical discipline which systematizes technical methods used in the description of concrete phonological systems. Not without reason does the well-known work of K. L. Pike, devoted to a systematic presentation of descriptive phonology, contain the characteristic subtitle: "A Technique for Reducing Languages to Writing". [1] It is obvious that descriptive phonology is closely connected with theoretical phonology since the technique of description of concrete phonological systems must rely on a conceptual apparatus which characterizes the nature of phonological reality; this fact should, however, in no way outweigh the basic difference between theoretical phonology and descriptive phonology in regard to the problems which fall within their respective domains.

All that has been said so far about descriptive phonology applies in an equal degree to descriptive linguistics in general, descriptive phonology being a component part of this system. As E. Coseriu rightly writes, "American structuralism is only a *method of investigation*, just as European structuralism constitutes an a priori conception (hypothesis) which determines the method of investigation."[2]

In contemporary logic of science the term "explication" describes a critical analysis of established concepts, as a result of which the established concepts undergo a split-up and are replaced by new, more exact and revealing concepts. R. Carnap calls such new concepts explicata, the old concepts explicanda.[3]

The importance of a critical analysis of concepts can hardly be overstressed. The history of science demonstrates that a critical analysis of basic, apparently selfevident, concepts has more than once led to fruitful progress in any field of knowledge, and at

[1] K. L. Pike, *Phonemics: a Technique for Reducing Languages to Writing* (Ann Arbor, 1947).

[2] E. Coseriu, *Forma y sustancia en los sonidos del languaje* (Montevideo 1954), p. 146.

[3] Cf. R. Carnap, *Einführung in die symbolische Logik* (Vienna, 1954), p. 2.

times has effected even the rise of totally new fields of knowledge. In this connection it is interesting to introduce the words of A. Einstein and L. Infeld regarding the origin of differential calculus: "The rigorous analysis of such words as 'very near', 'very short' is far from simple. Indeed, it was this analysis which led Newton and Leibnitz to the discovery of differential calculus."[4]

In subjecting the system of basic concepts of contemporary theoretical phonology to a critical analysis we will regard each of these concepts as an explicandum for which we will seek the corresponding explicatum.

Since the time of the publication of N. S. Trubetzkoy's *Grundzüge der Phonologie* there appeared a number of excellent works which elaborated and deepened the knowledge of basic phonological concepts. In the light of what has already been accomplished in the sphere of investigation of basic phonological concepts it would seem that within this sphere no important new results of fundamental methodological significance are likely to be attained. It is our belief, however, that in contemporary phonology there exists the possibility of disclosing, by means of the application of the hypothetico-deductive method, inherent antinomies whose overcoming should lead to a radical review of the established phonological concepts and to a formulation of a new phonological theory which differentiates strictly the two abstraction levels: (1) the level of phonological observation and (2) the level of phonological constructs. It is this kind of phonological theory that we propose to investigate.

The two-level theory of phonology, as formulated by us, is in full agreement with the concept of the structure of science in contemporary logic of science. Contemporary logic of science differentiates in every field of science two main abstraction levels: (1) the level of observation and (2) the level of constructs. Constructs are concepts which deal with unobservable entities that are postulated for the explanation of facts given through direct observation. Constructs relate to the level of observation through the so called rules of correspondence.

[4] A. Einstein and L. Infeld, *Evolution of Physics* (Cambridge, 1947), p. 25.

The theory of constructs corresponds to the "black box" theory in cybernetics. The term "black box" describes a system inaccessible to direct observation which has to be discerned through an analysis of directly observed data.

When we say that the two-level theory of phonology is in full accord with the conception of the structure of science as formulated by the logic of science and by cybernetics, we do not intend to profess that we have arrived at the two-level theory of phonology so to say "from above", i.e. through an a priori subjection of phonology to the logical scheme of the structure of science. It is necessary to stress most emphatically that the demarcation of the two abstraction levels in phonology can, and should, be clarified from the standpoint of the contemporary logic of science, but that its existence is contingent not on logic but rather on linguistic data. The demarcation is not dictated by general logical considerations but by the necessity to overcome fundamental linguistic antinomies, fundamental linguistic difficulties which arise during the analysis of linguistic data.

