Helsinki 1932), oder im Osttscheremissischen die Verbindungen **mb, nd, ŋg, nd, ndz, ńdź**, die nur im Inlaut vorkommen.

Endlich müssen *wortabgrenzende* und *morphemabgrenzende* Signale unterschieden werden. Das Deutsche besitzt hauptsächlich morphemabgrenzende Signale, d. i. solche, die nicht die Grenze des Wortes, sondern die Grenze des Präfixes, der Wurzel, bzw. des Suffixes anzeigen. Dagegen spielt der expiratorische Akzent im Finnischen, Ungarischen, Tschechischen, Armenischen, Polnischen usw. die Rolle eines wortabgrenzenden Signals, der in gar keiner Beziehung zur morphologischen Struktur des Wortes steht.

Nicht alle Sprachen nützen die Grenzsignale gleich stark aus. Es gibt Sprachen, wie das Französische, die sich nur mit einer kleinen Anzahl von Gruppensignalen begnügen, und andere, wie das Deutsche oder das Tamil, die einen grossen Reichtum an verschiedenen Grenzsignalen aufweisen. Dabei ist zu bemerken, dass in jenen Sprachen, welche auf Grenzsignale überhaupt Wert legen, diese meistens recht ungleichmässig verteilt sind. Es kommt vor, dass in einem Satze gewisse Wortgrenzen gleichzeitig durch mehrere Grenzsignale gekennzeichnet sind, während andere Grenzen nur ganz schwach oder gar nicht angedeutet werden. Im Deutschen kann man ziemlich lange Sätze ohne positive Grenzsignale bilden (z. B. *Am Boden sassen drei Kinder*) und daneben solche, wo jedes morphologische Element deutlich abgegrenzt ist (z. B. *die Hausfrau wäscht mein Hemd*).[1] Die äusserliche Signalisierung der Grenzen bedeutungstragender Lautkomplexe (seien es Worte oder Wortteile) ist nämlich keine unumgänglich notwendige Erscheinung der menschlichen Rede, sondern nur ein willkommener Behelf, der die syntaktische, bzw. morphologische Zerlegung erleichtert und die Aufmerksamkeit des Hörenden von Zeit zu Zeit entspannt. Der Vergleich mit den Verkehrssignalen darf hier wieder herangezogen werden: man kann ja sehr gut auch ganz ohne Verkehrssignale auskommen (und ist tatsächlich auch noch vor etwa 100 Jahren ganz ohne sie ausgekommen), dann muss man aber, erstens, sehr langsam fahren und, zweitens, fortwährend aufpassen. Die Signalisierung automatisiert das Fahren und macht eine grössere Geschwindigkeit möglich. Beim Sprechen ist es genau so....

Trotzdem die abgrenzende Funktion der Laute viel weniger wichtig ist als die bedeutungsdifferenzierende, muss sie dennoch immer berücksichtigt werden. Und zwar, nicht nur bei einer rein deskriptiven, sondern auch bei einer historischen Sprachbetrachtung. Viele Lautveränderungen haben den Zweck, neue Grenzsignale zu schaffen. Als im Urgermanischen die stimmlosen Spiranten nach unbetonten

[1] Um dieses Beispiel richtig analysieren zu können, sind folgende Tatsachen der deutschen (schriftdeutschen!) Lautlehre zu beachten: innerhalb eines unzerlegbaren Wortes ist *h* zwischen Vokalen stimmhaft (*Uhu, Oho*): spricht man in "*die Hausfrau*" ein stimmloses *h*, so genügt dies, um das *h* als Anlaut einer Wurzel zu kennzeichnen (aphonemat. Einzelsignal). Die Verbindungen *sfr, auw, schtm, nh* sind phonematische Gruppensignale. Da *sf* im Auslaut einer Wurzel nicht stehen darf, muss *sfr* in *s+fr* getrennt werden. Die Verbindung *scht* (ʃt) kommt im Schriftdeutschen im Wurzelauslaut nicht vor, ebensowenig *tm* im Wurzelanlaut; daher kann *schtm* (ʃtm) nur in ʃ+t+m zerlegt werden.

