

Arabic phonetics in the beginning of the third millenium

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ABSTRACT

Arabic phonetics has been part of the study of Arabic language since the 7th century CE. The great works by Al-Khali:l, "Kita:b al-'Ayn", and Si:bawayh, author of the first Arabic grammar book "al-kita:b" (i.e., "The Book") are the two cornerstones of this field. The early Arab grammarians knew phonetics quite well, although they mixed it with phonology, but interest in phonetics has remained fairly marginal until the middle of the 20th century. Modern phonetics in the West, computerized innovations and other factors enhanced also Arabic phonetics especially in the last two decades.

This introduction reviews five major schools which developed Arabic phonetics in the (Classical) past: dictionary, grammar, Koran reading, philosophy, and rhetoric. These are compared with modern trends in Arabic phonetic studies: dialect descriptions, sociolinguistic studies, pure phonetic features, language acquisition and teaching and new phonetic areas: prosody and suprasegmentals. The basic differences between the two periods lie in research motivation and methodology.

The talks in this session exemplify salient features of segments and suprasegments in colloquial dialects and Literary Arabic: pausal forms, glottalization, gemination, emphatics (coarticulation), and intonation. The studies were performed by modern analysis techniques.

Keywords: Arabic phonology/phonetics; pausal forms; glottalization; gemination; emphatics

1. INTRODUCTION

The long history of Arabic phonetics is considered to have begun in the 7th century CE with Al-Khali:l's *Kita:b al-'Ayn*, the first Arabic dictionary. Its alphabet letters were phonetically arranged from the larynx to the lips, and in the introduction it discussed the phonological/phonetic system of Arabic. Arabic phonology has developed within linguistics, mainly due to religious motivation. Phonetics attracted only part of their attention (it has been claimed that it was the least important for

them, since phonetics is the last chapter in "The Book", Si:bawayh's comprehensive grammar book. The centers of Arabic linguistic studies developed in Basra, Kufa and Baghdad (in this order) and later in Spain (Cordova), Egypt (Cairo) etc. The phonetic studies continued to develop during the Abbasid Empire (9th-11th centuries) until the Middle Ages. These "old" texts are still researched by Arab and non-Arab scholars.

Since the 19th century the Arabic speaking world has undergone a "renaissance" (*nahd^ha*) while opening to the West (i.e., Europe, and later to the USA). As part of this growth, modern linguistic notions and methods including phonetics gradually reached Arab scholars. Studies in the 20th century found that the Classical Arab linguists had come up with several ideas and notions which were later independently re-defined by Western linguists (e.g., [1], [2]). At present Arabic linguistics is widely studied by native and non-native speakers of the language in both the Middle East and in the West.

2. CLASSICAL SCHOOLS OF PHONOLOGY

'Ala: Jabr Mohammad [7] classifies Arabic phonological/phonetic studies from the beginning of the Islamic period into five schools: dictionary-compilers, grammarians, Koran reading experts, philosophers, and rhetoricians. Each of these schools had different motivations, goals and methods in studying Arabic phonology and phonetics.

Dictionary compiling phonetic-linguists begin with the noted Al-Khali:l Abu: 'Amr AL-Fara:hi:di:, although there were linguists before him and he did not invent the whole system by himself. Yet his dictionary was the greatest contribution to the nascent field. It was arranged by articulation locus of the phonemes (letters), from *'ayn*, the guttural phoneme and ending at the lips. He also organized each item by three root consonants turning them round and covering all the options. In both these issues – phoneme ordering and three-consonantal

roots – Al-kahli:l's dictionary was a first. Previous dictionaries were more or less word lists organized by content or subject-matter. After him, the dictionaries were phonologically or alphabetically organized, though authors of dictionaries often copied Al-Khali:l's items and definitions.

Al-Khali:l's student, Abu Bishr 'Amr Ibn 'Uthma:n Ibn Qanbar Si:bawayh, was author of the first and fundamental grammar book of Arabic *al-kita:b*. This book represents the grammarians' school, and includes his own and earlier grammarians' views on phonology. Like Al-Khali:l Sibawayh lists the speech sounds, with a careful description of the manner of articulation based on live (spontaneous) Arabic speech. He also discusses features of Arabic phonetics such as *tafxi:m* (emphasis), *iddiġa:m* (assimilation) *ġahr/hams* (sonorous/muffled), *waqf* (pausal forms) etc.

Correct Koran reading and *tajwi:d* is a holy and important task in Islam, due to the holiness of the Koran. Linguists wanted to prescribe the most correct and beautiful manner of articulation which would prevent errors in Koran reading by both native and non-native students of Arabic. For this goal they described the minutest details of the system. They added the aesthetic element to the technical description. They depicted, for example, details of assimilation processes (forward and backward, partial and complete), emphatization, nasalization, phoneme reduction/lengthening, etc.