Our investigation attempts to disclose the basic methodological consequences that arise from a consistent demarcation of the two abstraction levels in phonology. This consistent demarcation has inevitably resulted in a clash with the entire system of accepted views in the domain of crucial problems which are encountered in theoretical phonology. Criticism of these views should not be taken in any way as an attempt to minimize the historical merits of the prominent linguists who have erected the edifice of contemporary theoretical phonology. On the contrary, we want to stress the great debt we owe to a number of authors whose views we have not wholly been able to share.

Adhering strictly to the proposed program of investigation we have considered it expedient to present what is customarily called the history of the problem, only as far as it was necessary for to a complete explanation of the basic principles of the two level theory of phonology. A systematic critical review of the work done by our predecessors lies beyond the limits of this program of investigation and could constitute a separate publication.

It is selfevident that we do not profess to present a conclusive solution to the investigated problems. We will be satisfied if our work will focus attention on the essential ideas which have been bypassed by theoretical phonology until the present time and which might evoke discussion that will further the progress of this science.

Since theoretical phonology constitutes a part of theoretical structural linguistics we hope that this work will make clear the need to extend the demarcation of the two abstraction levels to the entire field of structural linguistics. The demarcation of the two levels of abstraction extended to other spheres of theoretical structural linguistics should yield results which will parallel in their essence those attained in theoretical phonology.

Presenting his book to the judgment of his readers the author would like to express his gratitude to all who have aided him in his work.

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I

THE TWO-LEVEL THEORY OF PHONOLOGY

1. THE PROBLEM

"Often it is only after immense intellectual effort, which may have continued over centuries, that humanity at last succeeds in achieving knowledge of a concept in its pure form, in stripping off the irrelevant accretions which veil it from the eyes of the mind."[1] These words of the great German logician apply to phonology no less than to any other branch of knowledge. More than a half century has passed since the concept of phoneme has been introduced into the science of language, but even at the present time the problem of the definition of the phoneme cannot be considered to have been fully resolved.

Wherein lies the essence of the problem which concerns the definition of the phoneme?

Every definition of a concept is arbitrary, since every scholar can define any concept in a way which is to his advantage. From this point of view the definitions of concepts are not concerned with the essence of the matter, and arguments concerning such definitions can hold only terminological interest. Although the definitions of concepts are in themselves arbitrary, we can regard any definition of a concept as a statement which possesses an explanatory function. In this case the definition of the concept answers the question: "What is the nature of x?": for example, "what is the nature of light?", "what is the nature of meaning?", "what is the nature of truth?", etc. Since the definitions of concepts which are based

[1] G. Frege, *Die Grundlagen der Arithmetik* (Breslau, 1884), p. vii.

on the formula "what is the nature of x?" require on the part of the scholar a deep penetration into some sphere of reality, and are at the same time formulated not in the form of single, isolated statements but in the form of an entire system of statements, such definitions can be called theories as well; for example, the "definition of light" can be called the "theory of light", the "definition of meaning", the "theory of meaning", the "definition of truth", the "theory of truth". The aforementioned words of G. Frege do not apply to all definitions of concepts, but only to definitions of concepts based on the formula "what is the nature of x?" because this type of concept definition in particular presents fundamental problems which are rooted in the process of human knowledge. The history of science shows that the strife for progress in any field of knowledge often takes on the form of a conflict of pro and con definitions of concepts based on the formula "what is the nature of x?"[2] Conflicts of this type have existed in connection with the concept of the phoneme over the past fifty years. The question is, then, which definition of the phoneme based on the formula "what is the nature of x?", i.e. which phoneme theory, reflects most closely the linguistic reality.

If we disregard the psychological theory of the phoneme (J. Baudouin de Courtenay, E. Sapir) and the physical theory of the phoneme (L. V. Ščerba, D. Jones), which are now only of a historical significance then at the present developmental stage of phonology there exist in principle the following three theories: (1) the relational-physical theory of the phoneme, (2) the theory of micro- and macrophonemes, and (3) the glossematic theory of the phoneme.

As will be pointed out, every one of these theories harbors some fundamental difficulty which can be overcome only through the formulation of a new theory that distinguishes two levels of abstraction: the level of observation and the level of constructs. It

[2] Cf. I. M. Copi, *Introduction to Logic* (New York, 1954), pp. 99-100; C. G. Hempel, "Fundamentals of Concept Formation in Empirical Sciences", *International Encyclopedia of Unified Science*, II, 7 (Chicago, 1952), pp. 6-14.

is precisely this kind of theory of the phoneme that we will attempt to formulate in the following chapter.