Vokalen stimmhaft geworden waren, wurde die Lautfolge "unbetonter Vokal+stimmlose Spirans" zu einem positiven phonematischen Gruppensignal: zwischen dem unbetonten Vokal und einer stimmlosen Spirans musste nunmehr immer eine Wortgrenze liegen. Dieses Grenzsignal bestand aber nur solange, als der Akzent im Urgermanischen seine indogermanische Stelle beibehielt und wurde mit der Entstehung der germanischen Wurzelbetonung zerstört. Diese Wurzelbetonung war aber selbst wieder ein neues Grenzsignal. Ein anderes Beispiel: der altlateinische Wandel der kurzen **a, o** zu **e** (> **i**) in nichterster Silbe musste zur Folge haben, dass **a, o** nunmehr auf die erste Wortsilbe beschränkt waren und somit als positive phonematische Einzelsignale fungierten. Betrachtet man die Lautgeschichte verschiedener Sprachen von diesem Gesichtspunkte, so bekommt manche, auf den ersten Blick sinnlose Erscheinung einen Sinn. Das Bedürfnis nach äusserer Signalisierung der Wort- bzw. Morphemgrenze ist somit eine nicht unwesentliche Triebkraft der Lautentwicklung.

10. Dr LOUIS HJELMSLEV (Aarhus): *On the principles of phonematics.*[1]

By *phonematics* I understand a science which treats phonemes exclusively as elements of language.

I want to examine in this paper the methods by which phonemes can be defined and described according to their linguistic nature.

I reserve the name of *phonematics* to the science proceeding by these methods, and I want to examine whether the different phonetic sciences up to now are to be considered as identical with phonematics or not.

As phonemes are linguistic elements, it follows that no phoneme can be correctly defined except by linguistic criteria, i.e. by means of its function in the language. No extra-lingual criteria can be relevant, i.e. neither physical nor physiological nor psychological criteria.

If it is true that language is a social institution, existing outside of and independently of the individuals, it must follow that language cannot be defined as a psychological phenomenon. Consequently the language feeling of the individuals must not be taken into account in the definition of phonemes. The psychological method and the subjective analysis must be replaced by a purely systematological method and by an objective analysis.

It follows from this that both phonetics and phonology are different from phonematics. The phonological phoneme is defined as a *sound-idea* or a *phonetic intention*, and phonology establishes the systems of phonemes exclusively on sound-ideas and language feeling.

[1] In future publications we propose to use the terms *cenematics* and *ceneme* for what are here called *phonematics* and *phoneme* respectively. These terminological changes were made—after the Congress—because *phoneme* does not adequately cover the concept defined in this paper, and also because it does not seem expedient to add to the denotations of this already much overworked term.

It has often been maintained that phonemes constitute the *outer* side of language, whereas grammatical and lexical units should constitute its *inner* side. This is not so. Both phonematic, grammatical and lexical elements are at the same time inner and outer phenomena.

The ending -z in dɔg-z is an entity consisting of three parts: *content, form,* and *expression.* The *content* is defined as the functional rôle played by this unit in the language, its purpose or destination in the grammatical economy of the language; in this example, the content is the same as the *meaning.* The *form* is the place occupied by this unit in the language *system.* The form is defined by the *value,* that is, by the differential minimum of content necessary to keep this unit apart from other units of the same sort. The value depends on the oppositions; in English the plural is opposed to the singular, in Lithuanian to the singular and to the dual. In the two languages the meaning of the plural is the same, but the value is different. The *expression* is the way in which this unit is symbolized or materialized.

Thus the ending -z is in English *a grammatical element of expression.* But the ending -z is not a phoneme. The grammarian would identify the ending -z with the -n of ɔks-n, an identification which would never occur to the phonematician. The phonematician would identify the -z of dɔg-z with the -z of hæz, which from the grammatical point of view is entirely different. z, considered as a phonematic unit, has a value very different from the value it has when considered as a grammatical unit.

This shows that a phoneme has a value, that it is an entity: a phoneme has a *content,* a functional destination in the phonematic economy of the language; a phoneme has a *form,* i.e. it occupies a place in a phonematic *system,* this again depending on its phonematic *value*; and a phoneme has an *expression,* a certain symbolization or materialization.

The expression of a phoneme is independent of its form and content.

I will show this in the following way:

In any language you may distinguish three different parts: (1) a central part, which is the *system*; (2) the *norm,* i.e. a set of rules, depending on the system, and fixing the necessary limit of variability of each element; (3) the *usage* adopted by a given language community. These three domains are different from *la parole,* which is the use of language by a single individual.

The usage generally fixes much narrower limits of variability than those of the norm.