The philosophers examined language as part of a systematic science. Their focus was firstly on the emergence of natural (physical) sound and its features: how sound progresses in the air, how high or low it sounds and how it reverberates (echoes), and then how it becomes speech sounds and how speech is produced (in the mouth) and perceived (by the listener). Their physical ideas were relatively correct, but the perception theories were mostly wrong because they did not understand the inner ear's and the brain's roles in this process.

The last school was that of the rhetoricians. Their motivation was to teach the most eloquent ways of articulation in both the aesthetic and content respects. Therefore their work focused on voice production, distinction between consonants and vowels (which was not fully clear for them), and "primary" and "secondary" phonemes (i.e., referring to "good" or desirable or normative vs. "bad" or undesirable pronunciation). The first diagram of the human vocal tract from the larynx to the lips, with names of the phonemes at their

articulation loci, as it is considered, was found in a manuscript of *mufta:h Al-'Ulu:m* ("the key of sciences") by Al-Saka:ki: (died in 626 H.=~ 1250 CE). Other diagrams followed in works of this school.

3. MODERN DEVELOPMENTS

With the Arabic *nahd^ŕa* (renaissance) in the 19th century Western science has been penetrating the Arabic-speaking countries. Arab interest in phonetics generally focused then on Koran reading art while in the West Arabic phonetics/phonology were studied mainly as part of works on Semitic-languages ([6], [3]). Both Arab and Western schools in the beginning of 20th century did not fully separate phonetics from phonology.

During the 20th century the interest in phonetics/phonology grew gradually, together with the generally increasing number of studies of Arabic. This increase was related to the growing economic and strategic importance of the Middle East, the growing number of native speakers of Arabic around the world, the growing number of Western universities with Arabic units, as well as the larger number of Arab students speaking many Arab dialects, who studied in the West. Until the end of World War II, most of these departments were in Europe: Germany, Britain, France, Holland and Italy. When the USA became a world power after WWII it also developed interest in the Middle East and Arabic studies. Computational communication theories and technologies whose repercussions reached the Arabic-speaking Middle East in the last third of the 20th century slowly enhanced interest in Arabic speech analysis. The features of the Arabic language, so different from European languages and from American English, have attracted many researchers' attention. The progress of Arabic phonetics is evident in the large number of studies on various aspects in this field published in the last three decades. At the beginning of the third millenium we can say that Arabic phonetics is one of the linguistic areas which are developing among world languages.

Since the 3rd quarter of the 20th century studies of various topics within Arabic phonetic systems have been increasing. Published MA and PhD studies, journal articles and books deal with phonology and phonetics of many Eastern and Western Arabic dialects including Kuwait, Yemen (San'a), Lebanon, Syria (Damascus), Jordan ('Amman), Israel (Haifa, Nazareth), the Palestinian territories,

Egypt (Cairo), Morocco (Marrakech), Tunisia (Rades). Works describing specific dialects usually dedicate a chapter to phonology and phonetic features. Literary Arabic as orally produced in, e.g., Iraq, Egypt and Morocco, has also been phonetically studied. The well-known Arabic diglossia, i.e. the dichotomy into literary vs. spoken levels, and the wide geographical range of dialects usually yield studies discussing a single local or social dialect.

The specific topics of such works may investigate the acquisition of phonology as a first language, its acquisition in bilinguals, language impairments and speech errors, computational programming of phonetic/phonological systems, prosodic structures such as word accent, speech rhythm and intonation. Some works view phonology in comparison with other Arabic dialects or other languages (e.g., English, French or Dutch, in pedagogical and bilingual studies). The three volumes of the *Encyclopedia of Arabic Language and Linguistics*, two of which have appeared recently ([10]), contain many sections dealing with phonology and phonetics in all these areas, as well as sections on the history and development of Arabic phonology/phonetics.

Studies ([5], [11]) show that since Classical Arabic the phonological/phonetic system of Arabic has changed in many respects. Although the names of certain phonemes have not changed, they are now articulated in different manners or loci than in the past. Modern studies also tackle topics which were hardly discussed in the past or not discussed at all (e.g., syllable structures, sentence intonation). Such studies range between theoretical phonology and phonetics (e.g., [4], [9]).

These studies are conducted not only by native speakers of Arabic but also by non-native researchers (from Europe, America, etc.)

The rising interest in phonology and phonetics has been driven not only by pure scientific motivation but also by applicative goals such as language analysis and synthesis for modern industrial products (e.g., interactive computer services, automatic telephony, text-to-speech programs for the hard of sight, psycho-acoustic problems of hearing impaired individuals, and other needs of learning impaired people; see e.g., programs by the Egyptian Sakhr company [8]). Since such applications are manufactured not only in the Arabic-speaking countries, Arabic phonetics has become important for many industrial bodies over

the world. It is to be noted that these new research goals are largely motivated towards non-religious goals - unlike goals in the Classical Arabic period.

