

THE INTERRELATIONS OF PHONOLOGY AND PHONETICS:  
A HISTORICAL PERSPECTIVE

by

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A THESIS SUBMITTED IN PARTIAL FULFILLMENT OF THE  
REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS  
in the Department of Modern Languages

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SIMON FRASER UNIVERSITY

February 1978

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ii  
A P P R O V A L

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DEGREE: Master of Arts (Languages, Literatures  
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TITLE OF THESIS: The Interrelations of Phonology and  
Phonetics: A Historical Perspective.

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Title of Thesis/Dissertation:

The Interrelations of Phonology - a Historical Perspective.

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February 10, 1978

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This thesis is a historical and critical study of the manner in which the phonetics-phonology relation has been perceived at different stages in the historical development of modern linguistic theory. The time-span of the study extends from the appearance of historical-comparative linguistics at the beginning of the 19th century to pre-war Prague phonology. Each of these stages of linguistic theory is compared with the current position in Generative Phonology. It is only since the 19th century, as Foucault has pointed out, that there has been an overt phonetics-phonology relation, because modern linguistics has been an empirical study of human behavior concerned with accounting for the speech signal.

The epistemological background of 19th- and 20th- century linguistics is examined, and a succession of scientific disciplines which were adopted as models by linguistics are identified and discussed. In particular, the emergence of structural linguistics at the beginning of the 20th century is explained in relation to contemporary developments in logic and philosophy.

The historical phonology of<sup>iv</sup> the early 19th century was a "theory of letters" in the classical tradition, which was a quasi-phonemics based on the alphabet. Later workers came to realise to an increasing extent that sound change has a phonetic basis, since phonological processes operate on natural classes of segments which can be defined in phonetic terms. This trend culminated in the theory of the Junggrammatiker, who held the view that phonetics is the key to sound change. This position is stated in Sievers' Grundzuege der Phonetik (1876). Sievers and his contemporaries had the notion of language-specific sound structure, but in view of their phonetic orientation, they thought of it primarily in terms of Articulatory Setting.

Following on the work of Saussure, the early Prague school set up a level of phonology in linguistic theory that was exclusively Structural and not defined in terms of phonetics. This theoretical approach involving a dichotomy between phonetics and phonology is expressed in Trubetzkoy's Grundzuege der Phonologie (1939). Trubetzkoy, in contrast with the position in later phonological theory, held the view that the two levels of description, though related, are in

principle autonomous. On<sup>v</sup> the other hand, Trubetzkoy had an interesting approach to the question of the hierarchy of features.

In conclusion, it is emphasised that a historical approach to the phonetics-phonology relation such that adopted in this study shows clearly the necessity of renewed interest in the problems of ARTICULATORY SETTING and the HIERARCHY OF FEATURES if some fundamental outstanding problems in phonological and phonetic theory are to be resolved. Some recent work that points in this direction is reviewed, and further lines for future research are suggested.

Abstract

Chapter 1: INTRODUCTION

Chapter 2: THE EPISTEMOLOGICAL BACKGROUND

Chapter 3: PHILOLOGIE

Chapter 4: THE JUNGGRAMMATIKER

Chapter 5: STRUCTURALISM

Chapter 6: CONCLUSION

References

In this thesis, an English translation has been appended to quotations from texts in German. In the German quotations themselves the umlaut is indicated by a following "e", because of computer printing restrictions.



## Chapter I: Introduction

What is the relationship between phonology and phonetics? It is a question which is of interest to everyone doing linguistics, because linguistic theory is supposed to account for speech behavior. It is a problem which has not yet been completely resolved. int.

The approach to the problem to be adopted in this study will be a historical and critical one. That is to say, I will be examining the way in which the phonetics-phonology relation has been perceived in different linguistic theories, and evaluating those perceptions in comparison with each other and with the position in phonology today. Thus by studying what the phonetics-phonology relation has been, we can draw some conclusions suggestive of what the relation should be in the best theory. Kuhn (1970: 9) observes that the history of science is

a source of phenomena to which theories about knowledge may legitimately be asked to apply.

If the history of knowledge has a contributory value for the theory of knowledge, the history of linguistics can, in much the same way, be a source of means to define or expand linguistic theory.

The historical scope of the study will be from the end of the 18th century to the development of Prague phonology: from William Jones to Trubetzkoy. Neither of these points is arbitrarily chosen; each choice was motivated by the logic of the study. The appearance of historical-comparative linguistics at the turn of the 18th and 19th centuries marks a Copernican Revolution in the history of the discipline. This is agreed upon by historians of widely differing views (Arens 1955: 135; Cassirer 1945: 97; Foucault 1966: 293). It is also, of course, a traditional view of the history of the discipline, unfortunately associated with the anti-historical notion that before the appearance of historical-comparative studies there was "no linguistics". Although this is not true, the fact remains that in many ways we feel closer as linguists to the 19th-century philologists than we do to the theoreticians of language of the Enlightenment. And this is not without reason, especially as regards phonology and

phonetics. Malmberg (1968: 10) observes that in the 19th century

phonetics was first developed as an autonomous branch of linguistic research...

And Foucault (1966: 298) says of 19th-century linguistics:

Tout l'être du langage est maintenant sonore.

It is only since the 19th century that linguistic theory is supposed to account for the speech signal, as we shall see. The reason for taking the turn of the 18th and 19th centuries as the point of departure for the present study is therefore clear: before then, there was no phonetics-phonology relation to speak of. Again, the work of the Prague school is generally agreed to mark the introduction of the Structuralist method to phonology, and Trubetzkoy's *Grundzüge* to be its codification (Piaget 1968: 67f; Arens 1955: 487; Bierwisch 1968). (Trubetzkoy had a somewhat different view of the phonetics-phonology relation from the one espoused by Generative Phonology.) This makes for an interesting

discussion. Also, I aim to show that Trubetzkoy's theory of phonology contained some important insights which have since been overlooked on account of changing directions in linguistics.

There is as yet no coherent or generally-accepted theoretical framework in the history of linguistics. Bursill-Hall has developed what amounts to a theory in his publications (Bursill-Hall 1966, 1974, 1975), though it has not been formalised. The following is a sketch of that theory:

1. Linguistics is a metalanguage or second-order language, its object language being language itself (This, of course, follows the characterisation of linguistics in the theory of Firth - cf. Firth 1948).
2. Linguistics, being a language in this sense, is amenable to the same kind of analysis as language itself.
3. Linguistics therefore, like language, has a synchrony and a diachrony.

4. The synchronic aspect of linguistics is an *état de théorie*. The diachronic aspect is the history of linguistics.

5. Just as language is embedded in culture and must therefore be analysed with reference to its context of situation (Firth), so *états de théorie* must be analysed in their contexts of situation. That is to say, the historian of linguistics must take account of external factors affecting linguistic theorising - especially the epistemological background.

6. The exchange between linguistics and its philosophical background is two-way. Because of its close association with the "foundation" disciplines of philosophy and logic, linguistics is the weathervane of intellectual change.

7. The history of linguistics shows a reactive alternation between two tendencies or emphases, theory- versus data-orientation (cf. also Robins 1967).

The object of the present study will be the metalanguages of successive *états de théorie*. In each case there will be two

metalinguistic levels to discuss: phonetics, which idealises speech, and phonology, which generalises phonetic patterns. In evaluating the different theories critically, Generative Phonology will be used as a reference point. It would be anti-historical to confer a privileged status on current theory in this kind of study, but we must have a framework for the discussion, and Generative Phonology is the theoretical framework within which most people are working today. Just as we cannot get outside language no matter how critical we are (Popper 1976), so too we must accept to base ourselves in some metalanguage, if only for purposes of comparison, in a critical discussion of metalanguages. \*

According to Generative Phonology, linguistic theory includes a universal phonetic theory, which is a statement about the articulatory possibilities of man. Thus Chomsky (1964: 67 fn) enunciates a requirement of "phonetic specifiability" which he defines as

the requirement that a general linguistic theory must include a universal phonetic theory, with a fixed alphabet.

There are two levels of abstraction and analysis which have systematic, that is theoretical, status. ① The first is systematic phonetics which is a transcription of the speech signal in a standard alphabet. The letters stand for segments, and the segments are bundles of phonetic features. The ② second level is systematic phonemics. This level abstracts the sound pattern of the language from the phonetic transcription. It is also composed of segments which are bundles of phonetic features.

The linking of the two systematic levels is regulated by the Naturalness Condition (Postal 1968). This states that the phonemic segments must be specified in terms of the same phonetic features as the phonetic segments. The phonemic segments are "abstract" in the sense that they do not necessarily correlate with components of the speech signal, but they are "natural" in that they are bundles of PHONETIC features.

There is no automatic inductive procedure leading from the phonetic to the phonemic level. On the other hand, the phonetic level is highly determined by the phonemic level.

The phonemic level will determine the phonetic level fully, in fact, unless language-specific phonological rules intervene. Thus Postal (1968: 64f):

...Systematic phonemic representation makes a set of indirect phonetic claims, claims that the phonetic form of a particular systematic representation must be such and such unless there are special phonological rules which determine otherwise.

Phonetics is a "mentalistic" phenomenon in the perspective of Generative Phonology. It is not in any sense "data". In the first place, it is an idealisation of vocal tract behavior. This is true of all phonetic transcription systems, such as the IPA - at least implicitly. Secondly, though, phonetics is a reproduction of the speaker-hearer's interpretation of the speech signal. Chomsky & Halle (1968: 294) describe the phonetic transcription as

a representation of what the speaker takes to be the phonetic properties of an utterance, given his hypothesis as to its surface structure and his knowledge of the rules of the phonological component.



And they go on to say:

since in this view phonetics is concerned with grammatically-determined aspects of the speech signal, there can be no question about the relevance of phonetics to the study of language...The phonetic transcription, in this sense, represents the speaker- hearer's interpretation rather than directly observable properties of the signal...

There are two stated arguments for having the Naturalness Condition. ① The first is economy: if the feature composition of segments is already specified at the phonemic level, we do not need to introduce them by rule in order to derive the phonetic representation. Thus Postal (1968: 75f) observes:

It is logically possible to imagine a theory of language which assumes that phonological and phonetic structures are totally distinct, i.e. based on totally distinct sets of elements. Under this assumption it would be necessary to have in every language rules particular to that language only which relate every aspect of phonological structure to its particular

phonetic realisation... In contrast, systematic phonemics including the Naturalness Condition... claims that phonological and phonetic structure are essentially similar and require special language-limited rules to relate them only with respect to a very limited number and kind of properties. Much of the work of generating phonetic representations from input systematic phonemic structures is a function of universal rules and conditions. This is possible just because the vocabularies on which systematic structure is based are in significant part given by the phonetic vocabulary. Hence, except in irreducible cases of completely special language-limited facts, systematic structures automatically pass into phonetic structures without the need of setting up ad hoc rules.

- ② The second argument for the Naturalness Condition is this. The fact that phonological rules operated on NATURAL CLASSES of sounds is evidence that phonemic segments, the input to the rules, are to be specified in terms of phonetic features.

The notion of natural class is important. A natural class of segments is defined as having one or several features in

common. It is defined on the basis of phonetic similarity, in other words. But there is another criterion, a phonological one, apparent from the previous paragraph: a natural class is a group of segments which pattern together in phonological processes.

The above sketches the articulation of the theory by Chomsky & Halle (1968) and Postal (1968). A more extreme emphasis on naturalness appears in the subsequent development of Natural Phonology (see Kiparsky 1968, Hooper 1976). In this articulation of the theory, there is a STRONG NATURALNESS CONDITION which requires that lexical entries be in phonetic representation. This is based on the assumption that phonetic representation, but not "abstract" phonological representation, has psychological reality. Further constraints on the depth of phonological representation are the STRICT ALTERNATION CONDITION, which requires that all the segments of the underlying representation of a morpheme should occur in at least one of its allomorphs, and the rejection of EXTRINSIC RULE-ORDERING, based on the assumption that the application of P-rules is determined completely by universal principles.

The existence of disagreement about the depth of phonology and the nature of the statements linking phonemic to phonetic representation in contemporary phonology shows that the discussion of the phonetics- phonology relation is still very much open. This study in the history and philosophical foundations of linguistics is intended as a contribution to that discussion.

## Chapter 2: THE EPISTEMOLOGICAL BACKGROUND

In this chapter I propose to expand on my view of the historical scope of the study as I formulated it in the Introduction. In Bursill-Hall's approach to the history of linguistics, *états de théorie* must be analysed in their contexts of situation; that is to say, it is important to know what was happening in philosophy and in other scientific disciplines if we are to understand the development of linguistics. And since linguistics is the weather-vane of intellectual change, the history of linguistics should contribute to our understanding of the growth of knowledge in general. Accordingly, I will try to give an account of the epistemological framework within which scientific and philosophical thinking was done from the late 18th century on.

I will link this account directly to the development of linguistic and phonetic theory in the following way. It is clear from the documentary evidence that linguistic discourse in the 19th and 20th centuries has been consciously modelled on a succession of scientific disciplines. That is to say, practitioners of linguistics in each *état de théorie* perceived

a contemporary *état de théorie* in another science as being exemplary, successful and worthy of emulation, and they set themselves the task of emulating it in their own field. I will refer to these model disciplines for convenience as "paradigm sciences", since the notion is analogous in some important respects to the Kuhnian notion of paradigm. The difference between the two notions is clearly that the Kuhnian paradigm is a model theoretical framework INTERNAL to a discipline, whereas a paradigm science is a model EXTERNAL to the discipline. In Kuhn's view (1970: chap. 2), disciplines which are not yet "well-defined" (notably the social sciences) are apt to model themselves after other more advanced sciences in this manner. That this should be the case with linguistics from the end of the 18th century on is highly significant. It shows that linguistics in the modern period lost the privileged status it had during the Enlightenment. No longer the organon of criticism, it was thenceforth one science of man among many. My account of these paradigm sciences will be twofold. First, I will describe the *état de théorie* of the discipline in question, and try to explain why it was a particularly advanced exemplar of the contemporary epistemological framework. Second, I will review the

documentary evidence in linguistic discourse for the paradigm status of the discipline in question, and draw conclusions from this about what a given group of linguists considered their own scholarly activity to be.

Before going on to discuss in detail developments from the end of the 18th century on, it is necessary to consider what the epistemological framework was before then, and how it differed from the epistemological framework of the period we will be concerned with in this study. This is necessary because the earlier stages of the development we are studying can be fully understood only as a period of transition, and also because we will have occasion to compare developments from the end of the 19th century on with the epistemological framework of the Enlightenment.

Foucault (1966: chap. 4; chap. 8, iv & v) contrasts the conceptual framework of knowledge - or, as he calls it, episteme - of the 19th century with that of the Enlightenment in the following way. The episteme of the 19th century was to be closely linked with the study of man and his behavior. Man would no longer be just the scientific observer of nature, but

an object of scientific study himself. The Enlightenment had been concerned with defining man's role as observer; the 19th century would be concerned with investigating man's variability in space and time as object of study. Discourse on man (conceived of as "transcendental human nature") in the Enlightenment is accordingly logic and epistemology; in the 19th century, sociology and psychology. All this was reflected in the science of language. The Enlightenment regarded language as the medium (more or less adequate) of scientific discourse; the 19th century made language an object (varying in space and time) of scientific discourse (1).

Foucault's approach to the history of science thus has something in common with Kuhn's notion of paradigm, but it is basically Kantian. Indeed, Foucault sees the "episteme shift" at the end of the 18th century as being focussed around Kant's "Copernican Revolution" in philosophy. Now this was a revolution in the Subjekt-Objekt-Beziehung (subject-object-relation) in epistemology. In classical epistemology of the Aristotelian tradition, the subject (the scientific observer) is assimilated to the object (nature); that is, the observer is supposed to see things as they are,



according to their "nature". But with Kant, the object is assimilated to the subject; since observation is a structuring ACTIVITY, there is a new emphasis on the role of perception. Thenceforth, in the 19th century knowledge focusses on the subject - man. The subject becomes the object; for the scientific observer has become the object of scientific observation himself. In the 19th century, social science is deterministic, because it perceives man as being determined by the socially-inherited framework of perception; science, however, is objective and "positive". (Thus Marx says: science is necessary, because appearance and reality are not identical.) But in the 20th century, a new principle of Relativity emerges: determinism reveals itself to be untenable, at least in practice; not only man, but science itself is determined by the framework of perception. (Cf. Popper's epistemology of "conjectures and refutations", and Kuhn's more extreme relativism in his "paradigms and revolutions" model - see Dixon MS).

In the 19th century, linguistics was, as before (in Firth's phrase) "language turned back upon itself", but thenceforth language impinges upon scientific consciousness no longer as a

unitary and transparent phenomenon, but as a social product of man - varying with, and tied to the inexorable contingencies of time and space, like man himself. Since language varies in time and space, linguistics is historical and comparative; and since it is tied to time and space, a discourse about the empirical stuff (material) of all the elements of language - root, affix, grammatical process.