There is in English a phoneme which I may symbolize by the letter r or by the name aːə. In Standard English *usage,* this phoneme is mostly symbolized in pronunciation by one single roll or by a fricative sound produced by the tip of the tongue, and accompanied by voice. In other English usages it is symbolized otherwise, e.g. by several rolls of the tongue, in Northumberland by a uvular fricative. These differences in usage are allowed by the English *norm,* because the norm allows any symbolization which does not entail confusion with other phonemes which by the English

system are required to be kept apart from r. If you pronounced the English r unvoiced, saying ‌r̥ait, or if you pronounced it as x, saying xait, you would be able to do this without confusing it with any other phoneme, and consequently you would for that reason not be in contradiction to the English norm, but only to the English usage. On the other hand, if you pronounced r in the same way as you pronounce the English phoneme l, there would be confusion, and you would be in contradiction to the norm.

One and the same *phonematic* system may be pronounced by means of very different *phonological* systems.

It is without the slightest importance to the norm, which symbols are adopted by the usage. For the recognition of the norm and of the system, usage phenomena are irrelevant.

Phonematics must consider the phonemes as elements of the language system, without regard to the particular way in which they are symbolized. They may be symbolized by means of sounds, but they may be symbolized quite as well by several other means, e.g. by means of letters, or any other signals adopted by two or more individuals.

There is no necessary connexion between sounds and language. The decisive fact is that other symbols than sounds *can* be used to express phonemes.

Neither phonetics nor phonology study phonemes. Phonetics and phonology must be defined as theories of phonematic usage, whereas phonematics are meant to be the theory of phonematic norms and systems.

The phonematic *inventory* of a language must be found by studying the possible *commutations,* i.e. replacings of one value by another, as in bæth, fæth, hæth, ræth, etc. But the units we obtain by this method of commutation are not yet phonemes. I shall call them *prephonemes.* They may by further operations be reduced to phonemes.

The English word "kick" can be decomposed into five commutable elements: khɪkh. In commuting the first element, we obtain e.g. "tick" thɪkh, "pick" phɪkh. The second element is obviously identical with the fifth. This element may be replaced by commutation with another element, e.g. s: khɪks, thɪks, phɪks.

In two minutes I shall show you that the sound-combinations ph, th, and kh symbolize simple phonemes of English. But the method of commutation only makes us recognize the prephonemes p, t, k, and h.

Moreover, the method of commutation sometimes leads us to recognize prephonemes which by a further phonematic analysis turn out to be not phonemes, but *prosodies.* I understand by a prosody an element not constituting the series, but consolidating the series. In Danish the glottal stop is the phonetic symbol of a prosody. But by the method of commutation we recognize it simply as a prephoneme; thus in ɔʔ "a river" the last element can be commuted with s in ɔs "us".

The function of the prephonemes is studied by establishing a list

of all prephoneme combinations occurring in the language. We find e.g. in English

bə	ən
bɑ	əs
bī	əz
	əθ
	əl, and so on.

This done, we find that these series are composed of two different types of prephonemes, in such a way that a prephoneme of one type may be combined with a prephoneme of the other type, whereas two prephonemes belonging to the same type can never be combined.

The prephonemes belonging to one of these types are those which have the faculty of forming a notional unit, or a word, by themselves, as in English ə, ɑ, ı. I call this type *central prephonemes*. The prephonemes belonging to the other type can never make up a word by themselves without any additional prephonemes; so e.g. English b, n, s, etc. I call this type *marginal prephonemes*.

Now a central prephoneme can only be recognized as a phonematic unit if it occurs in the language without entering into central groups, and a marginal prephoneme can only be recognized as a phonematic unit if it occurs in the language without entering into marginal groups.

This condition is necessary because otherwise it would be impossible to distinguish between single phonemes and groups of phonemes. The condition is fulfilled for the English h, which is a marginal prephoneme occurring outside of marginal groups, e.g. in hɔp, but not for the prephonemes p, t, and k, which never occur outside of marginal groups such as ph, th, kh. Consequently h is in English a phonematic unit, but p, t, and k are not; the prephoneme groups ph, th, kh consequently are to be considered simple phonemes in English.

