PHONETICS, PHONOLOGY, AND THE NATURAL OF IT.

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ABSTRACT

This paper discusses the recent debate in phonology between formally-oriented and functionally-oriented approaches (generative phonology and natural phonology). It claims that both views have inspiring insights and drawbacks, pleading for a substantial neutrality of phoneticians with respect to the phonological research. In particular, it is stressed that phonology is a fundamentally abstract discipline: its proper goal is to avoid arbitrariness, rather than attain concreteness, according to the now prevailing (and much too ambiguous) wave. However, it is to be hoped that some recent developments both in phonology and phonetics might provide the ground for a fruitful convergence of these disciplines, within their own domains.

1. The theoretical debate of the last fifteen years or so among phonologists was largely, albeit not exclusively, centered around the problem of naturalness, or 'concreteness' (as I will show below, the two terms should not be confused). Although the debate was held on a multipolar basis, one of its most intriguing aspects was the confrontation between MIT inspired phonology and natural phonology (à la Stampe and Co., but also à la Hooper and Co.). I shall devote my attention to this problem, trying as much as possible to take a neutral viewpoint, namely the viewpoint of a phonetician who keeps an eye on phonology in order to get fruitful inspiration for his own research.

The confrontation between generative phonology and natural phonology (henceforth, GP and NP) on the theme of naturalness/concreteness does not represent a completely new phenomenon. Quite on the contrary, this is just the latest episode of a more general, and much older, contraposition between formally-oriented and (so to say) functionally-oriented phonological theories, which has characterized the whole of phonology since its very beginning. This has been in fact a constant feature in the history of the discipline, much before the advent of GP. Indeed, if viewed from the corner of naturalness, many streams of structuralist phonology, both in Europe and in the USA, look much more abstract than orthodox GP. As an example, think of Bloomfield's /ʔ/ analysis of Menomini, where an underlying /w/ is arbitrarily postulated only to the effect of blocking the expected palatalization of the sequence /tj/ in those words which exceptionally escape this process.

Yet, Bloomfield's approach does not represent the most extreme case of abstraction in structuralist phonology: for that matter, just think of such scholars as Hjelmslev or Z. Harris. Needless to say, not all structuralist phonologists show this extreme neglect for the phonetic substance: Jakobson is a very clear example of a phonologist with a sharp interest in the physical support of language. However, in some sense it can be said that GP yielded a substantial change in the orientation of phonological studies. Even the well-known Hallean paradox, concerning the absence of a level of autonomous phonemics in Russian (and in phonological theory), can be understood in this light: the intermediate level of autonomous phonemics is rejected in as much as it does not add any relevant piece of information on the link between the abstract morphophonemic level and the concrete allophonic level.

Curiously enough, then, the kind of objections which NP raises against GP are partly of the same kind as the objections which GP raised against structuralist phonology: namely, the undue neglect of the phonetic substance. There is ground to say, therefore, that GP and NP appear to be very different, or quite similar, to each other, according to the distance from which they are looked at. If compared to the most abstract among the structuralist approaches, they both look quite concrete; if compared to each other, NP looks much more substance-oriented than GP.

In what follows, I shall try to consider the topic of naturalness, and the confrontation of GP and NP, from the viewpoint of phonetics. Tow questions are of particular interest in this context:
1) Who did prevail in the recent theoretical debate (the formally-oriented, or the substance-oriented)?
2) Is there any special lesson to be learned for phoneticians?

The answers to these questions will be tentatively given in sections 3 and 4 below; in section 2, I shall be concerned again with the topic of concreteness/functionality, claiming that too much of an emphasis has been put on this concept in recent works.

2. There is no doubt that the discussions which took place on the matter of naturalness were in the whole very instructive and fruitful. For one thing, it appears to me that these discussions forced the adhe-

rents to GP to reanalyse their own positions, and to pay more attention than ever before to this issue. However, not everything went on as smoothly as that. I would like to provide a couple of examples.