Associated with this change in the foundations of linguistics at the end of the 18th century is an major expansion of the data-base of the discipline - most importantly, the discovery of Sanskrit. Again, it is an expansion in the perspective of time (breakthroughs in decipherment by Champollion and others) and in the perspective of space (the addition of newly-discovered languages in Europe and Asia to the linguist's canon). Also, the logical study of language as practised by the Enlightenment could go no further for want of advances in the powers of formalisation of mathematics; a lack which would not be made up until the end of the 19th century, with the development of mathematic logic and logical positivism. Both these facts are mentioned by Chomsky (1972: 20f) in his attempt to explain the hiatus between Cartesian

# linguistics and Generative Grammar:

The death-knell of philosophical grammar was sounded with the remarkable successes of comparative Indo-European studies, which surely rank among the outstanding achievements of 19th-century science... Modern structural-descriptive linguistics developed within the same intellectual framework, and also

made substantial progress... In contrast, philosophical grammar did not provide appropriate concepts for the new comparative grammar or for the study of exotic languages unknown to the investigator, and it was, in a sense, exhausted. It had reached the limits of what could be achieved within the framework of the ideas and techniques that were available. There was no clear understanding a century ago as to how one might proceed to construct generative grammars that "make infinite use of finite means" and that express the "organic form" of human language...

However, it would be a mistake to think that these two factors were in any important sense the cause of the new development in linguistics known as Indo-European philology. Sanskrit had

been known and commented on quite early in the 18th century (Arens 1955: 127); polyglot linguistic surveys had been undertaken since the 16th (Arens 1955: chap. 4, a); and Leibniz and others had early propounded hypotheses about the genetic relatedness of European languages (Arens 1955: 77ff). Again, though all the major theoretical premises of Cartesian linguistics had been established in the 17th century, this did not prevent derivative work being done all through the 18th; and philosophical grammar continued all through the 19th century in Germany, in the Humboldt tradition (some of the main works being Steinthal's Grammatik, Logik und Psychologie 1855 and Finck's Haupttypen des Sprachbaus 1910). Rather would it be true to say that interest in the languages of the world and neglect of the logical side of language were made possible by the episteme of 19th-century science.

This change in the foundations of linguistics is signalled by Grimm in the Deutsche Grammatik (1819: p. vi) when he says that the task of the discipline is to observe the facts of language, not to submit language to the a priori categories of logic:

Allgemeinlogischen Begriffen bin ich in der Grammatik Feind; sie fuhren scheinbare Strenge und Geschlossenheit mit sich, hemmen aber die Beobachtung, welche ich als die Seele der Sprachforschung betrachte.

I am opposed to logical concepts in grammar; they provide apparent rigor and system, but impede observation, which I consider to be the essence of linguistic research.

Humboldt, in a fragment Ueber den Nationalcharakter der Sprachen dating from about 1823 (Stuttgart edition of the Collected Works 1969: 76), stresses the autonomy of linguistics from logic because of its scientific status:

Da aber die Sprache nur durch sich wirkt, so muss man dieselbe auch, wie überhaupt jeden Gegenstand, den man wahrhaft ergrunden will, nur um ihrer selbst willen, und unabhängig von jeden anderen Zweck studieren... Dies Studium der Sprache ist in sich nun wie das jedes anderen Naturgegenstandes.

Since language functions only through itself, it must - like any object - be thoroughly investigated - be studied solely

for its own sake, independently of any other aim... This study of language is basically like the study of any other natural object.

And Bopp (1833: p. xiiif) proposed to study language

Als Gegenstand, und nicht als Mittel der Erkenntnis.

As an object, and not as a means of knowledge.

Having sketched the general epistemological framework of the 19th century in contrast to that of the Enlightenment, let us now see how the unity of outlook implied by the idea of an epistemological framework is reflected in the influence of a succession of paradigm sciences on 19th-century linguistics.

COMPARATIVE ANATOMY was the paradigm science for the first generation of Indo-European linguists at the beginning of the 19th century. Its method, associated with the name of Cuvier (Leçons d'anatomie Comparée 1800), was to compare the various anatomical structures of the animal series. Systematic comparison enabled the scientist to infer the genealogy of

species. The second step in the method was palaeontology: reconstruction of the anatomical structure of an extinct species on the basis of comparative study of existing species descended from it. Where part of the anatomical structure to be reconstructed was already known (through fossils or other remains), knowledge gained from comparative study could be used to fill the "holes in the pattern". Each anatomical structure was regarded as a closed system: modifications in one part of the anatomy during evolutionary history would cause modifications elsewhere in the anatomy. Thus, in palaeontological reconstruction, structural information could be used inferentially to fill the gaps where empirical evidence was not available. In this way, a deductive method found a place in an inductive science (Cassirer 1945: 106ff).

Coming as it does at the end of the 18th century, Comparative Anatomy is a transitional kind of scientific discourse - it looks back to the Enlightenment, and forward to the 19th century. It looks back to the mechanical materialism of the 18th century, to science as classification of the observable (a conception exemplified in the taxonomy of Linnaeus). Comparative Anatomy was also Rationalist and Universalist (as

Enlightenment science was), especially in the formulation of its method by Goethe, who made pioneering contributions to the discipline (see his Zur Morphologie 1817). Goethe's biographer Lewes (1864: 350) says that Comparative Anatomy as practised by Goethe was based on the assumption

that all living organisms are constructed on an uniform plan, and that Comparative Anatomy is only valid because such a plan seems traceable.

Both in botany and anatomy, Goethe's model was that of an Urform undergoing individual differentiation or METAMORPHOSIS into species, the range of differentiation being constrained by the innate characteristics of the organic TYPE in question. Goethe invented the term MORPHOLOGY; he had a formative influence on Humboldt (Cassirer 1945: 115f). Though it looks back to the Enlightenment in these respects, Comparative Anatomy with Cuvier and Goethe was also forward-looking and innovative, because its theoretical approach is structural and historical.

F Schlegel, in his Sprache und Weisheit der Indier (1808: I,



iii) says that hypotheses about the genetic relatedness of languages must be based on comparative study, as in Comparative Anatomy:

Jener entscheidende Punkt aber, der hier alles aufhellen wird, ist die innre Struktur der Sprachen oder die vergleichende Grammatik, welche uns ganz neue Aufschluesse ueber die Genealogie der Sprachen auf aehnliche Weise geben wird, wie die vergleichende Anatomie ueber die hoehere Naturgeschichte Licht verbreitet hat.

The decisive point which will explain everything here is the internal structure of language or comparative grammar which will give us new information about the genealogy of languages in the same way as Comparative Anatomy has shed light on higher natural history.

J Grimm advocates an inductive procedure similar to the method and the scientific rigor of Comparative Anatomy (1819: p. xii):

Wird man sparsamer und fester die Verhaeltnisse der einzelnen

Sprachen ergruenden und stufenweise zu allgemeineren Vergleichen fortschreiten, so ist zu erwarten, dass bei der grossen Menge unsern Forschungen offener Materialien einmal Entdeckungen zustande gebracht werden koennen, neben denen an Sicherheit, Neuheit und Reiz etwa nur die der vergleichenden Anatomie in der Naturgeschichte stehen.

If the relations of individual languages are established more economically and precisely, and we progress step by step to more general comparisons, it can be expected that with the scope of our research on the available data discoveries can be made which will be equalled in certainty, novelty and interest only by those of Comparative Anatomy in natural history.

And Humboldt, in his essay Ueber den Dualis (1827: 113f)) states the Rationalist aspect of contemporary scientific thought when he says that comparative linguistics must employ two approaches which he calls *historisch* and *philosophisch*. This is an adaptation for linguistics of Goethe's view that the natural scientist must study the development of individuals and species (*historisch*) while still keeping sight of the underlying TYPE which determines them (*philosophisch*).

Humboldt's view is echoed by A F Pott in his Etymologische Forschungen (1833: p. xxivf):

Der Weg Bacos, d.h. sorgfaeltiger Beobachtung und unermuedlicher Aufsuchung von Analogien und Gesetzen...ist endlich mit Glueck auch in der Sprachwissenschaft betreten; moege echte Sprach- philosophie stets ein wachsames Auge darauf halten, dass derselbe sich nie in dem Sande oder in den Moraesten des platten Materialismus verliere.

Bacon's method, that is, careful observation and indefatigable searching for analogies and laws... has fortunately been adopted at last in linguistics. May true philosophy of language always keep a watchful eye that that method never gets lost in the sand or in the morasses of trivial materialism.

According to Foucault (1966: 275ff), the notion of anatomical structure in Comparative Anatomy was what led to the more dynamic 19th-century BIOLOGY. Cuvier's structural principle implies that the study of living nature is to concentrate on the central organisation of the anatomy rather than the

individual parts of the anatomy. The object of study thus changes from the (overt) observational characteristics of the organs to their (covert) functions in the totality of the organism (2). The dominance of the dynamic, historical approach in the life-sciences was assured by the appearance of Darwin's evolutionary theory. Life science now leaves behind the Rationalism of Goethe's Urform theory: natural process is no longer seen to involve given forms in the course of change - the forms themselves, far from being immutable types, are in constant flux (Collingwood 1946: 210ff).

19th-century linguistics, in spite of the surprising degree of Rationalism of its pioneers - surprising in the context of Chomsky's (1972) remarks quoted earlier - was by nature committed to a dynamic view of language. Historical linguistics implies a PROCESS model (in the sense discussed by Hockett 1948). Thus it was inevitable that the new dynamic biology should be a paradigm science for linguistics. Humboldt had already stated the dynamic view. Here we have an example of Humboldt's peculiar genius, which was to forecast all the developments of modern linguistics, often in a paradoxical way. He says, in the text *Ueber die*

Verschiedenheit des menschlichen Sprachbaues (early version, 1827-29: 184):

Eine Sprache ist auch nicht einmal in der durch sie gegebene Masse von Woertern und Regeln ein daliegender Stoff, sondern eine Verrichtung, ein geistiger Prozess, wie das Leben ein koerperlicher. Nichts, was sich auf sie bezieht, kann mit anatomischer, sondern nur mit physiologischer Behandlung verglichen werden, nichts in ihr ist statisch, alles dynamisch.

A language is not a tangible material, even in the the mass of words and rules it exhibits, but an arrangement, a mental process, as life is a bodily process. Nothing about it can be compared with anatomical observation, only with physiological; nothing in it is static, everything is dynamic.

However, it was not until Schleicher's well-known work on the Darwinian hypothesis (Die Darwinsche Theorie und die Sprachwissenschaft 1863) that an attempt was made to model historical linguistics after evolutionary biology.

Cassirer (1945: 98f) observes that whereas the early Junggrammatiker tried to model linguistics on the laws of physics, Paul in his late formulation of the theory Prinzipien der Sprachgeschichte (1880) tried to base linguistics on psychology. This, says Cassirer, is not symptmatic of any source of controversy in linguistics, because of the principle of Reductionism: experimental psychology as developed in Germany in the 19th century modelled itself on contemporary physics, and psychological hypotheses were considered to be reducible in principle to the laws of physics. For most of the 19th century, physics was still dominated by the classic Newtonian paradigm. Experimental psychology, taking its cue from the established natural science, became highly mechanistic. It discovered the unconscious, beyond the privileged sphere of will and reason by which the Enlightenment had defined human nature. In the unconscious, the structures of BEHAVIOR were situated. And sicne behavior is thus irrational and involuntary, it can be accounted for by a determin- istic model. I will therefore say that the paradigm sciences for the next etat de theorie in linguistics, that of the Junggrammatiker, were MECHANISTIC PHYSICS AND PSYCHOLOGY (3).

19th-century linguists were early concerned with "matching the physical science paradigm" (see Dixon 1973 for discussion of this concept). Bopp (1833: p. xiiif) was perhaps the first to say that linguistics was that

...die Sprachen...behandelt werden, und mehr eine Physik oder Physiologie derselben zu geben versucht wird.

...languages...are dealt with, and rather it is attempted to provide a physics or physiology of them.

With the Junggrammatiker and their mechanistic approach derived from contemporary physics and psychology, linguistics loses all its former Rationalist tinge and becomes a completely empirical study of human behavior. The focus of linguistic research now becomes precisely verbal behavior in the individual speaker or in social groups. Brugmann and Osthoff, in their Morphologische Untersuchungen (1878: p. i) say of earlier 19th-century work:

Man erforschte zwar eifrigst die Sprachen, aber viel zu wenig

den sprechenden Menschen.

Languages were indeed carefully studied, but far too little the speaking human being.

Arens (1955: 276) observes that this approach is closely connected with contemporary Lautphysiologie, notably the work of Sievers, who was the phonetician of the Junggrammatiker. Indeed the interest of the Junggrammatiker in phonetics and dialectology is clearly a consequence of their conception of linguistics as a study of individual and group speech behavior. As Paul (1880: 24) put it:

Das wahre Objekt fuer den Sprachforscher sind vielmehr saemtliche Aeusserungen der Sprech- taetigkeit an saemtlichen Individuen in ihrer Wechselwirkung aufeinander.

The total manifestations of speech activity by the total of individuals in interaction with each other are the true object for the linguist.

Language, being a structure of behavior is situated in the



unconscious. That is to say, it is beyond the sphere of human will or rational choice. Therefore, it can be accounted for by a Deterministic model. It was this that gave linguistics its scientific status, according to the Junggrammatiker. In consequence, linguistic change could be regarded as law-like, as exceptionless. As Leskien wrote, in his Deklination im Slawisch-litauischen und Germanischen 1876 (quoted by Arens 1955: 291):

Laesst man aber beliebige, zufaellige, unter einander in keinen Zusammenhang zu bringende Abweichungen zu, so erklaert man in damit, dass das Objekt der Untersuchung, die Sprache, der wissenschaftlichen Erkenntnis nicht zugaenglich ist.

If one admits random deviations which cannot be related to one another, one is in fact saying that the object of investigation, language, is not accessible to scientific knowledge.

This attitude is a significant departure from the moral view of language expressed by Humboldt and Grimm. For both these thinkers, language is bound up with human freedom; a language

is the activity by which a nation expresses its cultural individuality (4). (Humboldt of course had already begun to see the group aspect of language as determining the individual, but I will postpone discussion of this for the moment.) In Ueber die Verschiedenheit des menschlichen Sprachbaues (1835; Werke III: 650), Humboldt writes:

Ohne ein Akt des unmittelbaren Bewusstseins, ja selbst der augenblicklichen Spontaneitaet und der Freiheit zu sein, kann (die Sprache) doch nur einem mit Bewusstsein und Freiheit begabten Wesen angehören und geht in diesem aus der ihm selbst unergründlichen Tiefe seiner Individualitaet und aus der Taetigkeit der in ihm liegenden Kraefte hervor.

Without being an act of direct consciousness, even of momentary spontaneity and freedom, (language) can only belong to a being endowed with conscious-ness and freedom, and in this it springs from the depths of his individuality (unfathomable even to himself) and from the activity of the powers within him.

As Arens (1955: 289) observes, the Jungrammatiker claimed "no

exception without a rule", where earlier workers had claimed "no rule without an exception". It was a fundamentally non-Deterministic conception of language that led Grimm (1819: 582) to characterise linguistic change in the following way:

Die Lautverschiebung erfolgt in der Masse, tut sich aber im Einzelnen nie rein ab. Es bleiben Woerter in dem Verhaeltnis der alten Einrichtung stehen, der Strom der Neuerung ist an ihnen vorbeigeflossen.

The sound shift applies generally, but never occurs in every single case. Words remain as they did in the previous situation; the stream of innovation has passed them by.

The latter part of the 19th century saw the development of social science. Comte provided the notion of a group of sciences similar in method and equal in scientific rigor to the natural sciences the task of which would be to study man in society. He invented the term "sociology", and his pupil Durkheim addressed himself to the problem of developing this into an empirical science. Economics since the end of the 18th century with the classic British school and later the

Enlightenment, and it may be linked to the Enlightenment conception of language as the organon of criticism: different languages are more or less efficient tools for discovering the natural world, and a REAL CHARACTER would be a language the categories of which would be completely transparent to the categories of reality. However, it is only toward the end of the 18th century that attempts begin to be made to develop the notion of linguistic relativity into a full-scale theory of society in the work of Condillac, Rousseau and Herder (see Aarsleff 1974). Clearly, this is due to the fact that the episteme shift at the end of the 18th century made possible a study of human variability in time and space. In Humboldt's theory of language, which is at once Rationalist and Romantic, there is a fundamental opposition between the determining, socialising force of language and the individual speaker's creativity. In Ueber die Verschiedenheit des menschlichen Sprachbaues (1835) he remarks

...wie gering eigentlich die Kraft des Einzelnen gegen die Macht der Sprache ist. Nur durch die ungemeine Bildsamkeit der letzteren...wird das Gleichgewicht wieder einigermaßen hergestellt... In dem auf (den Einzelnen) ausgeübten

Einfluss liegt die Gestzmaessigkeit der Sprache und ihrer Formen, in der aus ihm kommenden Rueckwirkung ein Prinzip der Freiheit.

...how small the strength of the individual is against the power of language. Only through the remarkable plasticity of the latter...is the balance scemewhat restored. The law-like nature of language and its forms resides in the influence it exercises on (the individual); in the effect coming back from him, a principle of freedom.

J Grimm similarly emphasises that language is socially inherited when he speaks of the exclusivity of the first language in the nervous system of the speaker(1819: Vorwort):

Die Sprache gleich allem Natuerlichen und Sittlichen ist ein unvermerktes, unbewusstes Geheimnis, welches sich in der Jugend ein- pflanzt und unsere Sprachwerkzeuge fuer die eigentuemlichen vaterlaendischen Toene, Biegungen, Wendungen, Haerten oder Weichen bestimmt; auf diesem Eindruck beruht jenes unvertilgliche, sehnsuechtige Gefuehl, das jeden Menschen befaellt, dem in der Fremde seine Sprache und Mundart

zu Ohren schallt; zugleich beruht darauf die Unlernbarkeit einer auslaendischen Sprache, d.h. ihrer innigen und voelligen Uebung.