The central prephonemes which by this test are found to be phonemes can be called *vowels*. A vowel is an independent or combined phoneme. The marginal prephonemes which by our test turn out to be phonematic units may be either *prosodies*, as the Danish glottal stop, or *consonants*, i.e. dependent or combining phonemes. But beside vowels and consonants there are phonemes which are both combined and combining. E.g. English i, u, l are both combined and combining. A phoneme of this sort can be called a *semi-vowel*.

The syllable can be defined as a series containing one and only one combined element, i.e. one and only one vowel, or semi-vowel in vocalic function. As to the limit of the syllable, it is a law that in any language the initial and final clusters surrounding the combined phoneme and belonging to the same syllable may be composed in any way in which an initial and a final cluster can be composed in a notional unit consisting of one syllable, but not in any other way. Thus the limits of a phonematic syllable are submitted to rules, but these rules, given by the norm, leave a certain latitude of variability.

When the syllable is established, we are able to distinguish marginal prosodies from consonants. In all cases where the prosodic nature of an element is evident, this element is either only final or only initial, and never capable of being both final and initial. Generalizing from this experience, a *marginal prosody* must be defined as *a marginal phonematic unit not capable of being both final and initial*, and a consonant as a marginal phonematic unit capable of being both final and initial.

The ancient Greeks must have had the idea that h was in their language a prosody, because they wrote it by means of a diacritical sign, and so it is in fact, the phonematic unit h only being capable of initial position. This consequence has to be accepted, because this is the only way in which consonants and prosodies can be kept apart by a consistent definition.

The *phoneme system* is built up by three sorts of *phoneme relations*: *grouping relations*, *implications*, and *alternations*.

The *grouping relations* allow us to define each phoneme according to its combining power. In examining this sort of relation it is sufficient to examine clusters consisting of *two* consonants. It can be stated as a general phonematic law, that if a language admits more complicated consonant clusters, consisting of more than two consonants, these complicated consonant clusters never admit combinations which are not admitted in simple clusters of the same language. In English you can have the initial cluster spl, as in split, only because you can have the initial cluster sp, as in spūn, and the initial cluster pl, as in plīz.

An *alternation* (as for instance ablaut and umlaut) is defined as the replacing of one phoneme by another under definite *grammatical* conditions.

An *implication* means the replacing of one phoneme by another under definite *phonematic* conditions. Thus there is an implication d in t in German "Hunde, Hund" = hunde, hunt, and in English there is an implication z in s: "fields, ships" = fildz, ʃips.

By an examination of grouping relations, of implications and of alternations, every phoneme in every language can be unambiguously defined. But all phonemes are not defined by all these criteria, because there are general laws of compensation between the three sorts of phoneme relations, which make them mutually exclusive.

Thus implications can only take place between phonemes which have no mutual grouping relations, and vice versa. So German t and d can never be grouped together in a consonant cluster belonging to the same grammatical unit of expression, and the same is true of English z and s.

Grouping relations and implications on one side, and alternations on the other side are to a large extent mutually exclusive. It is rare that a phoneme enters both into alternations and into grouping relations or implications. Some phonemes are defined as *alternative* phonemes, others as *constellative* phonemes. In Indo-European, vowels are generally alternative, consonants constellative; but this distribution is not universal.

The study of phonematic systems and of their development is an urgent task of linguistics which is earnestly recommended to the Second International Congress of Phonetic Sciences.

11. Mr H. J. ULDALL (Copenhagen): *The phonematics of Danish.*[1]

§ 1. This paper must be regarded as a preliminary report on the work of the Phonematic Committee of the Copenhagen Linguistic Circle. The work has not been completed, but we should like nevertheless to put a few of our results before the Congress as an illustration of phonematic method.

§ 2. Danish contains the following phonematic units:

central . . . . . . $\Big\{$ a ā ɛ ɛ̄ e ē i ī ɔ ɔ̄ o ō u ū œ œ̄ ø ø̄ y ȳ

        phonemes $\Big\{$ b d f g j k l m n p r s t v

marginal $\Big\{$

        . . . . $\equiv$ T$_1$ T$_2$ T$_3$ T$_4$

        prosodies $\Big\{$

superimposed . . . . A$_1$ A$_2$ A$_3$

In this list those who know Danish phonetics will miss ð, ɣ, ə, ŋ. ð is found to be a realization of d, which is used in final position in the syllable after a vowel (e.g. *gud* guð "god") and optionally after the consonant r (e.g. *byrd'* byr'd or byr'ð "descent"); g is realized as ɣ under the same conditions and after the consonants l and r (e.g. *vāg'* va'ɣ "vague", *valg'* val'ɣ "choice"); ə is a realization of ɛ in unaccented syllables after the accent (e.g. *glīdɛ* gliːðə "glide"), and of e in unaccented syllables before the accent (e.g. *be* ˈtAl'ɛ bə ˈta'lə "pay"). Here, by the way, is an example of overlapping but not of implication: both of the phonemes ɛ and e are realized as ə under certain conditions, but these conditions are mutually exclusive so that, although the two phonemes have a type of realization in common, there is no replacement of one phoneme by the other.