The modern literature on Arabic phonology/phonetics can be classified by language, too: works written in Arabic or in other languages. The literature in Arabic is usually written by researchers who live in the Arabic-speaking countries in the Middle East and North Africa. A growing part of this community is at least familiar with if not followers of the modern phonetic sciences as developed in the West. Such studies are often rooted in the traditional approach or combine Western approaches and methods with traditional ones. Growing numbers of Arab phoneticians study and publish in the West (often remaining there after completing their studies). This combined trend ultimately contributes to the development of Arabic phonetics. In addition to them, non-native phoneticians study Arabic phonetics both in the West and in Arabic-speaking countries.

Table 1 lists some researchers' names as milestones in the history of the study of Arabic phonology/phonetics in the past (cf. [7]) and the 20th century.

4. CONCLUSION: VIEW TO THE FUTURE

Briefly, what can be hoped for the future is to further develop phonetics/phonological studies in order to learn more about the system of the Arabic language and its application and use by native and non-native speakers. Almost all the general topics in phonetics need be further developed, as e.g.:

1. Basic descriptions of phonetic features in the numerous different dialects.
2. Finding similar and different phonetic features between individual dialects and between them and Literary Arabic.
3. Manners and phases of acquisition of colloquial Arabic phonetics as mother tongue and as second/foreign language in various environments.
4. Study of the mutual phonetic effect of Literary Arabic and colloquial dialects on one another.
5. Special attention to the prosody of colloquial dialects (e.g., for increasing the naturalness of automatic speech devices).
6. The use of phonetics for the aid of populations with special needs such as hearing impaired, sight impaired, SLI children, or aphasics.
7. Study of the effects of foreign languages on Arabic phonological/phonetic systems.

For industrial goals it is important to learn to contend with colloquial dialects, in spite of their

great variety, because it is the mother tongue of native speakers of Arabic. Maybe the combination of Literary and colloquial Arabic features (as in modern Educated Arabic) may lead to a feasible solution for industries which struggle with the question which dialect should be synthesized among the immense number of Arabic varieties.

In this session four researchers present some interesting phonetic features of Arabic in the fields of segmental and supra-segmental phonetics. These four talks are just the tip of the iceberg, and it is hoped they will serve as "teasers" for future research on Arabic phonetics.

5. REFERENCES

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Table 1. Researchers' names as milestones in the study of Arabic phonology/phonetics

Date	School/Origin	Researchers working in Phonology/phonetics
Past (Classical Arabic)	Dictionary-compilers	Al-Xali:l; Al-Qa:li; Al-Azhari; Al-S ^ʿ a:hib ibn 'Abba:d; Ibn Si:da
	Grammarians	Sibawayh; Al-Mubarrad; Al-Zajja:ji; Ibn Al-Sarra:j; Al-Zamaxšariy: Ibn Ya'i:š; Ibn Jinniy; Al-Rad ^ʿ iy; Ibn 'As ^ʿ fu:r; Al-Ašmu:niy; Al-Suyu:t ^ʿ iy
	Koran reading	Al-Mar'ašiy (=Sa:jiqal-zade), Al-Qurt ^ʿ ubiy, Ibn Al-'Ala:'
	Philosophers	Al-Fa:ra:biy, Ibn Si:na; 'Tkhwa:n al-S ^ʿ afa; Ibn Rušd; Al-Bi:ru:niy
	Rhetoricians	Ibn Sina:n, Al-Khafa:jiy, Faxr Al-Di:n Al-Ra:ziy, Abu Ya'qu:b Al-Saka:kiy
In the 20 th century (modern Arabic)	Europe, America: phoneticians, mainly Semitists specialized in or worked on certain Eastern / Western dialects	H. Blanc, G. Bohas, A. Borg, C. Brockelmann E. Broselow, D. Cohen, J. Cantineau, C.A. Ferguson, H. Fleisch, W. Gairdner, J. Heath, C. Holes, B. Ingham, O. Jastrow, T.M. Johnstone, J. McCarthy A. Meillet, T.F. Mitchell, E. Selkirk, S. Sara, J.C.E. Watson
In the 20 th century (modern Arabic)	Arab states: Egypt, Syria, Iraq, Lebanon, Saudi Arabia, Morocco, etc.	S.Al-Ani, G. Q. AlHamd I. Ani:s, M. Bakalla, Th. Benkirane, Sh. Dayf, M. Feghali, A. Frayha, M. Lahlou, M. Ma'an, 'A. Matar