Language, like every natural or moral entity, is an unnoticed, unconscious secret which establishes itself in childhood and shapes our vocal organs for the peculiar tones, usages, hardness or softness of our native language; this impression is the basis of that irrepressible feeling of longing that everyone feels when he hears his own language or dialect spoken abroad; it is also the basis of the impossibility of learning a foreign language - that is, complete mastery of it (5) .

The notion of social determinants of perception has wide ramifications in 19th-century social science. There emerges a sharp distinction between social forces and the individuals who embody them. Social forces cannot have effect unless they are embodied in the social behavior of individuals, but these social forces are above and beyond the conscious control of the behaving individuals, and so have a determining power over those individuals (6) . No doubt the most striking

illustration of this idea is given by Marx in his theory of economic history: individuals in each stage of society are compelled by economic necessity to fulfil the dialectical development of history, although they are not conscious of it and it may be against their own interests. However, the clearest formulation of the idea in the theory and method of social science is provided by Durkheim's concept SOCIAL FACT: social institutions and processes exist independently of the individual social behavior that embodies them (7).

The notion of the supra-individual social institution is found in Saussure's term *langue*. The frequently-debated question of whether Saussure's *langue-parole* opposition is directly derived from Durkheim's *fait social* is for our present purposes beside the point. What matters is that the two notions have the same epistemological pedigree.

Similarly, the notion of *valeur* has its background in the discussion about VALUE in economics from the British school and Marx; and the notion of synchrony and diachrony, as Piaget (1968: 65) points out, depends on a concept of structural equilibrium which goes back to Cuvier's biology:

...L'indépendance relative des lois d'équilibre par rapport à celles du développement: Saussure a tiré à cet égard une partie de son inspiration de l'économie qui, à son époque, insistait sur les premières (avec Pareto à la suite de Walras), et où effectivement les crises peuvent conduire à un remaniement complet des valeurs indépendamment de leur histoire (le prix du tabac en 1968 dépend de l'interaction des marchés actuels et non pas de ce qu'il était en 1939 ou en 1914). De telles considérations auraient pu d'ailleurs être aussi tirées de la biologie elle-même, puisqu'un organe peut changer de fonction ou une même fonction être exercée par des organes différents.

Cassirer (1945: 101ff) mentions three trends in science at the end of the 19th century which might explain the demise of historical-comparative linguistics and its replacement by Structuralism. The first is the development of a non-mechanistic physics with electro-magnetism and the notion of FIELD; the second is the structural approach of Gestalt psychology. But as Cassirer observes elsewhere in the same essay, the structural principle was already at work in



Comparative Anatomy at the beginning of the 19th century. A structural interpretation seems unavoidable in the following text from Humboldt's Ueber die Verschiedenheit des menschlichen Sprachbaus (early version, 1827-29; Werke III: 442) :

Die Einpassung in ein System, vermoege dessen jeder artikulirte Laut etwas an sich traegt, in Beziehung worauf andre ihm zur Seite oder gegenueber stehen, wird durch die Art der Erzeugung bewirkt. Denn jeder einzelne Laut wird in Beziehung auf die uebrigen...notwendig gebildet.

Incorporation into a system by means of which every articulated sound carries something in relation to which other sounds stand beside or are opposed to it, is achieved by the manner of production. For every individual sound is necessarily formed in relation to the others.

And that the Junggrammatiker thought structurally is shown by the following representative quotation from Sievers (1876: 7): Vor allen Dingen suche man sich also einen genauen Einblick in den BAU jedes zu behandelnden Laut- SYSTEMES zu

verschaffen; man wird gut tun, dabei stets im Auge zu behalten, dass dieser nicht so sehr durch die Anzahl der in ihm zusammengewerfelten Laute an und fuer sich, als durch das Verhaeltnis dieser einzelnen Glieder untereinander bedingt wird...

Above all one should try to gain an insight into the STRUCTURE of every sound SYSTEM to be studied; it is well to remember that this structure is determined not only by the aggregate of the sounds that happen to occur together in it, but rather by the relatedness of these individual members to each other...

I have already mentioned that the Saussurean concepts langue and parole, valeur, and synchrony and diachrony were not new in 19th- century science either. So what was it that brought about the undeniably fundamental change in the foundations of linguistics at the end of the 19th century? The answer will be found, I think, in Cassirer's third trend in science at the end of the 19th century: the logic of Husserl, which distinguishes between formal and empirical truth-values. In fact, I will claim that Husserl's logic (in the Logische Untersuchungen 1900) is just one aspect of a general change in

the conceptual framework of knowledge which occurred at the end of the 19th century. It was not a change of the scope of an episteme shift, but I think it is necessary to postulate such a change (similar in some respects to the episteme of the Enlightenment) if we are to explain the development of 20th-century linguistics (8). Toward the end of the 19th century, a new philosophical movement arose which was associated with the development of mathematical logic. Since language in the 19th century is studied als Naturgegenstand und nicht als Mittel der Erkenntnis (as a natural object, and not as a means of knowledge), a system of symbolic logic develops which expresses scientific knowledge without the aid of natural language. Foucault (1966: 310) refers to symbolic logic and Indo-European philology as

deux produits de dissociation de la grammaire generale.

The philosophy of the new movement was anti-psychologistic and anti-empiricist. Its leaders were Frege and Husserl. Both these thinkers made a distinction between what is now called the INTENSION and the EXTENSION of statements: that is, between the inherent meaning of a statement and its real-world

reference. This is akin to the distinction Husserl made in his revival of deductive logic between FORMAL and EMPIRICAL truth-values: logic statements and statements of fact do not have meaning in the same way (9).

A parallel distinction was being made at the same time between Naturwissenschaft and Geisteswissenschaft (science of nature and science of man). The object of the Naturwissenschaften comprises entities in the natural world which can be observed with the senses. But the object of the Geisteswissenschaften comprises entities in the social world - in indeed they are entities at all; they have existence in so far as there are meanings, values and relations attached to them by mind and society.

The most important modern development of the ideas of Frege and Husserl in philosophy is Popper's notion of the THREE WORLDS. World 1 is the world of physical objects and physical states; World 2 is the world of states of consciousness; and World 3 is the world of OBJECTIVE CONTENTS OF THOUGHT (Popper 1972: 106). He says that World 3 is

man-made, and in a very clear sense, superhuman at the same time. It transcends its makers.

and adds (1972: 159 & fn) that it is

superhuman in that its contents are virtual rather than actual objects of thought, and in the sense that only a finite number of the infinity of virtual objects can ever become actual objects of thought.

Now since World 3 is a world of meanings and propositions, it is the sphere of language par excellence. Popper clarifies his philosophy of language with reference to the Stoic theory of the sign. He says of language (1972: 157):

In so far as it consists of physical actions or physical symbols, it belongs to the First World. In so far as it expresses a subjective or psychological state or in so far as grasping or understanding language involves a change in our subjective state, it belongs to the Second World. And in so far as language contains information, in so far as it says or states or describes anything or conveys any meaning or any

significant message which may entail another, or agree or clash with another, it belongs to the Third World. Theories, or propositions, or statements are the most important Third-World linguistic entities.

There is another important sense in which language is an inmate of World 3: this is provided by Popper's notion of the THEORY-IMPREGNATEDNESS OF PERCEPTION (scientific or everyday). Referring to Whorf, he says (1972: 165):

...We always pick out our problem against a third-world BACKGROUND. This background consists of at least a LANGUAGE, which always incorporates many theories in the very structure of its usages...

Thus language can be an inmate of World 3 in two ways. As scientific DISCOURSE (the metalinguistic function of language, in the case of linguistics), it expresses theories: for example, a universal phonetic alphabet, or a phonological analysis of a language. As superhuman SOCIAL INSTITUTION, it is a perceptual sieve (in the sense of Trubetzkoy 1939: 47f).

Popper comments on the epistemological pedigree of his theory of the Three Worlds as follows (1972: 106):

What I call "the Third World" has admittedly much in common with Plato's theory of Forms or Ideas... It has more in common still with Bolzano's theory of a universe of propositions in themselves, though it differs from Bolzano's also. My Third World resembles most closely the universe of Frege's objective contents of thought.

He also writes (1972: 162 fn):

Husserl's anti-psychologism was without doubt the result of Frege's criticism of Husserl's psychologistic Philosophie der Arithmetik... In his Logische Untersuchungen (in which he refers to Bolzano), Husserl states with marvellous clarity..."In all sciences we have to insist upon the fundamental distinction between three kinds of interrelations: a) the interrelations of our COGNITIVE EXPERIENCES..." (this is what I call the Second World) "b) the interrelations of the OBJECTS UNDER INVESTIGATION ..." (especially my First World -

but it can be any of the others) "and c) the LOGICAL INTER-RELATIONS" (these belong to my Third World).

It is interesting that Popper's view of language was influenced by the Prague Structuralist K Buehler (Popper 1972: 235 & fn). I have given a brief account of Popper's theory of the Three Worlds not only because it illuminates the work of Frege and Husserl in relation to linguistics, but also because (as I will later show, in my final chapter) it is important for the discussion of the psychological reality of phonology and phonetics.

As I have already shown, Saussure's langue-parole distinction is an idea that is inextricably bound up with the 19th-century view of language. Langue, the structure of language, is a social fact (in Durkheim's sense). It is beyond the control of individuals, because, paradoxically, no-one has the power to change it and yet it is constantly changing. And yet it is also clear from the foregoing discussion that the Saussurean dichotomy is related to the FORMAL- EMPIRICAL opposition in contemporary logic in quite significant ways. Langue is logically independent of parole. Langue is an objective



content of thought, VIRTUAL thought rather than subjective thought (110 ). It exists in the conscience collective, though it is only individual verbal behavior (parole) which gives it a phenomenal existence. It is a closed and self-regulating system, and its members are not entities but relationally-defined valeurs. Thus langue must be the object of a Geisteswissenschaft, not a Natur- wissenschaft.

The logical movement of Frege and Husserl gave rise to two important approaches in 20th-century scientific method. The first, as we have seen, is Structuralism; the second is Phenomenology. Foucault (1966: 312) observes that both these approaches derive from the episteme of the 19th century - Structuralism being oriented to the formal, and Phenomenology to the empirical. The aim of Structuralism is

mettre au jour les formes pures, qui avant tout contenu s'imposent à notre inconscient

of Phenomenology,

faire venir jusqu'à notre discours le sol d'expérience.

Structuralism aims to set up formal models for the structures of social behavior, which are empirically situated in the unconscious.

Phenomenology is a method of capturing in the descriptive model the essential characteristics of empirical reality. Both methods are thus in a sense attempted syntheses of the formal and the empirical; but whereas Structuralism presupposes a qualitative distinction between formal and empirical levels, Phenomenology presupposes that they must be unified. These perhaps rather abstract remarks take on some substance when we consider the development of linguistic theory after Saussure. The Prague school placed phonology in the sphere of *langue*, and phonetics in *parole*. There were different opinions as to how the levels should be linked in linguistic theory - as we will see in chapter 5 - with Trubetzkoy insisting on the logical distinction between them, and Jakobson later devising a taxnomic framework to describe both (12). The discussion of this theoretical problem is still by no means closed, and it is important for the phonetics- phonology relation in Generative Phonology:

especially, the status of the Naturalness Condition.

#### Notes

(1) The project of developing a universal language or REAL CHARACTER is a significant part of linguistics in the Enlightenment. The idea was to improve - in a decidedly prescriptive manner - on the imperfections of socially-inherited natural languages by constructing an artificial language suitable for logical and scientific discourse (Foucault 1966: 98f). It is interesting that the conception of Sanskrit of William Jones, coming in the period of transition at the end of the 18th century, is still very much of the Enlightenment. Thus William Jones (Works 1807 vol. III: 33) speaks of

the Sanskrit, in which books of religion and science were composed, and which appears to have been formed by an exquisite grammatical arrangement, as the name itself implies, from some unpolished idiom...

And in an oft-quoted passage (Works III: 34) he describes

Sanskrit as

of a wonderful structure; more perfect than the Greek, more copious than the Latin, and more exquisitely refined than either...

It is apparent from these statements that William Jones regarded Sanskrit as an ideal logical discourse, a kind of Real Character. It appears that Beauzée, who had heard about Sanskrit from another source, also considered it to be a Real Character (see Aarsleff 1967: 153, fn 105 and references there).

(2) A similar development is to be found in the history of neurology and the study of aphasia in the 19th century (Bouton 1976: 43ff). The classic workers in the field began by assuming that behavioral and cognitive functions were narrowly localised according to the anatomy of the brain. The celebrated example of this was Broca's inference from the clinical data for aphasia that language is situated in the left third frontal convolution. Later, conflicting clinical data forced the neurologists to realise that the brain works

not in a strictly localised manner, but structurally, the cerebral functions (especially the higher functions) being assured by the interaction of the different areas of the brain as a totality.

(3) Arens (1955: 252) relates this to the episteme of the 19th century as follows:

Diese beiden neuen Momente, Physiologie und Psychologie...kennzeichnen...die neue Wissenschaft von der Sprache...als einem Zweige der Anthropologie.

These two new influences, physiology and psychology...characterise...the new science of language as a branch of the science of man.

(4) Thus Foucault (1966: 303) says of linguistics at the start of the 19th century:

Le langage est lié non plus à la connaissance des choses, mais à la liberté des hommes.

(5) It is interesting that Grimm describes the problem in terms of ARTICULATORY SETTING, about which I will have more to say in later chapters.

(6) This approach implies one of the possible answers to an important question in the foundations of social science: how do you account for a behavior? If the regularities of social interaction are outside the perception or control of individuals, then social behavior is to be studied without reference to the behaving individuals; their ideas about the behavior are discounted as non-logical derivations (in Pareto's terms) or rationalisations (in Freudian terms) (see Winch 1967). Thus the American Structuralists had a policy of disregarding the metalinguistic pronouncements of the informant on his own speech. (This is because of their PSYCHOLOGICAL Behaviorism; and their LINGUISTIC debt to the Junggrammatiker, who said that sound change is unconscious.) This unjustified policy seems not to have been revoked in Generative Phonology, where no theoretical status attaches to Sprachgefuehl or any other such concept. This is surprising, for dissenting voices were raised. Sapir had always insisted that his informants had an intuitive knowledge of the

underlying phonology of their languages. Fries and Pike (1949) held that the linguist must take account of the reactions of speakers to linguistic variation, in cases of bilingualism and bidialectalism. And Firth (1934: 3; quoted by Roberts, to appear) thought that one of the tasks of the linguistic phonetician is to transcribe what speakers THINK they say.

(7) It is also to be noted that the Junggrammatiker held the view that there is no langue, only parole (here and in the rest of this study, I will follow the usual practice, initiated by Wells 1947, of using Saussure's terms langue and parole as technical terms). In Humboldt's terms, there is no ergon, only energeia (Arens 1955: 310). It was early stated by Brugmann and Osthoff (1878: p. i)

...dass die Sprache kein Ding ist, das ausser und ueber den Menschen steht und ein Leben fuer sich fuehrt, sondern nur im Individuum ihre wahre Existenz hat...

...that language is not a thing, which stands above and beyond persons and has a life of its own, but has its true existence

only in the individual.

This attitude on the part of the Junggrammatiker is no doubt due to their extreme empiricism, which could not tolerate "abstractions" in science (see Paul 1880: 11). Yet, although they formally rejected it, this all-pervading motif of the 19th-century science of man re-appears in their conception of linguistic change. Linguistic change for the Junggrammatiker is a superhuman developmental law which proceeds by "blind natural necessity", but through the medium of individual speech (Robins 1967: 184 & fn, where he quotes Osthoff, Das Verbum in der Nominalkomposition 1878, as stating that

...die Lautgesetze der Sprache geradezu blind, mit blinder Naturnotwendigkeit wirken.

...sound laws of language work blindly, with blind natural necessity.

(8) Foucault (1966) emphasises that Indo-European philology and symbolic logic belong nevertheless to the same epistemological framework: the episteme of the 19th century,



in which language is culture-bound and scientific knowledge must accordingly be expressed

in a form other than language. Symbolic logic, he says, is not a return to the Real Character project of the Enlightenment, but an attempt to define the psychological capabilities of man. He describes it (1966: 312), in what is clearly a reference to Generative Grammar, as

la prétention de contrôler tout langage eventuel, et ~~de le~~  
surplomber par la loi de ce qu'il est possible de dire.  
du

I nevertheless think that the history of linguistics in particular indicates that there was a change in the conceptual framework of knowledge at the end of the 19th century. Not an episteme shift, but a REACTION TO THEORY-ORIENTATION in terms of Bursill-Hall's model of the history of linguistics.

(9) There is a clear exposition of this theory in Frege's 1892 essay "Ueber Sinn und Bedeutung", which is a pioneering contribution to semantics. Husserl did not make any direct contribution to linguistics, but he revived interest in the

Enlightenment idea of UNIVERSAL GRAMMAR, which was later taken up by Hjelmslev (see Arens 1955: 377ff).

(10) An alternative interpretation might be that the inmates of World 3, since they constitute "objective" knowledge, are thus confined to scientific elements and statements. On language. This, however, does not vitiate the main point here, which is that the elements and theoretical statements of phonology are inmates of World 3.