The first example concerns the by now very well-known case of the k-∅ alternation in Turkish, which unpredictably characterizes the declension of a certain class of nouns. The traditional analysis performed by Lees /15/, attributes the alternation to the lexical differentiation between underlying /g/, which regularly devoices in syllable-final position and deletes intervocalically (in the Istanbul dialect), and underlying /k/ which is preserved. This seems to be in accord with the historical facts. However, as was suggested by Zimmer /20/ and Zimmer & Abbott /21/, the historical explanation does not account for the synchronic data, since /k/ deletion tends to operate in monosyllabic roots only, to the exclusion of polysyllabic ones. Actually, the situation is probably more complicated than that, according to Sezer /17/, because /k/ is preserved also in polysyllabic roots when it follows a long vowel (Zimmer & Abbott notice this fact mainly in connection with the behaviour of Arabic loanwords, which often retain /k/). Whatever is the real explanation of this phenomenon, I would like to call attention to a particular aspect of this debate, which has been unduly taken for granted by all participants. Namely, the solution put forth by Zimmer, based on syllabic count, was labelled the 'functional' solution, following an explicit statement by Zimmer himself. This is enhanced even in the title of a notorious paper by Halle /8/, which correctly criticizes Zimmer's claim that his own solution is to be preferred (on the ground of simplicity) to the 'formal' solution based on the underlying alternation between /g/ and /k/. Now, it is difficult to understand just what the term 'functional' means in this case. No doubt, polysyllabic words are longer than monosyllabic ones; consequently, a deletion process which concerns polysyllabic words only, might be regarded as a tendency to equalize the length of the words in the language. However, in the present case this explanation looks quite suspicious: why on earth should Turkish speakers make recourse to this 'functional' tendency only in the case of polysyllabic roots ending in /k/, to the exclusion of those ending in /p,t.../? I believe Halle is perfectly right in claiming that Zimmer's solution is on the same level, from the point of view of simplicity, as the more abstract approach consisting in postulating a lexically idiosyncratic morphophonemic alternation between /g/ and /k/. For that matter, Zimmer's proposal should be accepted rather on the ground of being more 'concrete' than the alternative proposal, although I am not sure that this argument is really compelling in the face of the whole system of Turkish morphophonology, where the alternation between voiced and voiceless stops has to be postulated anyway on independent grounds.

In conclusion, the Turkish case provides a good example of the distorted usage, which is sometimes to be observed, of the word 'functional'. A similar example is provided by Stemberger's /18/ analysis of the so-called empty consonants of French: where the author claims that his analysis is more concrete than the traditional approach (consisting in the postulation of underlying consonants, to be deleted in some particular contexts). The new solution consists in suggesting that the relevant words of French which undergo this phonological process show an extrasyllabic C in their CV-skeleton, which is eventually deleted whenever it is not captured by a process of re-syllabification. Here it is very difficult for me to understand what is the meaning of the term 'concrete'. True, a C position in the CV-skeleton does not need to be filled with any phonetic content, whereas an abstract consonant should be provided with a fully specified distinctive feature matrix, at least according to the current view. However, why on earth should a phonological representation look more concrete as a consequence of the insertion of an underlying C slot? If anything which is postulated by a given phonological theory deserved the qualification of 'concrete' just because it has been postulated, then any phonological object would be concrete! Stemberger & Marlett /16/ go so far as to claim that their treatment of empty consonants in Seri (basically similar to the one proposed for French by Stemberger) is even consistent with Venneman's 'Strong Naturalness Condition', which states that underlying representations should coincide with some surface form; but I just fail to see how any French consonant can be said to 'concretely' exhibit a C position in its surface form (apart from the fact that the Strong Naturalness Condition does not seem to be tenable on theoretical grounds, as pointed out e.g. by Kenstowicz & Kisseberth /14/.

It appears to me that what is involved here is a category mistake: Stemberger and coworkers seem to be strongly biased towards concrete analyses, and do not hesitate to call 'concrete' their own analysis of empty consonants, neglecting the simple fact that the CV-skeleton cannot on principled grounds be regarded as a concrete object. Understandably, Klausenburger /14/ argues that Stemberger's analysis of French empty consonants strains the concept of concreteness "beyond recognition".

I chose these two examples (the Turkish and the French one) in order to show two different instances of a quite common fallacy, namely the exasperated need to adhere to the by now prevailing wave of concreteness. This is a characteristically new phenomenon in the history of phonology: fifteen years ago, or so, most phonologists would have regarded as inappropriate any appeal to concreteness in their analyses. Now, things have gone so far, that concreteness is invoked even in the wrong cases. Although it might look funny to do so, it seems to be time for a phone-

tician (as I mainly consider myself) to remind phonologists of the essentially abstract nature of their own domain of research. As a matter of principle, nothing can be objected against people who incline towards abstract phonological analyses, provided they refrain from taking arbitrary steps: what should be avoided, as a source of confusion, is the undue appeal to concreteness or 'functionality'. Pushing things a little bit further, one might in fact claim that the very idea of concreteness looks quite meaningless as applied to phonology. I bet M. le Prince Trubeckoj turns in his grave every time the word 'concreteness' is uttered in the context of phonology. Alternatively, and choosing a milder formulation, one might claim that too often the polarity 'abstract vs concrete' is mistakingly understood as the dichotomy 'arbitrary vs motivated', where the illegitimate term is of course arbitrariness, not abstraction.