Since the concept of phoneme relates closely to the concept of distinctive feature and cannot be conceived apart from the latter, we will undertake alongside the analysis of the concept of phoneme also the analysis of the concept of distinctive feature. Thus, our task will be the formulation of a two-level theory of phonology.

Since the formulation of the two-level theory of phonology stemmed from the need to overcome the fundamental difficulties inherent in the relational-physical theory of the phoneme, we consider it expedient to adopt the following procedure: first of all we will sum up the relational-physical theory of the phoneme and point out the occurrence of the inherent fundamental difficulties; subsequently, we will single out the analogical difficulties related to the concept of distinctive feature: furthermore, we will show the direct link between the necessity to surmount these difficulties and the formulation of the two-level theory of phonology; finally, we will compare the two-level theory of phonology with the theory of micro- and macrophonemes and the glossematic theory of the phoneme, and show why these theories are not satisfactory.

2. RELATIONAL-PHYSICAL THEORY OF THE PHONEME

The relational-physical theory of the phoneme occupies a dominant position in contemporary phonology. This theory was set forth by various authors, but it was most fully and clearly presented by N. S. Trubeckoj.[3] Since we are interested only in the basic essentials of the relational-physical theory of the phoneme, it is not necessary to digress into the individual phrasing of this theory by various authors and to delve into the enumeration of the merits and demerits of these phrasings. It is sufficient to concentrate on the relational-physical theory as it has been presented by N. S. Trubec-

[3] N. S. Troubetzkoy [N. S. Trubeckoj], *Principes de phonologie* (Paris, 1949), pp. 33-46.

koj, since references to other authors cannot make any significant contributions to the criticism of the basic essence of this theory.

N. S. Trubeckoj derives the concept of phoneme from an analysis of the concept of sound opposition and of the concept of phonological unit.

Sound oppositions are either phonological or non-phonological; phonological oppositions are, moreover, subdivided into direct and indirect oppositions.

N. S. Trubeckoj defines the distinction between phonological and non-phonological oppositions as follows: "Sound oppositions which have the ability to differentiate between the meanings of two words of a given language are called *phonological* (or *phonologically distinctive*, or also *distinctive*) oppositions. On the other hand, such sound oppositions which lack this characteristic, can be termed *phonologically irrelevant* or *non-distinctive*."[4] For instance, in German the vowel opposition *o/i* constitutes a distinctive opposition, while the opposition of the labial *r* and the uvular *r* should be regarded as a non-distinctive opposition since in German there exist no two words which differ mutually only in regard to this sound opposition.

The difference between the direct distinctive opposition and the indirect distinctive opposition becomes clear in connection with the subdivision of sounds into mutually interchangeable and mutually exclusive. The former are those sounds which are encountered in a given language in identical sound environment; the latter are sounds whose presence in identical sound environment is precluded. Mutually interchangeable sounds can form both distinctive and non-distinctive oppositions. For instance, the sounds *r* and *l* in German are mutually interchangeable and constitute a distinctive opposition (e.g. *Rand* 'edge' — *Land* 'country'). By the same token, while in Japanese the sounds *r* and *l* are likewise mutually interchangeable, they do not constitute a distinctive opposition. On the other hand the mutually exclusive sounds do not, as a rule, form distinctive oppositions; however, in the case when such

[4] N. S. Trubeckoj, *op. cit.*, p. 33.

mutually exclusive sounds lack even a single common characteristic which would distinguish them from all other sounds within the same system, they do constitute distinctive oppositions. For instance, in German the so called *ich*-Laut and *ach*-Laut do not form a distinctive opposition because they are mutually exclusive sounds whose common features (voicelessness, dorsality, fricativeness) are not repeated in any other sound of the German sound system.

The mutually exclusive sounds *h* and *ŋ* (*h* is encountered only preceding vowels with the exception of the unstressed *e* and *i*; *ŋ*, on the other hand, only preceding the unstressed vowels *e* and *i*, preceding consonants and in terminal position) form a distinctive opposition, since their sole common characteristic — consonancy — is not limited to them and, consequently, does not warrant their isolation from the remaining consonants of the German language. Specifically those distinctive oppositions which comprise mutually exclusive sounds are called by N. S. Trubeckoj indirect distinctive oppositions as opposed to those distinctive oppositions which comprise mutually interchangeable sounds and which he calls direct distinctive oppositions.

Hence, sound oppositions are subdivided into distinctive (direct and indirect) and non-distinctive. From the concept of distinctive opposition N. S. Trubeckoj turns to the concept of phonological unit.