(11) This is evident in Martinet's use of the terminology virtuel and latent in Martinet 1965. Relatedness to the notion of "virtuality" is suggested by the terminology COMPETENCE and PERFORMANCE in Generative Grammar. This is perhaps worth mentioning, if only because it shows that Popper's idea of language as an inmate of World 3 might apply equally well to language as COMPETENCE as it does to language as langue.

(12) For further details, see Hohenstein (1976).

## Chapter 3: PHILOLOGIE

The phonetic framework used by the early Indo-European philologists was substantially the inherited classical framework as codified by Dionysius Thrax. The principal achievement of the Greeks in linguistics was the development of a metalanguage (Robins 1967: 39). The metalanguage that they developed was quasi-phonemic rather than phonetic. Sievers (1876: 24) observed that historically, the functional type of analysis of the sounds of language comes before the phonetic. If the linguist is dealing only with one language, his attention is concentrated on its structure and thus on the functional differences of which that structure consists. The functional view-point allows the linguist to regard the units of analysis as the building-blocks of lexical forms. Such is the case with the framework of Dionysius. Classical analysis of the sounds of language is based exclusively on Greek. It is based in fact on the Greek alphabet and the prosodic system, which amount to a working phonemicisation of Greek. The "letter-phonemes" of the alphabet are hypostatized as the building-blocks of utterance. An isomorphism is thus established between the structure of language, which is

composed of letters, and the structure of the natural world, which is composed of primary particles or stoikheia. Language in the perception of late Antiquity is seen to reside in texts most importantly (Dionysius himself says that the end purpose of linguistics is krisis poiematon), and therefore it is essentially WRITTEN. (Cf. Foucault 1966: 49ff.) In this sense, all language is composed of letters. And how could one begin to analyse the structure of language in the flux of speech, unless it was first put down in the fixed form of writing? Language is thus an ergon, in Humboldt's phrase: it has an existence independent of speech behavior and so linguistic analysis is not tied to the explanation of the speech signal, as it would be for the 19th century, and as it is for for us.

The Greek writing system is a working phonemicisation of Greek, but one clearly based on some phonetic observation. Thus in the stop consonant system

π	τ	κ
β	ζ	χ
φ	θ	ψ
ϕ	ς	ξ

there are three places of articulation, and there is a three-ways distinction between voiced, voiceless and tense or aspirated stops, with affricates consisting of stop base plus a continuant release which is redundantly /s/, this being the only fricative in the consonant inventory. The pulmonic onset /h/ is symbolised by a prosody rather than a letter (Firth 1948: 50 drew attention to the linguistic sophistication for this). And although the Greek alphabet is quasi-phonemic, and thus reveals no allophonic detail, there is at least one allophonic statement implicit in the writing system:  $\gamma$  before a velar stop is written  $\gamma$ , to show that /n/ by place assimilation becomes [ŋ]. It might also be mentioned that in sandhi between words a voiceless stop before a rough breathing is written as the corresponding tense or aspirated stop; this shows that the Greeks were aware of the relatedness of /h/ and aspiration. The classical phonetic metalanguage does indeed build on the phonetic insights of the writing system, but examination of the technical vocabulary of the metalanguage (cf. Bursill-Hall 1966) would suggest that morpho-phonological rather than phonetic criteria underly the analysis to a great extent. Thus the three-ways distinction between voiced, voiceless and tense or aspirated stops occurs

in the texts as tenuis, media and aspirata. These almost seem to be three values of a manner of articulation parameter. The Ancients did not know about voice state, as the term media shows. Media is a purely formal designation. Dionysius in his text has no real phonetic explanation of the term. But in support of his classification he gives an example of tenuis replaced by aspirata before a rough breathing. He also gives the designation "unchangeable" to nasals and liquids, because they do not change in the flexion of nouns and verbs (1).

At the end of the 18th century, owing to the change in the foundations of linguistics which occurred about that time, and which I have discussed in chapter 2, linguistic theory comes to a point where it is required to account for the speech signal. The phonetic framework available is still the classical one. It is worthwhile to begin our discussion of the period of Philologie with Sir William Jones' Dissertation on the Orthography of Asiatick Words in Roman Letters of 1794 (references are to vol. III of the Collected Works 1807), which affords us a valuable glimpse of how an 18th-century phonetician went about his work.

I have already observed (chapter 2, fn 1) that William Jones belongs to a period of transition between Enlightenment and 19th-century linguistics, in connection with his view of Sanskrit. This is apparent also from the schematic exposition of William Jones' phonetic framework which he gives in the Dissertation. He begins with the "soft and hard breathings", which he describes as the "primary elements of articulation" (1807: 264). The soft breathing is in one sense phonetic zero, but in fact William Jones seems to be using it as Indifferenzlage or articulatory setting. That is to say, one articulatory posture is identified as the neutral position of the vocal tract and is used as a reference point against which all other articulations can be mapped. William Jones compares this position to the articulatory posture for [a]. Similar statements are found in the Sanskrit phonetic treatises (Allen 1953: 32ff), [a] being the neutral vowel of Sanskrit (2). It seems likely that in his notion of the neutral position and in the structural view of the sounds of language which the notion of an articulatory reference point seems to imply, William Jones was influenced by the Sanskrit phonetic tradition which he discovered (cf. Allen 1953: 3, who says that the Dissertation is "clearly based on Indian models"). William

Jones lists five vowels: a, e, i, o, u. This is their "natural order", which of course is none other than the order in which they occur in the Latin alphabet. He says that the five basic vowels are the Latin alphabet. He says that the five basic vowels are exemplified, "though not precisely in their natural order" (1807: 264) in the words "an innocent bull". The phonetic transcription of this in modern English would be [ɪnəʃənt]. Even making allowances for late 18th-century pronunciation, it makes sense to say that the phrase in question contains all five basic vowels only if one means it in some phonemic sense - if we take schwa to be a secondary phoneme or allophone. Alternately, if we regard schwa as a phoneme of English in its own right rather than as an unstressed allophone of every vowel in the system, it would be a morphophonemic statement. Or again, if we regard vowel reduction in weak syllables as a prosody, it would be a statement in terms of generalised CV structure and phonematic units. This treatment of the vowels shows clearly, I think, that William Jones, though he attempts to describe the production of the sounds in physical terms, is continuing the classical phonetic tradition of hypostatizing the letter-phoneme. Thus his phonetics is really a



quasi-phonemics in the tradition of Dionysius Thrax. On the other hand, William Jones, as a phonetician and a philologist dealing with practical problems of transcription, was concerned with the problem of developing an international phonetic alphabet. He thought (1807: 269) that just as an ideal language (cf. my chapter 2, fn 1) should be able to represent adequately any shade of meaning,

...on the same principle, a perfect system of letters ought to contain one specific symbol for every sound used in pronouncing the language to which they belonged.

As Firth (1948) pointed out, William Jones was the first to point out the suitability of Oriental syllabic writing systems to their languages. Firth himself notes the prosodic principles underlying these syllabaries, and refers to them as "models of phonetic and phonological excellence" (1948: 51). William Jones writes:

...The Arabian alphabet...appears to me so complete for the purpose of writing Arabick, that not a letter could be added or taken away without manifest inconvenience, and the same may

indubitably be said of the Devanagari system; which...is more naturally arranged than any other...

On the basis of a comparative study of writing systems, William Jones aims to develop what is in effect a phonetic alphabet or romanisation consisting of Roman letters and prosodic diacritics (3). The purpose is this (1807: 269f):

...We may apply our present alphabet so happily to the notation of all Asiatick languages...so regularly that anyone who knew the original letters might rapidly and unerringly transpose into them...

William Jones stands at the beginning of the new departure in linguistics, since it was he who made the first unambiguous statement of the relatedness of Sanskrit to the classical European languages, but the beginnings of the historical-comparative method in linguistics date from the introduction of Indo-European studies into Germany by W v Humboldt and F Schlegel. Schlegel drew attention to Sanskrit in his book Ueber die Sprache und Weisheit der Indier (1808), and Humboldt was responsible for establishing Indo-European

studies at Prussian universities.

The phonology of Grimm and Bopp is a *Buchstabenlehre* (theory of letters) rather than a *Lautlehre* (theory of sounds). This may seem at first surprising in view of the statements by Grimm and Humboldt (which I reported in chapter 2) about the primacy of parole (for the use of the terms *langue* and *parole*, see chapter 2 fn 7). It is partly understandable in view of their philological orientation: Grimm and Bopp were working almost exclusively with texts in dead languages. But there is a deeper reason for this apparent contradiction between theory and practice in the work of Grimm and Bopp: their phonetic framework was in fact a quasi-phonemic one. Although an edition of Panini had appeared in 1810 (Arens 1955: 146), the Sanskrit phonetic tradition does not seem to have been known to Indo-European philologists until considerably later. The phonetic framework of Grimm and Bopp is essentially the classical one going back to Dionysius Thrax. Allen (1953: 1.10) says that Grimm got a "deceptive symmetry" in his formulation of the *Lautverschiebungen* from using the classical terms *tenuis*, *media* and *aspirata*. Grimm gives the table of correspondences as follows in the Deutsche Grammatik (1819:

584):

Greek p b f t d th k g ch "Gothic" f p b th t d k g Old High  
b(v) f p d z t g ch k German

Fricative such as f are not distinguished from aspirated (tense) Fricatives such as f are not distinguished from aspirated (tense) stops by Grimm. On the other hand, it is clear that th and ch, though written with two letters each, are functional units. Of the velar series he says:

Im Althochdeutschen stunde hier die media g ueberall konsequent und dem b, d der anderen Reihen analog; es mag aber ein Ueberrest der frueheren Lauteinrichtung sein, dass auch althochdeutsch der gotische Anlaut h, weil man ihn fuer eine spirans und nicht aspirata nahm, fortgalt.

In Old High German the media g would logically occur here analogous to the b and d of the other series; but it may be a remnant of the earlier position that in Old High German the "Gothic" initial h continued to be used, because it was considered a spirant rather than an aspirate.

The schematisation of the shifts in rows and columns and the use of the words *konsequent* and *analog* in the above quotation shows how the notion of natural classes of sounds can be implicit in formulations of this kind using a phonetic metalanguage, whether it be empirically adequate or not.

Grimm interprets the *Lautverschiebungen* as follows (1819: 584):

...Genau wie das Althochdeutsche in allen drei Graden von der gotischen Ordnung eine Stufe abwaerts gesunken ist, war bereits das Gotische selbst von der lateinischen (griechischen, indischen) herabgewichen. Das Gotische verhaelt sich zum Lateinischen wie das Althochdeutsche zum Gotischen.

...Just as Old High German dropped by one degree from the Gothic system, Gothic itself had already dropped down from the Latin (Greek, Indic) system. Gothic corresponds to Latin as Old High German corresponds to Gothic.

The interpretation that Old High German underwent the same process as "Gothic" implies a significant degree of abstractness in Grimm's phonological thinking, for the input and output of the process is phonetically not the same in each case - that is to say, the letter-segments are not the same.

The Germanic philologist R v Raumer wrote, in Die Aspiration und die Lautverschiebung (1837; quoted by Arens 1955: 214f)

(Wir werden) kaum zum Ziele kommen, wenn wir uns damit begnuegen, gewisse Buchstaben in gewissen Dialekten an der Stelle anderer Buchstaben in anderen Dialekten vorgefunden zu haben. Wir muessen auf das Wesen der mit diesen Buchstaben bezeichneten Laute eingehen, um zu sehen, wie aus dem einen der andere sich entwickeln konnte. Denn da die Umwandlung der Woerter nicht auf den geschriebenen Zeichen beruht und auf der Aehnlichkeit derselben, sondern auf den gesprochenen Lauten, so muessen eigentlich mit aller klaren Etymologie phonetische Untersuchungen Hand in Hand gehen...

(We will) hardly come to the desired result, if we are content to have discovered certain letters in certain dialects in

place of other letters in other dialects. We must go into the nature of the sounds symbolised by these letters to see how one could develop out of the other. For since change in words depends not on the written symbols and their similarity but on the spoken sounds, phonetic investigation must go hand in hand with all clear etymology...

It is apparent from this passage that the phonetic basis of sound change was now being clearly perceived, and perceived as a problem of linking the level of analytical abstraction represented by the quasi-phonemic alphabet to speech. This interpretation is confirmed by Raumer's description of allophonic variation, when later in the same passage he writes:

...Niemand (kann) leugnen, dass sich zwischen d als dem weichsten und t als dem haertesten unserer Dentale eine unzaehlbare Schar von mittelharten Zahnlauten denken laesst... Diese Mannigfaltigkeit von Zwischenlauten (kann) in der lebendigen Bede wirklich nachgewiesen werden. Die Schrift dagegen muss sich begnuegen, den weichsten und den haertesten Grad zu bezeichnen. Alles, was dazwischenliegt, muss sich

gefallen lassen, unter d oder unter t eingereiht zu werden.

...No-one can deny that between d as the softest and t as the hardest of our dentals an innumerable host of medium-hard sounds can be imagined... This diversity of intermediate sounds can really be demonstrated in living speech. Writing, on the other hand, must make do with symbolising the softest and the hardest. Everything in between must allow itself to be classed as a d or a t.

A F Pott (1833: 74) had a similar notion of the phonetic basis of sound change when he wrote:

Gesetzliche Buchstabenvertauschungen...finden nur statt zwischen homorganen oder homogenen, mindestens homoiorganen (zB Kehl- und Gaum- buchstaben, oder solchen, die eigentlich zwei Organen angehören) oder homiogenen Lauten. Eine durch Induktion erwiesene Buchstaben- vertauschung laesst von der Wirkung einen Schluss auf die Ursache zu, naemlich, dass die beiden wechselnden Laute, auch wenn wir deren Verwandtschaft anderswoher nicht kennen, auf irgendeine Weise aneinander Grenzen muessen.



Law-like substitution of letters...occurs only between homorganic or homogeneous, at least homoiorganic (e.g. guttural and palatal letters, or those which in fact belong to two organs) or homoiogeneous sounds. An inductively demonstrated substitution of letters permits an inference as to the cause, namely that the two alternating letters must have something in common with each other, even if we do not know from elsewhere what their relationship is.

Pott illustrates his discussion with an example. s is phonetically related to r, and h to s (Pott's phonetic reasoning is rather un-convincing, though). Persian h can thus correspond to Latin r, since both correspond to Sanskrit s, although it is not possible to claim that h and r are phonetically related (5).

To sum up at this point, then, the early philologists tried to account for sound change in terms of quasi-phonemic LETTERS. Later workers found that sound change, the substitution of one letter for another over time, could be explained only with reference to phonetics, to the SOUNDS of which the letters

were conventional or idealised symbols. And again, if two or more letters are found to pattern together in historical change, they must have some phonetic features in common, even if the existing phonetic framework does not have the machinery to describe this adequately; but if the two letters clearly have no phonetic similarity, it will be found that they are separately derived from some segment earlier in the historical derivation with which both of them have phonetic features in common.

These statements lead to an implicit requirement of NATURALNESS in phonological description. Sound changes, like P-rules in Generative Phonology, are seen to operate on natural classes of phonemic segments. And it is also the case both that a natural class is defined on the basis of phonetic similarity, and that a natural class is a group of segments which pattern together in phonological processes (in this context, sound changes).

Indeed, it might be said that all phonological theory since the 19th century has been an attempt to explicate the notion of PROCESS. A process can be either temporal or derivational

(in Generative Phonology, these are similar in several important respects) (6). That is to say, it involves a derivation either from one *etat de langue* to another, or from systematic phonemics to systematic phonetics. In either case, a more or less abstract theoretical form is linked to a form pronounced by a certain group of speakers. The realisation on the part of linguists like Pott and Raumer that the idealised letter-segments of Grimm and Bopp had to be linked to their phonetic realisation in order to explain phonological processes gave substance to the dynamic view of language proposed by W v Humboldt, for whom language was *energeia* and *ein geistiger Prozess*.

Piaget (1968: 65) compares the dynamic model of Generative Grammar to the dynamic model of historical linguistics in the 19th century, in contrast with the exclusive synchronic orientation of early 20th-century Structural linguistics. This is because the theory and method of both historical linguistics and Generative Grammar can be expressed in terms of PROCESSES linking SYSTEMS. In the terms used by Hockett (1948), both are ITEM AND PROCESS models as opposed to Structural linguistics, which is an ITEM AND ARRANGEMENT model

(7). This viewpoint is perhaps an interesting alternative to the one proposed by Chomsky (1972) which I quoted in chapter 2: instead of Philologie and Structural linguistics being the hiatus between Cartesian linguistics and Generative Grammar, Structural linguistics is seen to be the hiatus between Philologie and Generative Grammar - at least as far as the phonetics-phonology relation is concerned.

#### Notes

(1) The text of Dionysius, with the scholia, can be found in Anecdota Graeca ed. Becker, Berlin 1814-1821. Dionysius' phonetic framework is described in section vi of the text.

(2) It is interesting to note that William Jones appears to assume that this neutral position is universal. The Sanskrit phonetic treatises do not say it is language-specific, which it is, but then again they were only dealing with Sanskrit so the statement cannot be taken in an absolute phonetic sense. On the other hand, William Jones being an astute practical phonetician had an appreciation of the language-specific nature of articulatory setting. In the Dissertation (1807:

288), discussing the phonetic inventory of Sanskrit, he speaks of

the hard labial pa, formed by a strong compression of the lips, which so ill suits the configuration of an Arabian mouth, that it cannot be articulated by an Arab without much effort.