3. Let us now try to consider the first of the two questions announced above. From what I said in the preceding section, it might appear that the functionally-oriented stream of phonology has prevailed over the alternative one during the theoretical debate of the last decade: indeed, as was noted, never before was there such a pervasive acceptance of the concreteness issue. However, things are not as neat as they might appear. The now overwhelming acceptance of the 'concrete' vocation of phonology is just the newest version of the so-called 'naturalness condition', which has always been a topic in most versions of GP. Any analysis which minimizes the number of distinctive features necessary to express a given generalization has always been regarded as the most highly valued, and termed a natural solution. The very search for a set of distinctive features was largely motivated by the goal of capturing as many natural classes of sounds with as few features as possible. Nevertheless, this concern never prevented GP from assuming very abstract positions, nor from taking the step of evaluating its own results on the basis of fairly mechanical features' computations (thus showing a strictly formal, rather than functional attitude). On the whole, the issue of concreteness/naturalness was often paid little more than mere lip service. So, it would be mistaken to say that NP succeeded in imposing a functional perspective on contemporary phonology: the theoretical issues it raised were undoubtedly taken seriously, but (as we saw above) they sometimes ran the risk of being strained beyond recognition.

The point is that the stance of GP on the matter of concreteness has always been somewhat ambiguous. On the one hand, GP has defined its set of distinctive features in quite physical terms (following the Jakobsonian tradition), thus suggesting a fundamental link between phonology and phonetics; on the other hand (as just noted), GP has devoted a great deal of attention to purely formal matters, such as the 'sim-

plicity metrics', based on the mechanical computation of features. In addition to this, GP has very often shown little concern for the distinction between synchronic and diachronic processes. One such example is Kisseberth's /13/ analysis of Yawelmani, which brilliantly reconstructs an underlying vowel system, on the basis of which all the apparently misterious anomalies of the surface phonetic form can be explained. But if one looks at it from the point of view of NP, then one cannot escape the following question: namely, is the postulated underlying /u:/, which never surfaces in any word of contemporary Yawelmani, really present to the phonological competence of the native speaker, or is it nothing more than an historical fact, devoid of any synchronic validity? To put it in other words, is there ground to postulate synchronic rules which derive surface forms such as c'omhun from the underlying /c'u:mhin/ (where the i/u alternation in the final syllable is due to vowel harmony), or should one regard this as a purely morphologized and lexicalized process, largely opaque to the contemporary speaker?

It is clear enough that the answer to these questions cannot be given without taking a strong theoretical position (i.e. a position which far exceeds the available evidence and represents a guess as to the proper basis to develop a framework of investigation and research). Generative phonologists tend to consider the objections raised by NP as irrelevant. They do not deny that morphological alternations exist; however, they believe there is no compelling evidence that these alternations (except for a minor portion of them) are mere reflexes of historical developments, rather than synchronic processes located in the brain of the speaker. After all, who knows how large the human capacity for fairly complex on-line computations is? The counterobjection of NP is that there are observable differences between processes which are directly reflected in the speakers' phonetic behaviour, and processes which do not surface explicitly. For instance, the speaker of a language with final obstruent devoicing will tend to apply this process also to foreign and nonsense words, whereas it would be quite surprising if the Yawelmani speaker produced (in the appropriate context) /o/ instead of /u:/ when pronouncing a foreign or a nonsense word. Thus, the NP claim that synchronic and diachronic processes must be kept apart from each other seems to be substantiated by observational evidence; and indeed, this is the strongest point in favour of NP. Yet, even this kind of argument does not solve the dispute. The charge which is usually made by generative phonologists against natural phonologists is that the latter reduce the relevance of the phonological component by depriving it of part of its content; and although this deprivation is done to the benefit of morphology, the splitting weakens the predictive power of the theory, since many phono-morphodictive phenomena are no more considered to be direc logical phenomena are no more considered to be directly

tly linked by a single line of derivation. And one could hardly deny that the theoretical assumptions defended by GP enabled it to provide several inspiring and fully developed pieces of description of the phonological component of many different languages.