Every member of a distinctive opposition is a phonological unit.

From this definition it follows that phonological units can vary in size; they can be larger and smaller. For example, in the case of the word pairs *stol* 'table' and *krug* 'circle' in Russian, *Mann* 'man' and *Weib* 'woman' in German, the counterposed words differ in their entirety; in the case of word pairs *ručka* 'pen' and *ranec* 'satched' in Russian or *tausend* 'thousand' and *Tischler* 'carpenter' in German, the difference is limited to the sound segments, which follow the (identical) initial consonants.

The method of the subdivision of the large phonological units into smaller ones is examined by N. S. Trubeckoj on the example of the phonological units [mɛ:] and [by:] in the German words *Mähne* 'mane' and *Bühne* 'stage'. From the oppositions of *Mähne*

'mane' — *gähne* 'I yawn' and *Mähne* 'mane' — *mahne* 'I admonish' it follows that the phonological unit [mɛ:] splits into smaller phonological units [m] and [ɛ:], and from the oppositions *Bühne* 'stage' — *Sühne* 'confession' and *Bühne* 'stage' — *Bohne* 'bean' it follows that the phonological unit [by:] splits into [b] and [y:]. The resulting phonological units [m], [b], [ɛ:], [y:] cannot be further subdivided into smaller consecutive phonological units.

From the concept of phonological unit N. S. Trubeckoj turns to the concept of phoneme: "Phonological units which from the standpoint of the given language cannot be subdivided into smaller consecutive phonological units are called *phonemes*".[5]

Having defined the concept of phoneme, N. S. Trubeckoj focuses his attention on the analysis of the relationship between phoneme and sound event.

One and the same sound can be simultaneously a member of a distinctive and a non-distinctive opposition. For instance, in German the opposition of *ach*-Laut — *ich*-Laut is a non-distinctive opposition, while the opposition of each of these sounds to the sound *k* constitutes distinctive opposition (e.g. *stechen* 'to stab' — *stecken* 'to push in'; *roch* 'smelled' — *Rock* 'coat'). In accordance with the simultaneous presence of one and the same sound in both distinctive and non-distinctive oppositions, its acoustic-articulatory features split up into phonologically relevant and irrelevant. Thus, in the above example in German the aperture between the blade of the tongue and the palate is phonologically relevant while the localization of this aperture in regard to the area of the palate is phonologically irrelevant. Phonological oppositions between sounds are contingent only on the phonologically relevant features of the sounds. Since every phoneme must constitute, without fail, a member of a distinctive opposition, the phoneme cannot be identified with a concrete sound, but only with a bundle of phonologically relevant features of such a sound. In this connection N. S. Trubeckoj supplements the aforementioned definition of the phoneme with the following definition: "*Phoneme — is the sum*

[5] N. S. Trubeckoj, *op. cit.*, p. 37.

total of the phonologically relevant features of a given sound formation".[6]

Every phoneme is realized through various sounds. For instance, in German the phoneme *g* is realized through a number of concrete sounds which include: (1) labial velar *g* (e.g. *gut* 'good', *Glut* 'glow'), (2) narrow-labial palatal *g* (e.g. *Güte* 'quality', *Glück* 'luck'), (3) non-labial velar *g* (e.g. *ganz* 'whole', *Wage* 'scales', *tragen* 'carry'), (4) non-labial strongly palatal *g* (e.g. *Gift* 'poison', *Gier* 'greed'), (5) moderately palatal *g* (e.g. *gelb* 'yellow', *liege* 'I lie') etc. Referring to this type of phenomenon N. S. Trubeckoj introduces the term "phonetic variant". "All these different sounds," he writes, "which realize one and the same phoneme, are designated as *variants* (or phonetic variants) of the corresponding phoneme".[7]

Such is the system of definitions which form the basis of N. S. Trubeckoj's theory of the phoneme. We call this theory relational-physical, since the concept of distinctive opposition on which N. S. Trubeckoj bases his definitions of the concepts of phonological unit and phoneme expresses also a variation of sound opposition, i.e. in other words, a definite relationship between sounds and hence the phoneme, being a member of a phonological opposition, possesses simultaneously both a relational and physical nature.