(Sievers' treatment of Indifferenzlage will be discussed in my next chapter.) William Jones' unempirical notion of the neutral position is still current. Chomsky and Halle (1968: 300) base their phonetic framework on a neutral position which might be suitable for a phonological description but not a universal phonetic one, because it is the articulatory setting of a North American English dialect. For criticism, see Annan (1972) It is notable that later in the same work (1968: 295) Chomsky and Halle mention the "articulation base" of particular languages as something excluded from phonetic transcription. For a general discussion of articulatory setting, see Honikman (1964).

(3) William Jones was not alone in his interest in developing

an international phonetic alphabet. Interesting phonetics was done through the 17th and 18th centuries, especially in England, where it was encouraged by the Royal Society. It must be said, however, that the motivation for phonetic research at this period was usually other than linguistic: its results were applied in such fields as short-hand, orthoepy and French teaching (see Gimson 1962: chap. 6, and references there). Chomsky (1964: 67) remarks:

It is worth noting that there are much earlier studies of articulatory phonetics with a view toward establishing a universal phonetic theory, for example, in the English phonetic tradition, the extensive distinctive features analysis developed by Wallis, Wilkins and others in the 17th century. It is difficult to imagine what might be the basis for the fairly commonly-held view that Western scholars, prior to the 19th century, "had not observed the sounds of speech, and confused them with the written symbols of the alphabet" (Bloomfield).

Research clearly needs to be done on the phonetic framework of the Royal Society phoneticians to establish how justified the

claims made for them in the above passage are. But I think it most likely that the kind of universal phonetic alphabet proposed by Wallis and Wilkins was not intended as a framework for empirical work in comparative phonetics or phonology, but as part of the Real Character project - cf. the quotation from William Jones and comments at the beginning of this chapter. This is not surprising, if true, since Wilkins is the well-known author of an *Essay toward a Real Character* (1668).

(4) An indirect link exists between William Jones and the early German school. Jones' acquaintance and student Hamilton returned from India at the end of the 18th century and lived in Paris, where F Schlegel learned Sanskrit from him (see Arens 1955: 139; Aarsleff 1966: 138).

(5) Percival (1974) has drawn attention to the importance of W v Humboldt as a practical linguist in his monograph on *Javanese Ueber die Kawi-Sprache* (1838). Humboldt examined the following problem of initial mutation in Javanese:

VERBS

NOUNS

VERBS

NOUNS

m	w/p	ng	h
n	t	ngr	r
ny	ch/s	ngl	l

Humboldt reasoned that historically the verb forms must be derived from the nouns, because the initial consonants of the verbs, being all members of the natural class of nasals, must be the output of a process. He writes (1838: 97, quoted by Percival 1974: 388):

Die Uebereinkunft der Laute deutet an, dass sie etwas Gemeinschaftliches an sich tragen, und weist dadurch auf eine gemeinschaftliche Ursache, eine kuenstliche Bildung hin, indess die zweite Reihe die Verschiedenheit der Konsonanten an sich traegt, welche die Anfangsbuchstaben der Woerter einer Sprache ueberhaupt haben; in ihr scheint also der natuerliche, Ursprungliche Zustand zu liegen.

The state of the sounds shows that they have something in common, and thus implies a common cause, an artificial formation, in that the second series contains all different consonants that might be expected in the initial consonant



inventory of a language; it thus seems to represent the natural, original situation.

This discussion of Humboldt's reported by Percival (1974) shows that even before Raumer and Pott, Humboldt realised the necessity of phonetic explanation in historical phonology.

(6) The following statements are fairly typical of the position in Generative Phonology:

1. "In the traditional approach to sound change, a 'sound law' is an observed correspondence between two stages of a language, a formula expressing the relationship between the phonetic representation of formatives before and after the change. The effects of a change, therefore, are incorporated directly into the lexical representations of individual formatives. In our approach, on the other hand, a rule that is added to the grammar may continue to function for many generations without causing changes in the lexical representations" (Chomsky & Halle 1968: 250f).

2. Synchronic alternations are vestiges of diachronic change

(Schane 1973).

3. Sound changes, in the synchronic viewpoint, are rules (Newton 1972: 4).

4. "There is not much difference between phonology and historical phonology" (King 1973).

Chomsky & Halle, in the passage quote above (1968: 250f) cite the important statement by Bloomfield in his Menomini Morphophonemics (1939: 105f) in which he sets up base forms and ordered rule statements which recapitulate the historical development of Menomini from Proto-Algonquian.

(7) Hockett in the same essay expressly identifies the ITEM AND PROCESS model with 19th-century linguistics when he says (1948: 386):

Rigorous work with historical linguistics, as everyone knows, preceded almost all rigorous descriptive work; the carry-over of "process" terminology from historical discussion is natural enough.

Here Hockett is referring to the phonemic practice of the early American Structuralists: Bloomfield and Sapir - due no doubt to their Junggrammatiker training.

## Chapter 4: THE JUNGGRAMMATIKER

Es muss in solchem Falle sozusagen eine Regel fuer die Unregelmassigkeit dasein; es gilt nur, diese ausfindig zu machen. (Verner 1877: 101)

In such cases there must be as it were a rule for the irregularity; it is just a question of discovering it.

Verner was laying down a principle for linguistic theory: that of total accountability. Linguistic theory must account adequately for all the data, with as few exceptions as possible. The problem which Verner solved was one of morphophonemic alternation. In the Germanic verb conjugation, voiceless fricatives alternate with voiced stops:

kveθana-      kvaθ      kvadum      kvedana-

The explanation for this, Verner argued, must lie in one of the four grammatical processes for verb conjugation in Indo-European:

1. endings
2. length of stem-vowel
3. augment and reduplication

## 4. accent shift

As is apparent from the examples quoted, the 0 - d alternation cannot be conditioned by any of the first three processes; therefore it must be the fourth. Verner concluded that Indo-European voiceless stops first went to Germanic voiceless fricatives, and that, along with the original Indo-European fricative s, they became voiced in inter-vocalic position, but remained voiceless if the root-syllable was accented (1).

The position that linguistic theory should completely determine the data, as enunciated by Verner, has to be seen against the background of Determinism (cf. my chapter 2). The Deterministic view of language which characterised the Junggrammatiker can be understood with reference to their conception of language as being precisely speech behavior. It is associated with the development of Laut-physiologie or articulatory phonetics (see Arens 1955: 277f).

Sievers, in his Grundzuege der Phonetik (1876), expresses the Junggrammatiker view that sound change has to be explained phonetically. Thus he writes (1876: 37):

...Eine wissenschaftliche Lautlehre kann... nur auf dem Grunde richtiger Erkenntnis des Wesens der Laute aufgebaut werden; die Funktionen derselben koennen zwar fuer die Untersuchung der Laute selbst Fingerzeige geben...aber sowohl die Einwirkung der einzelnen Laute aufeinander wie ihre selbststaendige Veraenderungen empfangen direkt von ihnen aus nur in den seltensten Faellen Licht.

...A scientific theory of sounds can...be built only on the basis of a correct knowledge of the nature of sounds; the functions of the sounds may indeed provide clues for the investigation of the sounds themselves...but both the effect of sounds on each other and their independent changes are illuminated only rarely by (their functions).

Sound change, according to Sievers, should be described in terms of the articulatory parameters of the sounds in question (1876: 7):

...denn das, was wir LAUTwandel nennen, ist ja erst eine sekundaere Folge der Veraenderungen eines oder mehreren derjenigen ARTIKULATIONS- faktoren durch deren zusammenwirken

ein Laut erzeugt wird.

...For what we call SOUND change is really only a secondary consequence of the changes of one or more of the ARTICULATORY factors by means of whose combination a sound is produced.

A major argument for the phonetic basis of sound change is that sound changes operate on natural classes of sounds. Sievers writes (1876: 6):

...Im allgemeinen ist es nicht der einzelne Laut, welcher nach gewissen, ueberall gueltigen Gesetzen der Veraenderung unterliegt, sondern es findet gewoehnlich eine korrespondierende Entwicklung KORRESPONDIERENDER LAUTREIHEN statt; ja in der Regel werden sich auch noch besondere Gesichtspunkte aufstellen lassen, welche die Veraenderung einer solchen Lautreihe aus dem Gesamthabitus des Systems unter der speziellen Stellung jener Reihe in ihm erklaren helfen.

...In general it is not the individual sound that undergoes change according to specific universally- valid laws, but

rather a corresponding development of CORRESPONDING SERIES OF SOUNDS occurs; indeed, it will generally be possible to fix on particular aspects that help to explain the change of such a series from the overall characteristics of the system and the special position of that series in it (2).

It is clear from this statement that the sounds of language add up to some kind of system. This system is not conceived of as a mere aggregate either, because Systemzwang is clearly seen to be one of the factors conditioning the direction of linguistic change. Sievers further observes that the sound system is to be regarded as a matrix of relations (1876: 7):

Vor allen Dingen suche man sich einen genauen Einblick in den BAU jedes zu behandelnden Laut- SYSTEMES zu verschaffen; man wird gut tun, dabei stets im Auge zu behalten, dass dieser nicht so sehr durch die Anzahl der zufaellig in ihm zusammengewuerfelten Laute an und fuer sich, als durch das Verhaeltnis dieser einzelnen Glieder untereinander bedingt wird...

Above all one should get an exact understanding of the



STRUCTURE of each sound SYSTEM under investigation; it is well always to keep in mind that the system is determined not so much by the number of sounds that happen to occur together in it as by the relation of these individual members to each other...

That this structural view of the sound level of language implies something akin to a phonemic principle is suggested by the following statement of Sievers' (1876: 103):

Wir brauchen nicht zu wissen, wieviele Vokal- nuancen es ueberhaupt gibt, sondern in welcher Weise das Vokalsystem einer jeden einheitlichen Sprachgenossenschaft zusammengesetzt ist...und wie dieses System sich zu anderen ebensolchen Systemen verhaelt...

We do not need to know how many shades of vowels exist, but how the vowel system of any unfied speech community is composed...and how this system relates to other such systems...

Similar considerations would appear to have led Sweet to the

idea of a BROAD TRANSCRIPTION - an idea which is very close to Structural phonemics (cf. Jakobson 1966). Sweet's practical notion was based on the criterion of distinctions in meaning. He formulated it as follows (1911: 251):

A broad notation is one which makes only the practically necessary distinctions in each language, and makes them in the simplest manner possible, omitting all that is superfluous. From a practical point of view the necessary distinctions are those on which the differences of meaning depend.

The same criterion of distinctions in meaning was used by Baudouin de Courtenay in his proposal, contained in his book *Versuch einer Theorie der phonetischen Alternationen*, 1895 (for details, see Wells 1974: 441-444. I will have more to say about Baudouin's theory presently).

An important point to note here, however, is that in the discussions of Sievers and his contemporaries, the notion of "sound structure" in language is invariably linked to the notion of ARTICULATORY SETTING (cf. my chapter 3 fn 1). Thus Sievers, discussing comparative dialect phonology, says (1876:

103) :

Man unterlasse also nie, zu untersuchen, ob sich die Abweichung der Einzelvokale zweier oder mehrerer Systeme nicht auf ein gemeinsames, die Stellung der Systeme ohne weiteres charakterisierendes Prinzip zurueckfuehren lassen. Solche Prinzipien sind beispielsweise die staerkere oder geringere Beteiligung der Lippen, verschiedene Stufen der Nasalisierung. Ferner gehoert hierher namentlich auch eine durchgehends bei allen Vokalen des Systems abweichende Lagerung der Zunge, die wahrscheinlich von Differenzen in der Ruhelage der Organe herruehrt.

One should therefore be careful always to consider whether the deviations of the individual vowels of two or more systems can not be traced back to a common principle which of itself characterises the arrangement of the systems. Such principles are for example greater or lesser lip action, different degrees of nasalisation. A deviant position of the tongue through all the vowels of the system, which probably stems from differences in the neutral position of the organs, also belongs here.

Viotor (1884: 270ff) refers to this passage of Sievers and to Storm's similar concept of Mundlage, and gives a detailed comparison of the articulatory settings of German, French and English (3) along the lines suggested by Sievers (1876: 103f). Paul (1880: 56f) - the context is a discussion of "ease of articulation" as a factor in sound change - says:

Es besteht in allen Sprachen eine gewisse Harmonie dieses Lautsystems. Man sieht daraus, dass die Richtung, nach welcher ein Laut ablenkt, mitbedingt sein muss durch die Richtung der übrigen Laute. Wie Sievers hervorgehoben hat, kommt dabei sehr viel auf die sogenannte Indifferenzlage der Organe an. Jede Verschiedenheit derselben bedingt natürlich auch eine Verschiedenheit in Bezug auf die Bequemlichkeit der einzelnen Laute.

In all languages there is a certain harmony of the sound system. One can therefore see that the direction in which a sound shifts must be conditioned by the direction of the other sounds. As Sievers has emphasised, this has a lot to do with the so-called neutral position of the organs. Any difference

in this naturally also conditions a difference in the case of articulation of sounds.

Jespersen (1899: 246ff) writes that the general character of a given language can be studied in two related ways, namely ARTICULATORY SETTING and what he calls *lautliche Oekonomie der Sprache* (phonetic economy of the language). Sweet (1890: 184ff) similarly discusses what he calls the "organic basis" or "basis of articulation" as a language-specific tendency controlling the phonetic inventory of a given language. It is interesting that Sweet observes that a language need not always exhibit a phonetic inventory completely consistent with its own articulatory setting; the criterion of meaning distinctions may be in effect. Thus English keeps its dental fricatives [θ] and [ð] for the sake of "distinctiveness" in many words, although they do not fit in with the "tongue retracted" setting of present-day English. The same observation is made by Vietor in his discussion of English (p. 272 of the 1903 edition), though he attributes it to Passy (1900: 245). Vietor also sees the "tongue retracted - lips neutral" setting of English as the explanation for the absence of front rounded vowels in English. Similarly, Jespersen

(1899: 251) observes that the "tongue tip advanced" setting for French explains why it has [p] but no [ɱ]. Thinking along the same lines as Sweet, Passy and Vietor did regarding the question of the English dental fricatives, Jespersen explains his notion of lautliche Oekonomie in the following manner (1899: 248):

Gewisse Unterschiede, die in einigen Sprachen eine sehr grosse Rolle spielen und zur Unterscheidung sonst gleichlautender Woerter gebraucht werden, spielen in anderen gar keine oder eine ganz verschwindende Rolle.

Some distinctions which are very important in some languages and are used to distinguish otherwise homophonous words are of little or no importance in other languages.

Jespersen illustrates this with reference to the feature of voicing in English and Danish. His statement, involving as it does the notions of DISTINCTIVE FEATURE and MINIMAL PAIR, leads on to Sweet's proposal (1906: 202) that the IPA should set up a standardised system of broad transcription for each language in addition to the International Phonetic Alphabet

- an idea which already brings us close to the phonemic principle of Structural phonology.

But why was the notion of SOUND STRUCTURE bound up with the notion of ARTICULATORY SETTING in the thinking of Sievers and his contemporaries? The question seems all the more pertinent, as the 20th-century notion of PHONOLOGICAL STRUCTURE has on the whole had no association with the notion of articulatory setting (4), the latter being generally ignored or forgotten. One need only think of Trubetzkoy's (1939: 47f) image of the phonological structure of a language as a kind of sieve: this notion, at first glance quite similar to the notion of articulatory setting, is in fact quite different, because it is based on the criterion of distinction of meaning only, and is oriented primarily to the hearer's perception of speech.

The answer to the question is this. For the Junggrammatiker and contemporaries, phonetics is the key to sound change because sound change operates on natural classes defined by phonetic features. Therefore, their conceptualisation of the structural idea, which became quite important to them due to

their interest in dialectology, is necessarily defined with reference not to an abstract matrix of relations but to a PHONETIC reality: articulatory setting. The epistemological background of 20th-century Structural phonology is somewhat different. PHONOLOGICAL STRUCTURE, in the 20th century, is not a more or less direct inference from vocal tract behavior, but a formal model of an underlying psychological reality and a social institution (5).

It is notable that the Junggrammatiker, with their exclusive orientation to parole, were of the opinion that sound change is not only a physiological phenomenon but also has a psychological dimension (6). Thus Brugmann and Osthoff (1878: p.iiiif) state:

Der menschliche Sprechmechanismus hat eine doppelte Seite, eine psychische und eine leibliche... Selbst die gewoehnlichsten Lautveraenderungen, wie zB der Uebergang von nb in mb, von bn in mn, oder die Umstellung von ar zu ra sind, wenn man bloss vom lautphysiologischen Standpunkt ausgeht, nicht begreiflich. Es muss notwendigerweise noch hinzukommen eine Wissenschaft, welche ueber die Wirkungsweisen der



psychischen Faktoren...umfassende Beobachtungen anstellt...

The human speech mechanism has two aspects, a psychological and a bodily one... Even the most common sound changes, such as nb going to mb, or bn to mn, or the metathesis of ar to ra, are incomprehensible if one looks at them from the viewpoint of articulatory phonetics alone. An additional science is needed to provide detailed observations about the operation of the psychological factors...

Physiological phonetics would thus have its counterpart, which would be an experimental psychology of verbal behavior in the individual subject. This is important to bear in mind when we consider what linguistic phonetics toward the end of the 19th century thought the meaning-distinguishing level or broad transcription to be. This level of analysis is to be understood in the context of individual psychology. This had to be so for the Junggrammatiker, because of their exclusive orientation to parole. As Paul (1880: 11) says:

Alle psychischen Prozesse vollziehen sich in den Einzelgeistern und nirgends sonst.