As I said, there does not seem to be a neutral or pretheoretical point of view about these matters. And indeed, even if we consider the problem from the point of view of phonetics, it should appear that either answer is perfectly legitimate. There is no reason why a phonetician should be bothered by the possibility that the phonological component is structured in such a way as to contain a fairly abstract set of rules, provided they do not suffer from arbitrariness, and provided of course that the output coincides with what is actually pronounced by the native speaker.

This last consideration might remind us of the position of those phonologists (adhering to GP) who defended the claim of the unnaturalness of phonology, in sharp contraposition to NP (cf., e.g., Anderson /1/ or Hellberg /11/). However, I do not regard those criticisms as especially harmful to NP. Indeed, NP never claimed that every phonological process is natural, for one must take into consideration the often unpredictable development of human languages, subject to the contribution of many diverse factors, such as contact with other languages, or morphological patterning. In fact, a great deal of the sound structure of any language is under the control of morphology, rather than phonology, and this has to be reckoned by any phonological theory. This is not to deny, though, the importance of Anderson's contribution, and of those who made the same move. On the contrary, their warning reminds us that any attempt to squash phonology onto phonetics is bound to failure; and it is a fact that NP, admittedly, has but a weak explanatory power: it does not tell us why a given phonological process occurs, rather it tells us whether that process is to be expected on phonetic grounds. Also, it is a fact that the first attempt to develop a comprehensive framework to motivate morphophonological patternings along the lines of NP is Dressler's /4/, which appeared long after the birth of NP.

4. With this caveat in mind, we can finally address the second question put forth in section 1. Let us recapitulate some of the observations which were advanced so far:
(i) phonology is an abstract domain of research;
(ii) in order to avoid the risk of arbitrariness in the analysis, some restriction must be posited, the most reasonable one being a restriction of phonetic naturalness (i.e. plausibility);
(iii) however, the pursuit of naturalness must not be carried out at the expense of principle (i).

Now, at first glance, one might advance the view that the general trend of contemporary phonology towards the naturalness/concreteness issue goes very

much in the same direction (despite the equivocal episodes described above in section 2) towards which phonetics is intrinsically oriented. I would like to claim, though, that this is not entirely true. No doubt, an 'unnatural' phonetics is hardly conceivable; furthermore, it is a fact that a purely abstract (which amounts to saying: arbitrary) phonology would be of no help to phonetic sciences. Nevertheless, I do not think that phoneticians (putting aside personal predilections) should encourage NP any more than GP, or in general functionally-oriented theories at the expense of formally-oriented ones. The basic contribution of phonology to phonetics is to be sought in its propensity to provide theories which can occasionally be tested experimentally, or inspire the conception of new ideas about the production of speech. In this respect, a formally-minded phonology might even provide better material for phonetic speculation, just because of its more provocative character. The search for phonetic motivation for abstract phonological processes is, after all, the fundamental challenge to phoneticians.

From this point of view, non-linear phonologies might easily prove to be more challenging than any version of NP. An interesting example of this can be found in Clements /3/, who explicitly tries to develop a phonetically motivated theory of autosegmental phonology, where each articulatory dimension corresponds to an individual autosegment, all this leading to a hierarchic conception of the feature content of phonemes. It is envisageable that this view of the phoneme will induce a new stream of research in phonetics, just as the traditional view of the phoneme as an internally unstructured matrix of distinctive features inspired important works. And it might be that something of this sort will be eventually triggered by a specific branch of non-linear phonology I alluded to above, namely CV-phonology, although the first attempt at experimental verification carried out by Stemberger & Mc Whinney /19/ is far from successful. A much more successful one is Hayes's /10/, which accumulates empirical evidence (in terms of reactions to a number of phonological processes) for the existence of multiple vs biunivocal linkings between the segmental and the CV tier (thus substantiating with new and convincing arguments the old view that geminates behave differently in the various languages); however, Hayes's approach is not experimental.