As has been previously mentioned, various authors present the relational-physical theory of the phoneme in different ways, but the essence of the theory remains unchanged. The likelihood of various phrasings of the relational-physical theory of the phoneme was pointed out already by Trubeckoj who stressed, however, that all such phrasings would lead to one and the same end. In this context he wrote: "The phoneme can only ... be defined on the basis of its function in the language. Whether we define it as the minimal distinctive unit (L. Bloomfield) or as the sound sign of the word envelope (K. Bühler), the outcome is the same: namely, that any

[6] N. S. Trubeckoj, *op. cit.*, p. 40. N. S. Trubeckoj refers here to the analogous definition of the phoneme which was given earlier by R. Jakobson in the Czech encyclopedia *Ottův slovník naučný*, Dodatky, II, 1, p. 608, under the heading "fonéma".

[7] N. S. Trubeckoj, *op. cit.*, p. 41.

language assumes the presence of "phonologically" distinctive oppositions and that the phoneme is considered to be member of such an opposition which cannot be further subdivided into smaller distinctive "phonological" units. This clear and unequivocal definition cannot be altered in any way. Any modification of this definition would only lead to a complication which can be avoided."[8]

The relational-physical theory is so clear and unequivocal that it seems unshakable; it firmly dominates modern phonology. However, as we propose to show in the following sections of this chapter, one encounters in it certain basic difficulties whose surmounting requires the formulation of a basically new theory of the phoneme.

3. PHONEME AND THE PROBLEM OF MEANING IN PHONOLOGY

First of all it is necessary to point out the fundamental difficulties inherent in the relational-physical theory of the phoneme which relate to the question: should one introduce semantic criteria into the definition of the phoneme?

This question has to be brought up at the very beginning since it concerns every theory of the phoneme. Having clarified this question we will be able to introduce into the aforementioned definition of phoneme of N. S. Trubeckoj the necessary clarity which will enable us to concentrate in subsequent discussion fully on the essence of the relational-physical theory of the phoneme and on our two-level theory of the phoneme, as contrasted with the former, without being distracted in consideration of the essentials.

We will commence with the term "distinctive". In the aforementioned definition of phonological opposition N. S. Trubeckoj uses the expression "distinctive opposition" synonymously with the expression "phonological opposition". The equalization of the terms "distinctive" and "phonological" can lead to the erroneous idea of a direct connection between the sounds of a language and the meaning of words. In reality we speak, however, not about a

[8] N. S. Trubeckoj, *op. cit.*, p. 44.

distinctive, but only about a differential function of the sounds of a language, referring to the function of differentiation of the signifiants (i.e. the sound envelopes) of the words. In so far as the signifiés of the words, i.e. the meaning of words, is concerned, the sounds of a language possess no direct connection with the signifiants. Thus, in the words *lom* 'crow' — *tom* 'tome' the sounds /l/ and /t/ in themselves have no meaning and are not directly connected with the meanings of the given words, but merely signalize differentiation of the signifiants /lom/ — /tom/. In any linguistic unit the meaning is contained not in the separate speech sounds but rather in the entire sound complex which contains the signifiant of the given linguistic unit. For instance, in the word *lom* the meaning is not inherent in the separate speech sounds /l/, /o/, /m/, but in the entire sound complex /lom/, i.e. in the signifiant of that word. The signifiant /lom/, being the carrier of a definite meaning (or, in accord with the terminology adopted by us, signifié) represents in itself qualitatively another level in contrast to the sounds /l/, /o/, /m/, into which it can be separated. Although it is true that in the case of some linguistic units is the separate sounds and not the sound complexes that act as signifiants it does not necessarily follow that separate speech sounds in themselves can possess meaning. For example, the speech sound /i/ acts as the signifiant of the Russian word *i*. However, it would be erroneous to think on the basis of this case, that the speech sound /i/ in the Russian word *i* is in itself a carrier of meaning. The speech sound /i/ in the Russian word *i* does not possess any meaning in itself. The meaning is inherent in the signifiant /i/ which, although it coincides with the sound /i/, represents at the same time a qualitative phenomenon of another order than does the speech sound /i/ taken by itself.[9]

In respect to the above exposition it becomes necessary to define more precisely the aforementioned definition of phonological and non-phonological oppositions, as stated by N. S. Trubeckoj. This definition can be reformulated as follows: *phonological oppositions*

[9] Cf. S. K. Šaumjan, "Sistema glasnyx fonem sovremennogo pol'skogo literaturnogo jazyka", *Učenye zapiski Instituta slavjanovedenija*, III, 1951, p. 394.; O. S. Akhmanova, *Fonologija* (Moscow, 1954), p. 12.