All psychological processes take place in individual minds and nowhere else.

For Paul, one of the elements of speech, along with production and kinesthetic feedback (*Bewegungsgefuehl*), is what he calls the *Laut- bild* (sound image). This is stored in the brain during the period of language acquisition, and it is a force for constancy in the realisation of sounds by speakers. This phonemic notion of a normalised sound has affinities with Saussure's notion of the *image acoustique*. It can also be compared with the phonemic theory of Baudouin de Courtenay (1895). Baudouin called his phonemic level *Psychophonetik*, where the units of analysis were ideal or intended sounds, in contrast with the level of actual speech performance, called by Baudouin *Physiophonetik*. This PSYCHOLOGISTIC theory of phonemics as an ideal, potential behavior pattern residing in the individual would later be criticised by Trubetzkoy (1939) (to be discussed in my chapter 5; cf. also the discussion of anti- psychologism in chapter 2). Baudouin's theory is nonetheless typical of the orientation of linguistics to individual verbal behavior in the latter part

of the 19th century. The centrality of this notion is illustrated by the following three dogmas of the Junggrammatiker, which are also familiar from the theoretical framework of the American Structuralists, their successors through Bloomfield (7):

1. Sound change belongs to the sphere of parole. Brugmann and Osthoff (1878: p. xii) say

...dass...alle Veraenderungen im Sprachleben nur von den sprechenden Individuen ausgehen koennen...

...that...all changes in the life of language can be caused only by individual speakers...

This is of course the view expressed by Saussure in the Cours (1916): langue is timeless and immutable, therefore change in langue can only have an external cause, namely parole.

2. The only empirical reality in linguistics is the idiolect. Thus Paul (1880: 37):

Gehen wir von dem unbestreitbar richtigen Satze aus, das jedes Individuum seine eigene Sprache und jede dieser Sprachen ihre eigene Geschichte hat...

Let us start with the unassailably correct assertion that every individual has his own language and that each such language has its own history...

The existence of languages in speech communities is explained by the principle of the density of communicative interaction.

3. Sound change is related to language acquisition (8). Paul again writes (1880: 58):

Man wird also wohl sagen koennen, dass die Hauptveranlassung zum Lautwandel in der Uebertragung der Laute auf neuen Individuen liegt. Fuer diesen Vorgang ist der Ausdruck Wandel, wenn man sich an das wirklich Tatsaechliche haelt, gar nicht zutreffend, es ist vielmehr eine abweichende Neuerzeugung.

It can therefore be said that the chief cause of sound change

lies in the transmission of sounds to new individuals. For this process, the term change is thus factually incorrect; it is rather a deviant new production.

This is similar to the widely-accepted explanation of linguistic change proposed by Kiparsky (1968b): language is recreated by every child on the basis of the data perceived, and so each generation has a slightly different grammar.

The Junggrammatiker and their contemporaries anticipated the structural and phonemic principles of 20th-century linguistics, but their point of view was phonetic and psychological rather than phonological and social. Their empirical and historical standpoint can be expressed thus: the STRUCTURE of language cannot be discerned without the FUNCTION (cf. Collingwood 1946: 221f). This is the basis of Paul's argument (1880: 20f) that linguistics, if it is to be scientific, must be historical. Paul says that the purpose of cross-linguistic or cross-dialectal comparison is to set up base forms (Grundformen) from which the related forms in the different dialects can be derived. The task of linguistics is thus

...nicht bloss zu konstatieren, was sich in den verschiedenen Sprachen oder Mundarten gegenseitig entspricht, sondern aus dem Ueberlieferten die nicht ueberlieferten Grundformen...zu rekonstruieren...

...not merely to find out what corresponds to what in the various languages or dialects, but to reconstruct...the unknown base forms on the basis of what is known...

It is impossible to account for comparative data without being historical in approach:

...Man konstatiert zwischen verwandten Formen und Woertern einen Lautwechsel. Will man sich denselben erklæeren, so wird man notwendig darauf gefuehrt, dass derselbe die Nachwirkung eines Lautwandels, also eines historischen Prozesses ist.

...We discover a sound alternation between related forms and words. If we want to explain this, we must conclude that it is the result of a sound change, that is, a historical process.

This is similar in many ways to the position in the standard theory of Generative Phonology (9). Phonological alternation among the dialects of a language is accounted for by relating the outputs of the different dialects to one pandialectal underlying form in each case. The underlying forms are related to the different outputs by dialect-specific rules or rule sequences (10). Thus phonological description and explanation is close to the diachronic perspective (cf. my chapter 3 fn 5). The linking of systematic phonemics to systematic phonetics typically recapitulates - but by no means completely - the history of the language. In terms of the Naturalness Condition, if the underlying forms are identical to the surface forms of an earlier *etat de langue*, they must indeed be "natural" in a very real sense. The Junggrammatiker were concerned precisely with the naturalness of phonological processes. Sound changes, which are diachronic processes, operate on natural classes; as do P-rules, which are synchronic processes, in Generative Phonology. Paul, emphasising the phonetic nature of diachronic change, says (1880: 24):

...Zwischen Abstraktionen gibt es ueberhaupt keinen Kausalnexus, sondern nur zwischen realen Objekten und Tatsachen.

...There can be no causality relation between abstractions, only between real objects and facts.

On the other hand, the Junggrammatiker had a Nominalist attitude to the reconstructed base forms of Indo-European, regarding them only as formulae rather than as pronounceable forms in a language (Robins 1967: 184). Thus Brugmann and Osthoff (1878: p. vi) remark that the Indo-European Grundformen are "rein hypothetische Gebilde" (purely hypothetical structures). Kiparsky (1974: 335) says that in the earlier part of the 19th century it was generally assumed that reconstruction results in the surface phonetic forms of the proto-language (11). The unwillingness of the Junggrammatiker to make this assumption can be regarded as a consequence of their empiricism: the "starred forms" of the Indo-European Ursprache could not be attributed any reality because they were unattested and presumably unattestable. It was precisely this attitude to the Ursprache that enabled the



Junggrammatiker to work with very abstract proto-forms arrived at by a rigorous procedure of inductive generalisation from the comparative data; the most striking example of this being Saussure's Mémoire sur le système des voyelles en indo-européen (1879), where Saussure was led to postulate distinctions in the proto-language which did not receive empirical corroboration until the discovery of Hittite. The abstract structural analysis of Saussure leads us on to 20th-century phonology, and it is with the development of Structuralism that we will be concerned in the next chapter.

#### Notes

(1) Halle (1964) discusses the historical order in which Grimm's and Verner's laws applied according to Verner's analysis. He argues that the two laws were thought to occur in ordered sequence on the grounds of an implicit criterion of simplicity used in Verner's argument.

(2) Cf. Sweet's almost identical formulation, in his *Practical Study of Languages* (1899: 29):

Phonetics is not merely an indirect strengthener of grammatical associations, it is an essential part of grammar itself. It enables us to state grammatical and philological laws with a brevity and definiteness which would be otherwise unattainable, as when we condense the information that under certain circumstances in a given language d becomes t, g becomes k, and b becomes p, into the simple statement that "voice stops become breath".

(3) It will be observed that all the authors referred to use as data for their discussions the articulatory settings of German, French and English. This illustrates how, as Malmberg (1968: 12) remarks, the classic phoneticians whose work is enshrined in the IPA chart worked with "unconsciously phonemic interpretations" Based on the languages they were familiar with. Another interesting illustration of the thinking of the classic phoneticians is the discussion of the segment [h] by Vietor (1884: 19). He says that the h sound familiar from English and German (and some varieties of French) is phonetically a voiceless version of the following vowel; but linguistically ("der sprachlichen Auffassung") it is a consonant, so it is best to represent it as [h]. If

there is a moral to all of this, it is that phonetic theory is not immutable, but changes and evolves with our general understanding of linguistic phenomena, because it is bound up with the functional view of language, phonology.

(4) A partial exception is Sapir's notion of phonetic DRIFT. Sapir states (1921: 181):

More often the phonetic drift is of a more general character. It is not so much a movement toward a particular set of sounds as toward particular types of articulation.

However, he does not seem to have incorporated this diachronic insight into his phonemic theory, which is synchronic.

(5) Cf. also here the synthesis of Grammont (1933), who refers to the work of Rousselot, but has also incorporated the insights of Saussure. He refers to phonetics (1933: 5) as

la base solide et indispensable de la LINGUISTIQUE.

(6) That is, linguistic change is a mentalistic phenomenon, in

Postal's (1968) terms.

(7) See further discussion in chapter 5.

(8) The notion that ONTOGENY REPEATS PHYLOGENY in the case of language acquisition and linguistic change has a long history. It is as old as the experiment of Psammeticus reported by Herodotus. In the 19th century, it is notable that Darwin wrote an essay on the acquisition of language by his son (quoted by Bar-Adon and Leopold 1971: 26ff), and that Schleicher wrote a similar piece (quoted by Bar-Adon and Leopold 1971: 19ff) in which he expressly compares the phenomena of acquisition of a number of sounds with similar data in Indo-European historical phonology.

(9) Before Generative Phonology, similar ideas were proposed by Wells (1947: 11), who says - the context is a discussion of the views of Saussure on dialect geography:

Now de Saussure relegate dialect geography to external linguistics...presumably on the ground that it studies correlations between langues and something else. However,

could we not consider that dialect geography is the spatial analog of diachronic linguistics in that it considers contemporaneous cognate systems as they are arrayed in space rather than in time... There would be no DIRECTION to the array - nothing corresponding to the earlier and later of time. Of two contemporaneous dialects, one could not be singled out as cause and the other as effect.

In Generative dialectology, however, there is something corresponding to "the earlier and later of time": extrinsic rule ordering. See Newton (1972).

(10) Perhaps the most comprehensive example of this is Newton (1972). He states (1972: 3) that

Dialects arise because many sound changes fail to diffuse over the whole speech community.

(11) The conception of the Ursprache current in the earlier 19th century may still echo however faintly William Jones' notion of Sanskrit as a Real Character (see my chapter 2 fn. 1).

## Chapter 5: STRUCTURALISM

As we have seen, the notions of STRUCTURE and PHONEME were in some form current in linguistic and phonetic theory in the last quarter of the 19th century. Nevertheless, these notions were developed against a background of phonetics and individual psychology, so that we really cannot yet speak of a phonemic principle or a structural principle *avant la lettre*. But at around the same time, toward the end of the 19th century, developments were taking place in the conceptual framework of knowledge: in particular, the logical and anti-psychologistic movement in philosophy led by Frege and Husserl, and the parallel development in social science led by Durkheim (cf. my chapter 2). In conformity with this development of the conceptual framework of science and philosophy, the emphasis in linguistics from the end of the 19th century on moves from the study of language variation in space and time to the formalisation of theoretical models. F de Saussure is regarded as the founder of Structuralism in 20th-century linguistics and social science in general, but we find that Saussure has little to say in the *Cours* about phonological structure or the phonetics-phonology relation,

and his views on this subject must be inferred from his discussion of the linguistic sign (Wells 1947: 3) and his fundamental distinctions between langue and parole, and synchronic and diachronic. In a well-known passage of the Cours (1916: 169), Saussure declares that

La langue est une forme et non une substance.

This statement is to be understood in connection with the concept of STRUCTURE. The structure of language is a self-regulating totality, and it is constituted by a set of logical interrelations: the elements of the structure are defined not intrinsically but in terms of their relation to each other.

Following the Saussurean dichotomy, Trubetzkoy in his Grundzuege der Phnologie (1939) states that there are two kinds of Lautlehre or metalanguage about the sounds of language: phonetics studies parole, which he calls Sprechakt (speech act), and phonology studies langue, which he calls Sprachgebilde (language structure). This dichotomy is required because the units of phonetic analysis are (in some

sense) empirically observable entities, whereas the units of phonological analysis, being constituents of a structure, exist only in their relations to each other. Phonetics studies entities, phonology relations. This view is expressed as follows by Trubetzkoy (1939: 15):

Die Phonologie ist die Lautlehre des Sprachgebildes, die Phonetik die Lautlehre des Sprechaktes, dabei befasst sich die Phonologie notwendigerweise mit der sprachlichen Funktion der Sprachlaute, die Phonetik dagegen mit der phänomenologischen Seite der Sprachlaute, ohne Rücksicht auf ihre Funktion. Dieser Unterschied findet sein Grund darin, dass das Sprachgebilde als soziale Institution eine Welt von Beziehungen, Funktionen und Werten der Sprechakt hingegen eine Welt der empirischen Erscheinungen (ist)... Man findet dieselben Verhältnisse in allen sozialen Wissenschaften, soweit sie sich mit der sozialen Verwertung materieller Dinge befassen. In allen solchen Fällen muss die soziale Institution als solche von den konkreten Handlungen, in denen sie sich sozusagen realisiert und die ohne sie nicht möglich wären, streng getrennt werden, wobei die Institution in den Beziehungen und Funktionen, die auf sie bezogene Handlung aber



von der phaenomeno- logischen Seite untersucht werden muss.

Phonology is the sound-theory of langue, phonetics the sound-theory of parole; phonology is necessarily concerned with the linguistic function of speech sounds, whereas phonetics is concerned with the phenomenological aspect of speech sounds without reference to their function. The reason for this distinction is that langue being a social institution belongs to a world of relations, functions and values, whereas parole belongs to a world of empirical phenomena... The same situation occurs in all social sciences, in that they deal with the social evaluation of material things. In all such cases, the social institution as such must be rigorously distinguished from the concrete actions in which it as it were realises itself and without which it would not be possible; the institution must be studied in relations and functions, the related action from the phenomenological aspect (1).

This view is a consequence of Saussure's distinction between langue and parole. Wells (1947: 1) describes it as "untenable", and formulates it as follows:

The idea that the formal systematic properties of phonemes are independent of their specific quality...

It was untenable for the American Structuralists because of their radical empiricism and reductionism, inherited through Bloomfield from the Junggrammatiker (cf. my chapter 4). For the American Structuralists, as for the Junggrammatiker, there is no *langue*, only *parole* (2). Furthermore, the phonemic level of analysis is no more than an inductive generalisation, and it is logically difficult to claim any ontological status for it. This latter Nominalist view was expressed by Twaddell (1935) when he said that the phoneme is merely a convenient fiction of linguistic analysis and that there is no reason to claim any kind of psychological reality for it, appealing to the Saussurean view that the elements of linguistic analysis have no independent existence apart from their "otherness". Twaddell's statements seem to have been intended as an answer to the views of Sapir, for whom the phoneme is definitely a psychological reality for native speakers (see Sapir 1925, 1933).

The "hocus-pocus" view of linguistics remained largely

unanswered in American Structuralism. If there is no langue, only observable parole, how can the phonemic level of analysis have independent existence outside the theoretical model of the linguist? Hockett (1948) asks the question "linguistics, game or science?", concluding somewhat tentatively that if linguistics is no more than a game, it must be the same game that the speakers are playing. But it is also interesting to note Hockett's observation (1961: 42; quoted by Postal 1968: 5 fn 2) that

morphophonemes...are artifacts of analysis or conveniences of description, not elements in a language.

which is in marked contrast with Sapir's ascription of psychological reality to the phoneme - since Sapir's phoneme, as is apparent from the two papers cited above, was abstract and MORPHOPHONEMIC, fore-shadowing the systematic phonemic level of Generative Phonology.

Trubetzkoy was aware of Twaddell's views and approved of his citation of Saussure; he comments (1939: 41):

Da das Phonem zum Sprachgebilde gehoert und das Sprachgebilde eine soziale Institution ist, ist das Phonem eben ein Wert und besitzt dieselbe Art von Existenz wie alle Werte. Der Wert einer Waehrungseinheit (zB eines Dollars) ist ebenfalls weder eine physische noch eine psychische Realitaet, sondern eine abstraktive und "fiktive" Groesse. Ohne diese Fiktion kann aber ein Staat nicht bestehen...

Since the phoneme belongs to langue, and langue is a social institution, the phoneme is a value and has the same mode of existence as all values. The value of a monetary unit (e.g. a dollar) is neither a physical nor a psychological reality, but an abstract and "fictional" quantity. But without this fiction a state cannot exist...

This statement by Trubetzkoy is however, only to be understood within the context of the Saussurean concept of langue: phonemes have no independent existence because they are not entia but relata; but the theoretical entity PHONEME, the phonemic level of analysis and the structure of language are real in an important sense. That this is so is shown by Trubetzkoy's discussion of Verwandtschaftsklassen or

relational classes (a notion of his which we will discuss shortly), where he writes (1939: 78ff):

Die Einteilung der Korrelationen in Verwandtschaftsklassen ist kein bloss theoretischer Kunstgriff. Sie entspricht vielmehr einer konkreten Realitaet... Die psychologische Realitaet der Einteilung der Korrelationen in Verwandtschaftsklassen...

The division of the correlations into relational classes is not a mere theoretical device. It corresponds to a concrete reality... The psychological reality of the division of correlations into relational classes...

Since phonetics deals with entia, and phonology with relata, they are different kinds of disciplines: phonetics is a Naturwissenschaft, phonology a Geisteswissenschaft (cf. discussion of these notions in my chapter 2). Phonetics deals with observable events, phonology with logical relations. The conclusion of Trubetzkoy's argument accordingly is (1939: 14):

Daher decken sich die Laute des Phonetikers nicht mit den Einheiten des Phonologen.