It is quite instructive, in any case, to see how often CV-phonologists try to provide a physical basis to the abstract entities they postulate: indeed, this is another instance of the concreteness trend now prevailing in phonological research (but recall the criticisms put forth in section 2 above). CV positions (or x positions, depending on the particular framework) are very often said to be 'timing units' and Marlett & Stemberger /16/ even speak of empty

consonant positions as something which produces consequences on the level of motor programming, although they admit that more work has to be done "on the low-level phonetic facts of empty syllable positions" (p. 637). Honestly, I think all this goes a bit too far. I have the impression that most phonologists did not notice what has been going on in phonetics during the last decade, in particular in the area known as 'action theory', where the issue of timing was extensively reexamined in the light of new acquisitions in physiology and psychology (cf. Journal of Phonetics 14,1,1986 for a recent debate on this topic). Of course, some phonologists did notice it, and even raised severe objections: cf. Hammarberg's /9/ polemics against Fowler /5,6/. However, I believe Hammarberg's emphasis on mentalism as opposed to physicalism is ill-founded: the recognition of the articulatory-acoustic correlates of phonemes, and of the intrinsic need for coarticulation (possibly in terms of coproduction, as suggested in Fowler & Smith /7/), does not exclude the fundamentally abstract nature of phonemes as mental entities responsible of the phonological patterns of natural languages. Besides, the physical properties of the speech mechanism are connected to higher-level principles, which themselves depend on the functional properties of the organism. If looked at from this ecological perspective, phonetics is no more a merely concrete domain of research; rather, it becomes a field which incorporates a notable degree of abstraction.

The elucidation of these topics is the matter of future research. Let me just say, to conclude, that I entertain the hope that some recent developments in phonology, as illustrated by Clements /3/, will provide the theoretical basis for a fruitful rendez-vous of phonetics and phonology, and possibly (why not?) for the convergence of NP and GP (or at least the most influential version of the latter) on the common ground of phonetic motivation (and plausibility) of phonological processes.

BIBLIOGRAPHICAL REFERENCES.

/1/ Anderson, S.R. (1981), "Why phonology isn't natural", Linguistic Inquiry 12: 493-540.
/2/ Bloomfield, L. (1939), "Menomini morphophonemics", Travaux du Cercle Linguistique de Prague 8: 105-115 (also in V. Makkai, ed. Phonological Theory, New York, Holt 1972: 58-74).
/3/ Clements, G.N. (1985), "The geometry of phonological features", Phonology Yearbook 2: 225-52.
/4/ Dressler, W.U. (1985), Morphonology. The Dynamics of Derivation, Ann Arbor, Karoma.
/5/ Fowler, C.A. (1980), "Coarticulation and theories of extrinsic timing", J.of Phonetics 8: 113-33.
/6/ Fowler, C.A. (1983), "Realism and unrealism: a reply", J. of Phonetics 11: 303:22.
/7/ Fowler, C.A. & Smith, M.R. (1986), "Speech perception as 'vector analysis': an approach to the problems of invariance and segmentation", in J.S. Perkell & D.H. Klatt, eds., Invariance

and Variability in Speech Processes, Hillsdale, N.J., Erlbaum: 123-39.
/8/ Halle, M. (1979), "Formal vs. functional considerations in phonology", IULC.
/9/ Hammarberg, R. (1982), "On redefining coarticulation", J. of Phonetics 10: 123-37.
/10/ Hayes, B. (1986), "Inalterability in CV phonology", Language 62,2: 321-51.
/11/ Hellberg, S. (1978), "Unnatural phonology", J. of Linguistics 14: 157-78.
/12/ Kenstowicz, M. & Kisseberth, C. (1979), Generative Phonology: Description and Theory, New York etc., Academic Press.
/13/ Kisseberth, C. (1969), "On the abstractness of phonology: the evidence from Yawelmani", Papers in Linguistics 1: 248-82.
/14/Klausenburger, J. (1986), "How concrete is extrasyllabicity?", J. of Linguistics 22: 439-41.
/15/ Lees, R.B. (1961), The Phonology of Modern Standard Turkish, Bloomington, Indiana Univ. Press.
/16/ Marlett, S.A. & Stemberger, J.P. (1983), "Empty consonants in Seri", Linguistic Inquiry 14: 617-39.
/17/ Sezer, E. (1981), "The k-Ø alternation in Turkish", in G.N. Clements, ed., Harvard Studies in Phonology 2.
/18/ Stemberger, J.P. (1985), "CV phonology and French consonants" J. of Linguistics 21: 453-57.
/19/ Stemberger, J.P. & Mc Whinney, B. (1984), "Extrasyllabic consonants in CV phonology: an experimental test", J. of Phonetics 12: 355-66.
/20/ Zimmer, K.E. (1975), "Some thoughts on likely phonologies for non-ideal speakers", in R.E. Grossman et al., eds., Papers from the Parasession on Functionalism, CLS: 556-67.
/21/ Zimmer, K.E. & Abbott, B. (1978), "The k-Ø alternation in Turkish: some experimental evidence for its productivity", J. of Psycholinguistic Research 7: 35-46.