ŋ, which does not occur initially, cannot be a consonant according to the rule that a consonant must occur both as single initial and as single final element in a syllable. ŋ is a realization of the group *ng*, the combination ŋg being a realization of *nk*. According to the same rule h is not a phoneme but a prosody, since it occurs as a significant unit only in initial position in the syllable.

§ 3. Prosodies are defined as consolidating either one syllable, accents, or a string of syllables, intonations. Of the second kind we have four in Danish: glottal stop (T$_1$), not glottal stop (T$_2$), h (T$_3$) and not-h (T$_4$); of the first, three: accents 1, 2, and 3 (A$_1$, A$_2$, A$_3$), realized as strong stress, half-stress, and weak stress.

Prosodies are further divided into grammateme prosodies, i.e. prosodies that consolidate a single grammatical element, e.g. h and not-h in Danish, and syntagm prosodies, such as glottal stop and not glottal stop and the three accents: there are no two single grammatemes in Danish distinguished by accent alone. The accents are

[1] See footnote on p. 49.

superimposed, i.e. they do not interrupt the speech-chain; the four intonations are linear, marginal.

§ 4. The marginal intonations glottal stop and not glottal stop occur only in final position in the syllable. The difference between the presence or the absence of the glottal plosive sound in initial position is phonematically irrelevant.

The place of the glottal stop depends on the structure of the syllable; in syllables containing a long vowel the glottal stop comes immediately after the vowel, in syllables containing a short vowel the glottal stop may fall on the vowel or on a following voiced continuant, including ð and ɣ. The place of the glottal stop is not significant in the norm but is fixed by usage, so that for instance the word *bløð'* "soft" is pronounced in one usage blø'ð, in another bløð'. Even such a word as *sɛl'* "self" may be pronounced sɛ'l in spite of the existence of another word sɛ'l, which means "seal".

When the realization of the glottal stop falls on a vowel, an implication long vowel in short vowel comes into force, i.e. all vowels, whether phonematically long or short, are realized short, so that the phonematic interpretation of the vowel as long or short is only possible if the syllable in question can be brought into a position where the conditions of the implication are not fulfilled. Thus the syllable ɔ' "river" is never used without the glottal stop, so that it is impossible to determine whether the vowel is phonematically ɔ̄ or ɔ. In be'n "bone" the vowel is phonematically ē, as shown by the pronunciation of the syllable in the compound ˈbeːn ˌknap, while bly' "lead" has y as shown by ˈbly ˌknap "lead button".

It follows from this that what is phonetically a difference in the place of the glottal stop is in some cases phonematically irrelevant, while in other cases it must be interpreted as a difference between long vowel and short vowel.

There is a conditional and optional implication of T$_1$ in T$_2$ (glottal stop in not glottal stop), which comes into force concurrently with the alternation A$_1$: A$_3$.

§ 5. The marginal intonations h and not-h occur only initially as has been mentioned. The difference between the presence and the absence of the sound h in final position is phonematically irrelevant: any syllable before a pause may end in aspiration, and the leaving out of this aspiration does not cause any change of meaning.

The intonations h and not-h are further characterized by not entering into any relation, whether implication or alternation, either with each other or with any other phonematic unit in the language.

§ 6. When a speech-chain containing a syllable with A$_1$ (full stress) is the second member of a compound whose first member is also a speech-chain containing a syllable with A$_1$, composition is marked by A$_2$ (half-stress) in the second member of the compound. This accent does not necessarily fall on the syllable that has A$_1$ in the free form: from ˈɛfDɛr "after" and ˈmeda "noon, dinner" is formed a compound meaning "afternoon" which may be pronounced ˈɛfdərˌmeda or ˈɛfdərmeˌda.

There is thus an alternation A$_1$: A$_2$ corresponding to the gram-