Therefore the phonetician's sounds do not correspond to the phonologist's units.

Trubetzkoy's doctrine of the dichotomy of phonology and phonetics did not become a permanent characteristic of Prague phonology in its later development, although it appears in an extreme form in the dichotomy of form and substance in the theory of the Copenhagen school. A new departure was announced by the Distinctive Feature theory developed by Jakobson (see Jakobson Fant and Halle 1951; Jakobson and Halle 1956). Distinctive Feature theory attempts to phonology in phonetics. Jakobson & Halle (1956: 19) call this the "'inner' approach to the phoneme" and advance it as the correct solution to

the crucial question (which) is the nature of the relationship between phonological entities and sound.

This approach is identified by Jakobson & Halle with that of

Bloom- field (1933). If phonetics is a Naturwissenschaft, and phonology is based on phonetics, then phonology is a psychological and a physical reality, and the Nominalist objections of Twaddell are obviated. The epistemological background to Jakobsonian Distinctive Feature theory, a Lautlehre consisting of classificatory parameters that are both phonetic and phonemic, is to be found in the phenomenological method in philosophy and social science developed by Husserl (see my chapter 2, and references there). According to phenomenological method, intuiting the essence of the phenomenon requires factoring out its defining properties, the essential characteristics of an entity which make it what it is. This is the basis of Jakobsonian Distinctive Feature theory (Jakobson & Halle 1956: 24):

Phonemic analysis is a study of properties, invariant under certain transformations.

Phenomenological method aims to link experience with discourse, and observation with metalanguage, in this manner (cf. Foucault's 1966 formulation quoted in my chapter 2). Jakobsonian Distinctive Feature theory is in this respect the

ancestor of Generative Phonology (3): the phonetic-phonological nature of the framework provides the motivation for the Naturalness Condition. As Postal (1968: 56) remarks:

The Naturalness Condition is concerned with a fundamental fact about human language - the emphasising of which fact is among Roman Jakobson's most important contributions. Namely, the relation between phonological and phonetic structures is a NATURAL one.

In view of the fact that linguistics since then has departed completely from the doctrine of the dichotomy of phonology and phonetics, it is important to examine carefully Trubetzkoy's conception of phonetics in the Grundzuege. According to Trubetzkoy, phonetics is indispensable to phonology (1939: 17):

Der Anfang jeder phonologischen Beschreibung besteht in der Aufdeckung der in der betreffenden Sprache bestehenden bedeutungsdifferenzierenden Schallgegensätze. Dabei muss die phonetische Aufnahme der betreffenden Sprache als Ausgangs-



punkt und als Material genommen werden.

The beginning of any phonological description consists of the meaning-differentiating sound- oppositions. The phonetic record of the language in question must be taken as the starting-point and as the data.

However, he goes on to say:

Allerdings sind die weiteren, hoeheren Stufen der phonologischen Beschreibung, die Systematik und die Kombinationslehre, von der Phonetik ganz unabhaengig. Somit ist ein gewisser Kontakt zwischen der Phonologie und der Phonetik trotz ihrer grund- saetzlichen Unabhaengigkeit unvermeidlich und unbedingt notwendig. Dabei duerfen aber nur die Anfangsteile der phonologischen und der phonetischen Beschreibungen (die Elementenlehre) aufeinander Ruecksicht nehmen, und auch da darf die Grenze des unbedingt Notwendigen nicht ueberschritten werden.

The further, higher areas of phonological description, patterning and tactics, are completely independent of

phonetics. Thus a certain amount of contact between phonetics and phonology is, in spite of their fundamental independence, inevitable and absolutely necessary. But only the initial parts of phonological and phonetic descriptions (setting up of elements) can take account of each other, and here too the limit of the absolutely necessary should not be exceeded.

Phonetics, although it is a Naturwissenschaft, has no primacy over phonology according to Trubetzkoy. For him, the functional view of speech sounds is primary. This view can be traced by to Sievers (1876: 24); but the difference between Sievers' PHONETIC view of the sound level of language and the 20th-century Structuralist view (as discussed in chapter 4 of this thesis) is apparent here, in that Sievers regarded the functional view as primary only in a historical sense and thought that progress in linguistics depended on phonetic knowledge, whereas Trubetzkoy says that the functional view is necessarily primary because the phonemic level is a psychological reality. (Cf. Swadesh 1934: 32: "Phonemes are...percepts to the native speakers...".) Trubetzkoy writes (1939: 37):

Positiv gegeben ist nur der konkrete kontinuierliche Schallstrom des Sprechaktes, und wenn wir aus diesem Kontinuum einzelne "Sprachlaute" heraus-schälen, so tun wir es eben, weil der betreffende Abschnitt des Schallstroms einem bestimmten Phoneme enthaltenden Wort "entspricht". Der Sprachlaut kann nur in seiner Bezogenheit auf das Phonem definiert werden. Geht man aber bei der Definition des Phonems vom Sprachlaut aus, so gerät man in einen circulus vitiosus.

Only the concrete continuous acoustic signal of parole is positively given, and when we abstract individual "speech sounds" from this continuum, we do it because the section of the acoustic signal in question "corresponds" to a particular word made up of phonemes. The speech sound can be defined only with reference to the phoneme. If one starts with the speech sound in defining the phoneme, one gets into a vicious circle.

Bloomfield (1933: 137) makes a similar statement:

Practical phonetics is an art or skill, not a science; the

practical phonetician frankly accepts his everyday recognition of phonemic units and tries to tell how the speaker produces them.

And Sapir's 1925 and 1933 papers mentioned earlier - especially his example of the perceptual errors of his phonetics students (1933: iii) - show a concern with the difficulties experienced by the field worker in getting rid of his own phonemic "set" for transcribing. The Jakobsonian position is expressed by Malmberg (1968) who says that the best approach is for the functional elements of language to be set up first by linguistic analysis, and then to find out what acoustic and physiological events correspond to those elements. Heffner (1950: 5) observed that general phonetics will not yield a universal taxonomy of speech sounds, because

{ descriptive phonetics can discern mutually exclusive classes of speech sounds only within a single language.

A universal phonetic alphabet would therefore have to be constituted by phonetic features rather than by speech sounds; and this is the case in Distinctive Feature theory from

Jakobson to Generative Phonology. Like Generative Phonologists, Trubetzkoy was of the opinion that the phonetic taxonomy should cover all the surface contrasts occurring in the languages of the world (1939: 81f):

Es handelt sich nunmehr darum, welche Schalleigenschaften in den verschiedenen Sprachen der Welt phonologische (distinktive) Oppositionen bilden... Unsere Aufgabe...ist ja nicht eine Systematik der Schallerzeugungs- moeglichkeiten des menschlichen Sprachapparats, sondern eine systematische Uebersicht der in verschiedenen Sprachen der Welt fuer die Bedeutungsunterscheidung tatsaechlich ausgenutzten Schalleigenschaften.

It is a matter of discovering what sound features constitute phonological (distinctive) oppositions in the languages of the world... Our task...is not a systematisation of the articulatory possibilities of the human vocal organs, but a systematic overview of the sound features actually used for the differentiation of meaning in the languages of the world.

Phonology, being part of langue, is a supra-individual SOCIAL

reality - not psychological, according to Trubetzkoy (4). Hence his criticism of the psychologicistic phonemic theory of Baudouin de Courtenay referred to in chapter 4 of this thesis. Trubetzkoy, reviewing the history of the phoneme concept, writes (1939: 37):

Zuerst wurde die Definition des Phonems in einer psychologistischen Ausdrucksweise gegeben. J Baudouin de Courtenay definierte das Phonem als das "psychische Aequivalent des Sprachlautes". Diese Definition war unhaltbar, da demselben Phonem mehrere Sprach- laute (als Varianten) entsprechen koennen, wobei jeder solche Sprachlaut ein eigenes "psychisches Aequivalent" - naemlich die ihm entsprechenden akustischen und motorischen Vorstellungen - besitzt.

The phoneme was at first defined in psychologicistic terms. J Baudouin de Courtenay defined the phoneme as the "psychological equivalent of the speech sound". This definition was untenable, since several speech sounds may correspond (as variants) to the same phoneme, in which case each speech sound has its own "psychological equivalent" - the

acoustic and motor images corresponding to it.

In other words, the phoneme cannot be defined by identifying it with the neural command for the production of the speech sound, because the phoneme may have several allophones, and since each of these different allophones will require a separate neural command, therefore the allophones are themselves centrally stored (cf. Heffner 1950: 65ff).

Trubetzkoy has this further comment on Baudouin's phonemic theory (1939: 12):

Der von J Baudouin de Courtenay vorgeschlagene Ausdruck "Psychophonetik" muss jedenfalls abgelehnt werden, da die Phonetik (die J Baudouin de Courtenay "Physiophonetik" nennen wollte) vielmehr mit psychischen Erscheinungen zu tun hat als die Phonologie, deren Objekte ueber-individuelle, soziale Werte sind.

The term "psycho-phonetics" (for phonology), suggested by Baudouin de Courtenay, must at any rate be rejected, since phonetics (called by Baudouin "physio-phonetics") has to do

with psychological phenomena rather than phonology, the objects of which are supra-individual social values.

{ Thus phonetics, which belongs to the sphere of parole, is individual and psychological. It has to do with the production and perception of speech sounds by the speaker.

To sum up, then, phonetics in the theory of the Grundzuege is both a Naturwissenschaft and an ancillary discipline to phonology. It is prior to phonology in the sense that the phonetic transcription provides the data for phonological analysis, and on the other hand phonology is prior to it in the sense that the functional view alone can determine segmentation and class membership in many cases. An illustration of the latter situation is provided by Trubetzkoy's discussion of mono- versus pluriphonematic analyses (1939: 54). He sets up a rule of procedure that what is a grouping of two or more sounds in the phonetic transcription should be regarded as a single phoneme

wenn dadurch ein Parallelismus im Phonem-inventar hergestellt wird.



if it enables a parallelism to be established in the phonemic inventory.

He gives the following example. A language has consonant clusters. There are sequences of [ts] and [tʃ]. Are each of these sequences made up of one or two phonemes? In this language, there are two series of stops: glottalised and non-glottalised. This distinction does not hold for fricatives. But [ts], [ts'], [tʃ], [tʃ'] occur. Therefore these sequences pattern with the stops. Therefore they are single phonemes (5).

This ambivalent attitude to phonetics in the Grundzuege is in many ways characteristic of 20th-century linguistics. It is notably reflected in the work of the American school. For them, the notion of an abstract, non-phonetic phonemics was "untenable" (Wells 1947:1) because of their empiricism; yet they held that phonetics is really not a part of linguistics at all, since linguistics is concerned only with phonemic pattern. We accordingly find situations such as the following:

1. As Fudge (1967: 8) points out, Nida (1949) set up the following vowel chart for a language:

----	FRONT	BACK
HIGH	i	o
LOW	e	a

Nida conceded that this classificatory schema did not make phonetic sense, but argued that it was convenient for framing the morpho- phonemic statements.

2. The American Structuralists had the usual practice of setting up consonant charts of the type

p	t	k
b	d	g, etc.

This kind of display of course implies a phonetic system of classification involving the parameters of place, manner, voice state and so on; the American Structuralists went so far as to speak of "gaps in the system" or "holes in the pattern"

where an empty slot occurred in the array.

3. The American Structuralists proposed to set up phonemic analyses using only distributional criteria; but they were forced to appeal to a supplementary criterion of PHONETIC SIMILARITY to avoid cases such as [h] and [ŋ] in English being assigned to the same phoneme because they are in complementary distribution.

A consequence of the exclusion of phonetics from linguistics by the American Structuralists was that the phonetic transcription came to be regarded as in some sense the DATA for phonology. This can be contrasted with the place of phonetics in the phonological theory of Firth (see Firth 1957). For Firth, phonetics is itself a theory and is therefore in no sense data. The data of phonology are PHONIC DATA, that is, speech. The phonetic transcription is a methodological tool for recording the phonic data. Phonology is a level of abstraction which aims to make as general a descriptive statement as possible in each case. The key Firthian term EXPONENCE refers to the realisation of the phonological elements in speech. Thus two different phonological elements

may have the same exponence in speech - as for example in Albrow's 1966 treatment of Welsh mutations, where [f] is the exponence of both phonematic p plus the soft mutation prosody, and of phonematic f. This implies an independent "abstractness" of phonology in relation to phonetics (6). In spite of Firth's avowed Nominalism, however, he clearly thought of the theoretical entities of phonology as possessing psychological reality, as is apparent from the final statement of his 1948 paper:

We speak prosodies and we listen to them.

The arguments against the doctrine of the dichotomy of phonology and phonetics are stated by Malmberg (1968) representing the Jakobsonian position. Malmberg finds the origin of what he calls this "unnatural division in the study of speech" in the parallel development of acoustic phonetics (which showed that there was no one-to-one correspondence between phonemic and phonetic segments) and Structural phonology, which became exclusively formal. Malmberg observes that Trubetzkoy and earlier Prague phonology, while postulating the dichotomy of phonology and phonetics,

consistently used phonetic features to define phonetic segments (7).

Trubetzkoy certainly was prepared to admit phonetics into phonology (the Elementenlehre of phonology, that is - 1939:17) more than the American Structuralists were. In the consonant-vowel opposition, for example, Trubetzkoy was of the opinion that it can be specified only in phonetic terms, not in phonological terms (such as distribution). He says (1939: 83):

"Vokal" und "Konsonant" sind LAUTLICHE, d.i. akustische Begriffe, und lassen sich nur als solche definieren. Jeder Versuch, die akustisch-artikulatorischen Begriffe bei der Definition der Vokale und Konsonanten aus- zuschalten oder zu umgehen, muss notwendiger- weise scheitern.

Consonant and Vowel are PHONETIC, i.e. acoustic concepts, and can only be defined as such. Any attempt to exclude or avoid acoustic-articulatory concepts in the definition of consonants and vowels must necessarily fail.

Accordingly, in Trubetzkoy's distinctive feature framework consonants are defined by Ueberwindungseigenschaften (manner features), vowels by Oeffnungsgradeigenschaften (height features), and both consonants and vowels by Lokalisierungseigenschaften (place features). But all this is still within the limits of Elementenlehre which Trubetzkoy set for the relations between phonology and phonetics. Language-specific phonemic patterning must in many cases determine the way these phonetic parameters are to be used in phonological description. A few examples of this from Trubetzkoy's material in the Grundzuege follow.

The segment [h] is in many languages "das unbestimmte Konsonanten- phonem ueberhaupt" (the minimally-specified consonant phoneme). Depending on the sound pattern of the language, /h/ may belong to the velar series, or to a laryngeal series (typically, if the language has a glottal stop). /h/ can of course be a Grenzsignal (boundary marker) in Trubetzkoy's framework. This is the case in classical Greek, where the spiritus asper is described (1939: 243) as  
  
gleichzeitig ein Phonem mit distinktiver Kraft...und ein

Signal des Wortanfanges...

both a phoneme having distinctive function ...and a word-initial marker...

This kind of phonological reasoning is close to that of Sapir, as described in his "Sound Patterns" paper (1925). It is also close in many ways to that of Firth. Firth of course was prepared to call [h] a consonant or a prosody, depending on the language. Trubetzkoy's Grenzsignal and Firth's Junction Prosody are of course very similar notions; Trubetzkoy (1939: 261) speaks with approval of an analysis of Tamil by Firth, in which there were more Grenzsignale than segment phonemes, and Firth (1948: 50) cites as exemplary Trubetzkoy's opinion that the phonetic notation system would have been better based on "prosodic" Greek writing than on the Roman alphabet. Firth, however, went even further in the abstractness of his phonological descriptions, making the consonant-vowel distinction itself language-specific (1948: 57):

Speaking quite generally of the relations of consonants and vowels to prosodic or syllabic structure, we must first be

prepared to enumerate the consonants and vowels of any particular language for that language, and not rely on any definition of vowel and consonant universally applicable. Secondly, we must be prepared to find almost any sound having syllabic value. It is not implied that general categories such as vowel, consonant, liquid are not valid. They are perhaps in general linguistics. But since syllabic structure must be studied in particular language systems, and within the words of those systems, the consonants and vowels of the systems must also be particular to that language and determined by its phonological structure.

Trubetzkoy has a similar conception of language-specific phonological structure in this passage (1939: 132):

In Sprachen, die eine einzige Liquida besitzen und wo eine palatale Lokalisierungsreihe besteht, laesst sich w also der labiale, y als der palatale und die einzige Liquida als die apikale Sonorlaut auffassen. Aber die Richtigkeit einer solchen Auffassung laesst sich nur dann nachweisen, wenn sie durch das Funktionieren des Systems oder durch einen grammatischen Wechsel verbuergt ist.



In languages which have only one liquid, and in which there is a palatal series, *w* can be specified as the labial sonorant, *y* as the palatal, and the single liquid as the alveolar. But the correctness of such a specification can only be established if it is supported by the functioning of the system or grammatical alternation.

Finally, an important example of Trubetzkoy's use of phonetic features in phonological explanation is provided by the concept of *Verwandtschaftsklassen* (relational classes). The concept can be situated in the theory of the *Grundzuege* briefly as follows. A *Korrelation* is the relation between two phonemes distinguished by a single feature: e.g. voicing, in the case of /p/ and /b/. *Korrelationen* can be sorted into *Verwandtschaftsklassen*. The notion thus implies a kind of hierarchy of features. A *Korrelationsbuendel* (correlation bundle) is a group of (three or more) phonemes each of which stands in two or more *Korrelationen* belonging to the same *Verwandtschaftsklasse*. An example of a *Korrelationsbuendel* is the threefold division of stops in Classical Greek: e.g. /p/, /b/ and /ph/. The two *Korrelationen* involved here -

voicing and aspiration - belong to the same Verwandtschaftsklasse. These groups of phonemes are often involved in neutralisation and morphophonemic alternation (1939: 78f). The notion of Verwandtschaftsklassen is an important one, not only because it is in many respects typical of Trubetzkoy's phonological theory, but also because it shows an awareness of the "phoneticity" of phonological rules. If we find NATURAL CLASSES of sounds patterning together typically in phonological processes in languages, we must assume - so long as we admit that there is a relationship between the phonological level and the phonetic level which has to be accounted for - that the two or more features defining the natural class in question are somehow related in the universal hierarchy of features (8).

The difference between classic Prague phonology as expounded in Trubetzkoy's Grundzuege and Generative Phonology is nonetheless clear. Trubetzkoy's phonology is STATIC, because it is a synchronic study of language; ARBITRARY, in the specific sense that phonological units are described with reference to the other units in the system rather than to their eventual phonetic realisations; and RELATIONAL, in that sound patterns

such as morphophonemic alternation are simply stated as such rather than derived from a base form. Trubetzkoy's is thus an ITEM AND ARRANGEMENT model. The standard theory of Generative Phonology is DYNAMIC, because a set of rules links systematic phonemics to systematic phonetics, and this in several important respects recapitulates diachronic evolution; NON-ARBITRARY in the sense that forms at the systematic phonemic level must be possible phonetic forms; and PROCESS-ORIENTED, in that sound processes are to be captured in the form of rules. Generative Phonology is an ITEM AND PROCESS model.

#### Notes

(1) The use of the word "phenomenological" in this passage of Trubetzkoy's should not of course be confused with the "phenomenological method" discussed later in this chapter and also in Chapter 2. The use of the word "phenomenological" to mean "phenomenal" or "having to do with (the perception of) real-world events" is common in German scientific writing, but it has nothing to do with the Phenomenology of Husserl.

(2) A clear expression of dissent from this Jakobsonian trend in Generative Phonology is to be found in Fudge (1967). Fudge is of the opinion (1967:2)

that phonology and the various phonetic levels are logically independent of each other, and, on the other hand, that it is the phonetician's task to investigate the relations which undoubtedly hold between them.

Phonological units must be abstract and non-phonetic, because (1967:8)

morphophonemic considerations often lead us to make groupings which are definitely counter-phonetic, and which hence cannot be handled in distinctive feature terms.

Fudge insists that (1967: 13)

distinctive features are PHONOLOGICAL and not phonetic.

His conclusion is that phonologists should "burn their phonetic boats" (1967: 26) and define their units of analysis

abstractly. In spite of Fudge's arguments, Generative Phonology in the succeeding decade has become increasingly dominated by the phonetic-oriented approach of "Natural" theory (see Chapter 1 of this thesis). A minority view of however represented by Foley's theory of phonology (see Foley 1970, Foley unpub.), which is a framework based on the data of morphophonemic alternation and historical change.

(4) A point of terminology here: when Trubetzkoy himself speaks of *psychologische Realitaet*, he clearly means social psychology. That this is the case with Sapir's "psychological reality" can be ascertained from a reading of his 1933 paper.

(5) This type of argument is still usual in phonology. An example is the discussion of Nupe by Chomsky and Halle (1968: 311). Are the labiovelars in Nupe labials with extreme velarisation or velars with extreme rounding? Phonetically, there is no way to tell the difference. But it is possible to decide "on the basis of the facts of the language". There are rounded and unrounded labials, and rounded and unrounded labiovelars. Also, all obstruents palatalise before front vowels; this includes labials and labiovelars. Therefore the

labiovelars are extremely velarised labials.

(6) For detailed discussion, see Roberts (1972) .

(7) It might be added here that the concept of distinctive features in phonology derives from the various non-alphabetic systems of phonetic notation in the latter part of the 19th century. Bell's Visible Speech (1867) was a set of complex symbols, in which each part of each symbol denotes a phonetic feature (e.g. for consonants, voice state, place and manner). Pitman's Shorthand (from 1837), based on Arabic syllabic writing, indicates place, manner and voice state of consonants by different writing conventions. And Jespersen's Alphabetic Notation (1899) is based on "sound elements" each of which is denoted by a symbol. All of these phonetic notation systems presuppose an analysis of segments into the feature components of articulation. It was doubtless this kind of phonetic analysis that enabled the "phonetic parameter" framework of the IPA chart.

(8) In Generative Phonology, in fact, we have yet to see a real advance on the position expressed by Chomsky and Halle

(1968: 300):

This subdivision of features is made primarily for purposes of exposition and has little theoretical basis at present. It seems likely, however, that ultimately the features themselves will be seen to be organised in a hierarchical structure which may resemble the structure that we have imposed upon them for purely expository reasons.

## Chapter 6: CONCLUSION

In this final chapter we will review the findings of our study of the phonetics-phonology relation in its historical perspective, and consider what relevance these findings may have for the foundations of phonology in contemporary linguistics. Our conclusions aim to be of interest to history, epistemology and linguistic theory.

We began with the premise that there has been an overt phonetics- phonology relation only since the 19th century. This is because modern linguistics, in conformity with the episteme of the 19th century (in the terminology of Foucault 1966), has studied language as an empirical human behavior, and has therefore had to try to account for the speech signal.

Linguistics in th 19th century has lost the special position in the hierarchy of knowledge which it possessed during the Enlightenment and has become just one of the sciences of man. This is strikingly demonstrated by the fact that 19th-century linguistics was influenced to a significant degree by a succession of other scientific discipl- ines. I have called



these PARADIGM SCIENCES (in allusion to Kuhn 1970), and I believe that the development of our discipline in the modern period cannot be fully understood without this background.

Before the 19th century, discourse on language had stopped short at the letters of the alphabet as used in the traditional orthographies. In general, linguistics has always had to relate its analysis to an inherited system of classification - be it the letters of the alphabet (for a writing system implies a theory of language) in the case of the early 19th-century philologists, or phonemic segmentation in the case of Generative Phonology. Since writing systems constitute a ready-made primitive phonemicisation or phonological analysis of each language in question, pre-19th-century linguistic phonetics or discourse about the sound level of language in Europe was in fact a quasi-phonemics or quasi-morphophonemics.

We are now in a position to compare the perceptions of the phonetics- phonology relation in the various *états de théorie* which we have been considering.

For William Jones, there are two kinds of transcription: first, the traditional orthography of the language, which may be an alphabet or a syllabary, and thus reflects the phonological structure of the particular language; and secondly, a system of phonetic notation applicable to all languages which would record their pronunciation accurately. William Jones' observation that the syllabaries used to write Oriental languages are optimally suited to reveal the sound structure of those languages shows that a language-specific notation need not necessarily be alphabetic (incorporating the assumptions of Western orthographic tradition) but that it may be found expedient to recognise primes larger than the letter or segment.

At the beginning of the 19th century, Grimm, in his discussion of the Indo-European sound shifts, states that the changes from archaic Indo-European languages to Germanic to Old High German represent a shift of one degree in each case; that is to say, Germanic underwent the same repeated process as archaic Indo-European, although the output of the process is phonetically different (different letter-segments) in each case. This implies an abstract view of phonological

process, and possibly hints at the primacy of this abstract level over the level of the phonetic realisation.

The concern with accounting for the speech signal which is characteristic of 19th-century linguistics subsequently led to the view that phonetics is the key to the explanation of sound change. Already in W v Humboldt's analysis of the Javanese verb (see chap. 3 fn 1 of my thesis), phonetic features are seen to operate in phonological processes. Pott (1833) and Raumer (1837) held the view that sound changes are "natural", i.e. that they must be accounted for in terms of possible phonetic changes. The Junggrammatiker in the latter part of the 19th century made it a dogma that the speech signal is the only reality and the only object of study of linguistics. Thus the primacy of the level of speech over any abstract model designed to account for the speech signal is unambiguously asserted. The Junggrammatiker insisted that the reconstructed forms of the Indo-European Ursprache are not to be thought of as forms in a language, but as abstract FORMULAE arrived at by inductive generalisation from the empirical data. Because the starred forms are precisely not speech data, they can have no ontological status. The recognition of

the formulaic status of the starred forms was the theoretical premise that enabled Saussure in the Mémoire to posit an abstract Indo-European vowel system which, though it accounted for the data, was not yet empirically justified in some respects. At any rate, the view of the later 19th-century Indo-Europeanists was that sound change must be explained phonetically. This is notably the position stated by Sievers (1876). It is due to the increasing realisation that phonological processes operate on natural classes of segments.

A structural conception of language had been present in 19th-century linguistics to a greater or lesser extent since Humboldt. It looms large in the thinking of Sievers and his contemporaries, but at this stage it is still basically a phonetic notion rather than a phonological one: it is associated with the concept of ARTICULATORY SETTING.

The Structuralism of 20th-century linguistics, as part of the new trend toward formalisation in philosophy and science at the end of the 19th century, is, in contrast, phonological. It was Saussure who initiated this conception, making of

linguistic structure an abstract, non-phonetic notion. The Prague school derived the concept of phonological structure from Saussure, and the dichotomy of phonology and phonetics was established as a theoretical principle. Trubetzkoy (1939) is undoubtedly the most comprehensive phonological theory before Generative Phonology. It is also in a sense the most forward-looking, in that it goes beyond classical phonemics in its concepts of BOUNDARY MARKER (showing that the phonological primes need not be exclusively segmental) and ARCHIPHONEME (showing a new concern with the question of redundancy). Distinctive Feature theory with Jakobson and later Generative Phonology has sought to abolish the autonomy of phonology and phonetics set up as a principle by Trubetzkoy, but the phoneticity of phonology is still to a great extent unexplored territory.

There has been a large measure of ambivalence in the whole of 20th-century linguistics with regard to the relations between phonology and phonetics and in particular the primacy relation existing between the two levels. Phonology must account for the speech signal, and phonetic transcription is the method of recording the speech signal; so phonetics must precede

I phonology in a methodological sense. On the other hand, phonetic transcription is liable to be biased by the language-specific perceptual set of the phonetician; and it is only phonological analysis that can decide between, for example, mono- or pluriphonemic solutions (for the contributions of Trubetzkoy, Sapir and Bloomfield to this discussion, see chapter 5 of this thesis).

The same epistemological framework of knowledge that made possible and necessary for linguistics the investigation of the speech signal decreed that the theoretical constructs of linguistics - the starred forms of historical reconstruction, or later the phonemic level of synchronic analysis - should correspond to an empirical reality. Constraints in Generative Phonology such as the Naturalness Condition are linked to the metatheoretical requirement of psychological reality. Just as earlier Distinctive Feature theory with Jakobson motivated the claim for the reality of phonology by basing phonology in acoustic phonetics, so too Generative Phonology constrains the abstractness of systematic phonemic representation by requiring that the same features be used to specify both systematic phonemics and systematic phonetics.

It is clear from our investigation that the requirement of psychological reality is characteristic of linguistics in the modern period, since linguistics since the 19th century has been an empirical study of human behavior. This requirement in Generative Phonology, as incorporated for example in the Naturalness Condition, nevertheless still gives rise to a number of conceptual difficulties. Phonology is part of competence (Chomsky & Halle 1968: chap.1). The competence grammar as set up by the linguist is a formal model accounting for the speaker's competence; it is not claimed to be a description of neural wiring or anything of that nature. It cannot be that, because competence itself is not accessible to direct empirical observation, only performance is. Then how can the requirement of psychological reality be invoked to constrain the metalanguage of phonology by identifying it with the metalanguage of phonetics? The ontological status of phonology is an important aspect of the foundations of linguistics. We have suggested that it has a bearing on phonological theory - especially the Naturalness Condition. This condition says that the systematic phonemic level, however abstract it may be - and the Naturalness Condition

does not constrain the distance between phonemics and phonetics in terms of the number of phonological rules, i.e. in terms of Derivational Abstractness (Roberts 1976b) - must use phonetic features. Apart from the arguments of economy and descriptive adequacy discussed in chapter 1, the Naturalness Condition rests on the assumption that the abstract phonemic level corresponds to some storage system in the central nervous system, and that this structure is directly linked to the vocal tract. In other words, the Naturalness Condition is based on the metatheoretical assumption of psychological reality. The same requirement of psychological reality underlies research in PSYCHOLINGUISTICS and NEUROLINGUISTICS. Examples of contemporary work in these lines of research are Read (1975), on the perception of phonological relations by children as evidenced in their spelling, and Cole & Scott (1974), on the various acoustic factors in speech perception. Psycho- and neurolinguistics constitute a highly necessary research activity, since the structure of language - the object of study of linguistics - is situated in the brain. But phonology cannot be reduced to neuropsychology; it is an independent level of description. We cannot assume that a given phonological model or its



theoretical elements correspond in any detail to neurophysiological structures underlying speech. Braithwaite (1953: chap.3), discussing the status of theoretical elements in a science, observes that theoretical elements have meaning in a different way from the elements of observation: the theoretical elements of a science are non-contingent and non-empirical. It seems that the theoretical constructs of a science of human behavior must be claimed to be real in some sense, but as I have said the requirement of psychological reality causes conceptual difficulties. I am convinced that Popper's philosophy of language (outlined in chapter 2) may provide an approach to this problem. In Popper's view, language is situated in a non-psychological sphere of reality. It seems to make more sense to say that phonology exists, first as a scientific theory or set of propositions in its own right, and secondly as a model that describes precisely (in so far as our attempts are successful) a delimited area of human behavior, rather than claiming that the central nervous system works that way, for the very good reason that we do not know how the central nervous system works in any great detail, and it is likely to be a long time before we do.

As far as phonological theory is concerned, a historical perspective on the phonetics-phonology relation serves to remind us, I believe, that the phoneticity of phonology is an open question, and that some of its most interesting aspects have yet to receive full discussion. It is the basic question considered by Sievers (1876) and Trubetzkoy (1939), each from a different theoretical standpoint. Sievers argued for the phoneticity of phonology from the fact that temporal process operates on natural classes of segments, thus anticipating the arguments for the Naturalness Condition in Generative Phonology; and he expressly related the unity of language systems to the phonetic concept of articulatory setting. Trubetzkoy affirmed the dichotomy of phonology and phonetics, but on the other hand he had a clear awareness of the phonetic nature of synchronic process; this prompted his approach to the hierarchy of features. In my view, phonology can be said to be necessarily related to the speech signal, without being determined completely by phonetic methodology; there are also deductive relations going from phonology to phonetics.

Looking back over these developments in linguistic and

phonetic theory since the 19th century, I am convinced that further discussion of the phonetics-phonology relation will have to find an important place for the concepts of THE HIERARCHY OF FEATURES and ARTICULATORY SETTING. We need to know exactly how the features are related to one another in phonetic terms, in order to specify natural classes and explain phonological processes; and an understanding of the overall phonetic characteristics of language systems should enable us to describe insightfully and economically the language-specific aspects of phonology, all the better to disengage its universal principles.

Some recent work has revealed a significant interest in these important but largely neglected areas of research. It has come to be realised that in phonological descriptions of the languages and dialects of the world there are PHONETIC GENERALISATIONS to be made. Kisseberth (1970, 1972) has shown that in many cases there is a "functional unity" in the phonological rules of a language, or a "conspiracy" among the rules to fulfil a certain function. Kim (1972) proposed the idea of a "metarule" attached to the phonological component of a language which describes a general phonetic tendency. Kim

remarks that the presently used formalism of Generative Phonology is unable to handle such statements of general phonetic tendency (1972: 168):

There seem to be cases where a certain tendency of articulation is preferred by and is characteristic of a speech community and that this general condition may be manifest in different shapes throughout the language, so that the current convention of rule formulation does not express this interrelationship (or "conspiracy" among rules)... There is enough evidence to suggest an alteration in the current framework of phonology...

Roberts (1972a, 1976a) has proposed that taking account of articulatory setting in phonological description should enable us to isolate the universal properties of phonology from the language-specific facts. And Trudgill (1974: chap. 8) has shown the importance of what he calls "setting rules" for the characterisation of social and regional dialect markers in sociolinguistics.

Trubetzkoy's preoccupation with the hierarchy of features has

scarcely been followed up in the standard theory of Generative Phonology. Thus Roberts (1975) identifies as a problem in the theoretical model

...the absence of a consistent hierarchical organisation for the features.

Similarly Warburton (1970: chap. 5) discusses the old problem of s and h in Indo-European, and notes that there is no way of accounting for this characteristic process in existing Distinctive Feature terms. She concludes that the problem is

primarily a question of the ordering of the features...

Ladefoged (1971: chap. 1) says that there is no clear evidence that the set of features required for phonetic contrasts is the same as for the natural classes of phonological rules. He proposes the setting up of "cover features" or multivalued parameters at the systematic phonemic level (e.g. GLOTTAL STRICTURE to cover the range "glottal stop" to "voicelessness"). It is likely that further

theoretical developments along the lines suggested in Ladefoged (1971) and Roberts (1976a) will reveal more about the interrelations of phonetic features.

To sum up, our investigation has brought to light a considerable amount of ambiguity and confusion in the perception of the phonetics- phonology relation in the theoretical development of modern linguistics. Resolving of those ambiguities and confusions is bound to be one of the most important tasks of future phonetic and phonological research.

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